

Delayed Retirement and Evaluation of the Payment Ability of Jiangxi Province's Basic Pension Fund in China

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Abstract: The current payment pressure on the basic pension fund of Jiangxi Province in China is continuously increasing, and what impact will the upcoming delayed retirement policy have on the payment capacity of this province's pension fund? This study evaluates the impact of two representative delayed retirement policies on the payment capacity of the basic pension fund in Jiangxi Province using actuarial methods. We found that delayed retirement is beneficial for improving the current and cumulative balances of the pension fund, significantly improving the future payment capacity of the pension fund. Moreover, the favorable effect of delayed scheme 2 is stronger than that of scheme 1. Given the favorable effects of the delayed retirement, the Chinese government should seize the time to formulate feasible delayed retirement policies to enhance the sustainable operation ability of the basic pension fund and ensure the timely and full payment of pension benefits for retirees.

Keywords: Public pension insurance, delayed retirement, policy impact, payment ability.

1. INTRODUCTION

The sustainability of basic pension fund has always been valued by the Chinese government. *The Third Plenary Session of the 18th Central Committee* proposed the establishment of a more fair and sustainable social security system. *The Report of the 19th National Congress of the Communist Party of China* pointed out the need to comprehensively establish a multi-level social security system with sustainable characteristics. Both *the 2021 and 2022 Government Work Reports of the State Council* pointed out the need to ensure the full distribution of pensions and ensure the sustainability of social security funds. Social insurance is the core of social security, and basic pension insurance is one of the core parts of social insurance. The sustainability of basic pension has always been a focus of government attention, which is related to the vital interests of all insured individuals and social stability.

Jiangxi, as a province in the central region of China, has started to experience a situation in recent years where the contribution incomes of the basic pension insurance fund for urban employees does not offset its pension expenditures, gradually consuming the historical accumulated balance of the fund. In May 2019, the General Office of the State Council issued *the Comprehensive Plan for Reducing Social Insurance Premiums*, which lowered the unit contribution rate. This resulted in a significant decrease in the contribution incomes of urban employees' basic pension fund of Jiangxi Province in 2019 compared to previous years, leading to the first time that this pension fund's contribution incomes did not cover pension expenses. The emergence of the COVID-19 has brought serious negative impacts to the operation of the vast majority of enterprises. At the same time, in order to ensure the resumption of work and production for enterprises, the government has implemented the policy of *Phased Reduction and Exemption of Enterprise Social Insurance Premiums*. The combination of these two policies has significantly reduced the contribution incomes of Jiangxi Province's basic pension fund, further increasing the payment gap of the fund. According to relevant data released by the Department of Human Resources and Social Security of Jiangxi Province, the payment gap of the basic pension fund for urban employees in this province reached 10.06 billion yuan at the end of 2020, an increase of 6.39 billion yuan compared to the end of the

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previous year. In addition, data released by Jiangxi Provincial Government in June 2021 showed that the payment gap of the basic pension fund for enterprise employees in this province had reached 4.71 billion yuan by the end of the first quarter, indicating that the payment gap of basic pension fund is still further expanding. In short, the payment pressure of the basic pension fund for urban employees in Jiangxi Province is continuously increasing, and it is urgent to evaluate the future payment capacity of basic pension fund in Jiangxi Province to ensure its sustainable operation ability.

The implementation of delayed retirement policy is imperative. *The 14th Five Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Long Range Objectives for 2035* point out the need to gradually delay the statutory retirement age, which is a gradual policy of delaying retirement. In addition, both *the 2022 Report of the 20th National Congress of the Communist Party of China* and the 2023 press conference attended by Premier Li Qiang after the closing of the 14th National People's Congress also clearly proposed the policy of gradually delaying the statutory retirement age, and mentioned that the policy is currently being carefully studied and fully demonstrated, and will be steadily introduced in due course. The delayed retirement policy will extend the payment time of in-service insured persons, relatively shorten the time for retirees to receive benefits, but it will also increase the level of pension benefits for delayed retirees. Then, what impact will the implementation of the delayed retirement policy have on the sustainability of the basic pension fund of Jiangxi Province in China? It is urgent to conduct in-depth evaluation, which has important practical value.

2. LITERATURE REVIEW

There are many achievements in using actuarial methods to study the financial situation of China's basic pension insurance funds. Mainly focused on the following three aspects. The first category is to calculate the future contribution incomes and pension expenditures status of pension insurance funds based on the background of population aging or longevity risks (Sin, 2005; Wang and Ren, 2013; Tian and Zhao, 2016; etc.). The second category is to evaluate the financial status and sustainability of pension insurance funds. Wang and Ren (2013) first summarized the connotation and measurement methods of financial sustainability of social pension insurance, and then constructed an actuarial model to evaluate the future incomes and expenditures status of social pension insurance. They believed that without reform, the system would face serious payment deficits in the future. The third category is to conduct in-depth research on the impact of childbirth policies and comprehensive plan for reducing social insurance premiums on the financial situation of pension insurance funds (Zhang *et al.*, 2018; Yang and Chen, 2021; etc.). However, most of the above literature only focuses on the China's national level of basic pension insurance and does not focus on the level of various provinces across the country, with even fewer calculations involving Jiangxi Province.

There are also a few literature related to the calculation of Jiangxi Province. For example, the *Actuarial Report on Basic Pension Insurance for Chinese Enterprise Employees* jointly compiled by Yang and Liao in 2019 and the *China Pension Actuarial Report (2019-2050)* edited by Zheng in the same year, although both involve the calculation of Jiangxi Province, they have not specifically conducted in-depth calculations on Jiangxi Province, making their calculation results in Jiangxi Province not detailed and reliable. Currently, only Wu (2012) specifically calculated the contribution incomes and expenditures of basic pension insurance for urban employees in Jiangxi Province, but the calculation results of this literature are relatively vague, with the following main shortcomings. The first point is that the established actuarial model is relatively rough and has not been specifically combined with the following two important policy documents: *the Decision of the State Council on Establishing a Unified Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 26 of 1997) and *the Decision of the State Council on Improving the Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 38 of 2005). The second point is that the calculation object is the balance of contribution incomes and expenditures of basic pension insurance, without answering how much payment pressure pension funds have. The third point is that this literature only used the grey model GM (1, 1) for population prediction, which is relatively rough and does not use mainstream population prediction methods. The fourth point is that the calculation period of this literature is from 2010 to 2019, which is already outdated. In summary, it is urgent to calculate and evaluate the future payment capacity of the basic pension fund in Jiangxi Province based on the actual statistical data of this province.

There has been extensive research on the impact of delayed retirement on the financial situation of pension insurance, but there is no consensus at home and abroad on whether delayed retirement is beneficial for improving financial conditions. Some scholars believe that delaying retirement can alleviate the payment pressure on pension funds and enhance their sustainability (Cremer and Pestieau, 2003; Karlstrom *et al.*, 2004; Galasso, 2008; Breyer and Hupfeld, 2010; Yu *et al.*, 2018; Ren *et al.*, 2019; etc.). Other scholars have questioned the effectiveness of delaying retirement to alleviate the pressure of pension insurance payments. For example, Weller (2002) and Miyazaki (2014) found that delaying retirement not only makes it difficult to cope with the widening pension gap, but also leads to a decrease in the tax base, especially significantly reducing the pension benefits for low-income groups. Yu (2012) believed that delaying the retirement age may not necessarily improve the payment ability of basic pension insurance. Yang (2019) also believed that delaying retirement policy is difficult to alleviate the difficulty of pension payment.

Compared to existing literature, this study mainly has the following innovative point. Although there is a wealth of research on measuring and evaluating the financial situation of basic pension insurance funds, the vast majority of these literature focuses on China’s national level of basic pension insurance and does not focus on the level of each province in the country, with even fewer calculations involving Jiangxi Province. There are also a few literature related to the calculation of Jiangxi Province, but they only stay at the surface without conducting in-depth calculations. Thus, this study specifically and in depth measures and evaluates the future payment capacity of the basic pension fund of Jiangxi Province in China.

3. MODEL CONSTRUCTION

Currently, there is a distinction between pooling accounts and individual accounts in China’s basic pension insurance fund accounts. Pooling accounts refer to the basic pension insurance premiums paid by the insured employee’s work unit. Individual accounts refer to the basic pension insurance premiums paid by insured employees for themselves. Individual accounts are equivalent to the government’s liabilities for the individual pension insurance contributions of insured employees. No matter how severe the payment pressure on the basic pension insurance fund may be, according to the relevant provisions of the *Social Insurance Law of the People’s Republic of China*, the government must pay the pension funds of insured employees’ individual accounts. It can be seen that the government’s ability to maintain sustainable operation of individual accounts of basic pension insurance funds is the primary and crucial link. Thus, this study takes individual accounts pension as an example to examine the impact of delayed retirement policy on the future payment ability of the basic pension insurance fund for urban employees in Jiangxi Province.

To examine the impact of delayed retirement on the basic pension fund’s ability to pay, we will use four indicators: contribution incomes, pension expenditures, current balance, and cumulative balance. Among them, the current balance F_t refers to the basic pension fund’s current contribution incomes C_t minus the current pension expenditures P_t . Accumulated balance AF_t refers to the basic pension fund’s remaining capital at the end of a certain year. The accumulated balance in year t is equal to the accumulated balance at the end of year $t-1$ multiplied by $(1 + \text{return on investment } i_t \text{ in year } t)$, and then added to the current balance in year t .

Firstly, we will construct actuarial models for the correlation between delayed retirement and the contribution incomes and pension expenditures of individual accounts of Jiangxi Province’s basic pension fund. Secondly, based on the correlation between current and cumulative balances, contribution incomes, and pension expenditures, the calculation model was ultimately constructed to investigate the impact of delayed retirement on the payment capacity of basic pension fund.

According to the provisions of the *Decision of the State Council on Establishing a Unified Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 26 of 1997), individual accounts pension should be distributed for insured “middle persons” and insured “new persons”. Among them, the insured “middle persons” refer to insured individuals who have been employed before 1997 and retired after 1997. The insured “new persons” refer to insured individuals who joined after 1997. According to the relevant provisions of the *Decision of the State Council on Establishing a Unified Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 26 of 1997) and the *Decision of the State Council on Improving the Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 38 of 2005), and referring to the modeling experience of Yang and Shi (2016), the following actuarial models are constructed.

3.1 Retirement Age and Contribution Incomes Model for Individual Accounts Pension

The contribution incomes C_t from the individual accounts pension of basic pension insurance is equal to the pension insurance premiums paid by the insured employees for themselves in year t , and its formula is as follows.

$$C_t = \sum_{j=1}^2 \sum_{x=e}^{r-1} L_{t,x}^j \times \bar{S}_{t-1} \times d_t \times c_t \quad (1)$$

Where j represents different types of insured individuals, $j=1$, and 2 respectively represent insured “middle persons” and “new persons”. The e is the age of the new employee who participates in basic pension insurance, and the r is the retirement age of the insured person. The $L_{t,x}^j$ represents the number of insurance persons in category j aged x in year t . The rate of pension insurance premiums paid by insured persons for themselves is c_t . The \bar{S}_{t-1} is the statistical average salary of the insured persons for the previous year (i.e. $t-1$ year). And it can be calculated using the following formula:

$$\bar{S}_{t-1} = \bar{S}_{t_0} \times \prod_{k=t_0+1}^{t-1} (1 + g_k),$$

Where g is the average wage growth rate and t_0 is the starting year for calculation. According to historical statistical yearbook data, the actual payment base is generally less than \bar{S}_{t-1} , indicating that not all statistical average wages are collected, and there is a certain collection rate, denoted as d_t .

3.2 Retirement Age and Individual Accounts Pension Expenditures Model

According to the provisions of the *Decision of the State Council on Establishing a Unified Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 26 of 1997) and the *Decision of the State Council on Improving the Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 38 of 2005), the government needs to pay individual accounts pension for retired “middle persons” and “new persons”. The age range of these people who need to be paid can be combined as $[r, \min(r+t-z-1, \omega)]$ years old, where z is the year of implementation of State Council Document No. 26 of 1997, i.e. $z=1997$, and The ω is ultimate survival age for insured employees. Then, the formula for the pension expenditures P_t in year t is as follows:

$$P_t = \sum_{j=1}^2 \sum_{x=r}^{\min(r+t-z-1, \omega)} L_{t,x}^j \times I_{t,x}^j \quad (2)$$

Referring to the research experience of Yang and Chen (2021), the general formula for the individual account pension $I_{t,x}^j$ of each insured employee can be summarized as follows:

$$I_{t,x}^j = I_{t-(x-r),r}^j = \frac{12}{m} \times \sum_{k=\max(z, t-x+e)}^{t-(x-r)-1} \left[c_k d_k \bar{S}_{k-1} \times \prod_{h=k+1}^{t-(x-r)} (1 + j_h) \right] \quad (3)$$

Where m is the number of months that the individual accounts pension should be paid according to government documents, and the j_t is the bookkeeping interest rate of the individual accounts pension.

The actuarial models for the relationship between retirement age r and individual accounts pension’s contribution incomes C_t and pension expenditures P_t have been constructed. Based on the correlation between current balance F_t , cumulative balance AF_t , contribution incomes, and pension expenditures, the calculation model can be obtained to determine the impact of retirement age r on individual accounts pension payment ability.

4. Parameter Estimation

This study specifically examines the impact of delayed retirement on the payment capacity of the basic pension fund in Jiangxi Province from 2023 to 2045. Firstly, we refer to previous research experience and set up two representative deferred retirement schemes. Then, we set the values of the parameters required for calculation during the prediction period.

4.1 Design of Deferred Retirement Schemes

Referring to the research experience of Zeng *et al.*, (2021) and considering the different delayed retirement situations of male and female employees, two representative progressive delayed retirement schemes are designed. Set up two delaying schemes for female and male employees respectively. Currently, their legal retirement ages are 50 and 60 years old, respectively. In order to alleviate the resistance to reform, the target retirement age for both male and female employees is to be increased by 5 years old from the original level. Assuming that both female and male employees start to delay retirement in 2024, and their retirement ages increase annually at the same rate, further setting the annual increase in retirement ages as 3 and 6 months each year, two representative progressive delayed retirement schemes are obtained, numbered as delayed retirement scheme 1 and delayed retirement scheme 2.

4.2 Estimation of the Number of Insured Persons

Based on past practical experience, the insured age e for new employees is set at 20 years old, and the ultimate age ω for employees is set at 100 years old. The queue element method is used to estimate the number $L_{t,x}$ of urban employees participating in the basic pension insurance in Jiangxi Province from 2023 to 2045. Divide the number of insured individuals into two parts for estimation, namely, estimate the number of insured persons who have already joined at the age of $x \geq e+1$ years old and the number of insured persons who have newly joined at the age of $x=e$ years old, respectively.

For the estimated number of insured employees who have already joined, it is equal to the number of insured employees of each age in the previous year multiplied by their corresponding survival probability. The survival probability during the prediction period is derived from the age gender mortality rate data under the Far East Life Table in Padis-int software. As for the estimation of the number of newly hired insured persons in each year, it is equal to the product of the number of e year olds in the future China's population distribution by age and gender, employment rate, urbanization rate, pension insurance coverage rate, and the proportion of enterprise employees insured to the total number of urban employees insured in the China. The estimation of population distribution by age and gender in China during the prediction period can refer to the estimation process of Yang and Chen (2021). Using the relevant data from the *Jiangxi Statistical Yearbook 2022*, it can be estimated that the employment rate, urbanization rate, and the proportion of enterprise employees insured to the total number of urban employees insured in China. The pension insurance coverage rate is assumed to range from 85% in 2015 to 95% in 2025.

4.3 Setting of Other Parameters

According to the official website data of the Department of Human Resources and Social Security of Jiangxi Province, it can be seen that the average annual salary of all urban employees in Jiangxi Province with basic pension insurance for urban employees in 2021 is 66576 yuan. Estimation of the average wage growth rate g . The ARIMA (0, 1, 0) model is used to fit the average wage index data of urban unit employment personnel from 2001 to 2021 published in the *Jiangxi Statistical Yearbook 2022*, and the fitting results are further extrapolated to obtain the average wage growth rate for the prediction period. Estimation of the pension insurance collection rate d , where the contribution incomes of the basic pension fund for urban employees in Jiangxi Province for the current year is equal to the number of insured employees for urban employees in Jiangxi Province for the current year \times payment rate \times collection rate \times the average salary of urban employees in Jiangxi Province in the previous year. According to the data published in the *China Labor Statistics Yearbook 2022*, it can be calculated that the pension insurance collection rate in Jiangxi Province in 2021 is 95.37%, which will be used as this collection rate for the prediction period. Referring to the approach of Yang and Shi (2016), the bookkeeping interest rate j of individual accounts pension was set at 3.27% in 2015 and prior years, 6.98% in 2020 and subsequent years, and the return on investment i of basic pension insurance fund was set at 6.53%. According to the *Decision of the State Council on Improving the Basic Pension Insurance System for Enterprise Employees* (State Council Document No. 38 of 2005), the rate c of pension insurance premiums paid by insured persons for themselves is 8%. According to this State Council document, it is known that when employees retire at the age of 50, and 60, the number of months that their individual accounts pension should be paid is 195, and 139 months, respectively. And the starting cumulative balance of the individual accounts pension fund for basic pension insurance in Jiangxi Province is set to 0.

5. Analysis of Impact of Delayed Retirement Policy

Firstly, without considering the delayed retirement policy, the calculation model constructed above is programmed using MATLAB software, and the values of the above parameters during the prediction period are substituted to simulate the results of the contribution incomes, pension expenditures, current balance, and cumulative balance of individual accounts pension fund in Jiangxi Province, which are regarded as the benchmark status. Secondly, after implementing the delayed retirement scheme 1 and delayed retirement scheme 2 designed in the previous section, the results of the above four indicators can also be simulated. The results of these four indicators are compared with the benchmark status to obtain the impact of the delayed retirement policy on the payment ability of the basic pension fund in Jiangxi Province.

5.1 Impact of Delayed Retirement on Pension Fund's Contribution Incomes

After the implementation of deferred retirement schemes 1 and 2, as well as under the benchmark status, the contribution incomes C_t of individual accounts pension fund for Jiangxi Province's basic pension insurance from 2023 to 2045 is shown in Figure 1, respectively.

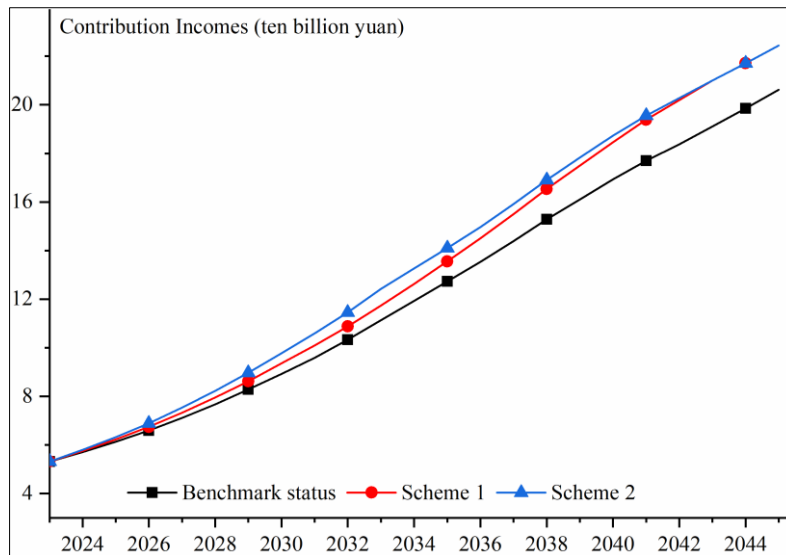


Figure 1: Fund's contribution incomes under two delaying schemes and benchmark status

The contribution incomes C_t of individual accounts pension fund for Jiangxi Province under the baseline scenario, deferred retirement scheme 1 and scheme 2 are rapidly increasing over time. The contribution incomes of both scheme 1 and scheme 2 for delayed retirement is higher than that of the baseline status, indicating that delayed retirement can increase the contribution incomes of individual accounts pension fund in Jiangxi Province.

5.2 Impact of Delayed Retirement on Pension Fund's Pension Expenditures

The pension expenditures P_t of the individual accounts pension fund for basic pension insurance in Jiangxi Province from 2023 to 2045 under two deferred retirement schemes and the benchmark status are shown in Figure 2.

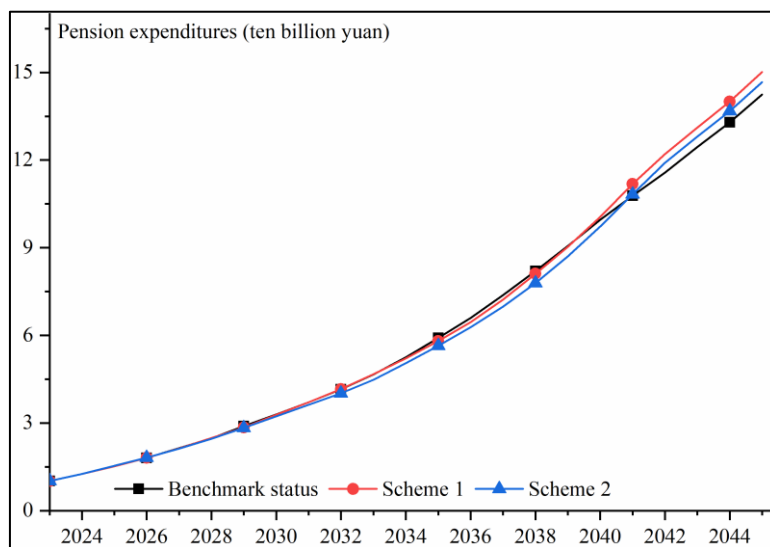


Figure 2: Fund's pension expenditures under two delaying schemes and benchmark status

It can be seen that compared to the pension expenditures of the individual accounts pension fund for basic pension insurance in Jiangxi Province under the benchmark status, both two delaying retirement schemes will reduce pension expenditures between 2023 and 2040. This is mainly because the increase in retirement age r of insured persons results in a relative reduction in the duration $(\omega-r)$ of receiving pension benefits after retirement, thus saving some pension expenses. However, after 2041, compared to the benchmark status, delaying retirement will actually increase pension expenses. This is mainly because raising the retirement age of insured persons will increase the pension calculation standards through the principles of “paying more and receiving more” and “paying more for a long time and receiving more”, which will also increase pension expenses. Before 2040, the savings in pension expenses exceeded the increase in pension expenses, resulting in a relative decrease in pension expenses during this period. On the contrary, after 2040, the scale of pension savings is smaller than the scale of pension increase, indicating an increase in pension expenditures during this period.

5.3 Impact of Delayed Retirement on Pension Fund's Current Balance

The current balance F_t of the individual accounts pension fund for basic pension insurance in Jiangxi Province from 2023 to 2045 under two deferred retirement schemes and the benchmark status are shown in Figure 3.

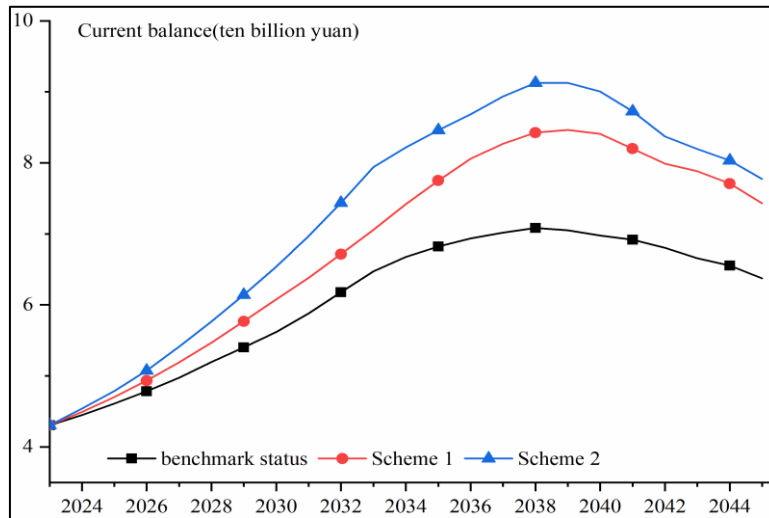


Figure 3: Fund's current balance under two delaying schemes and benchmark status

The current balance of individual accounts pension fund for basic pension insurance in Jiangxi Province under the delayed retirement scheme 1, scheme 2, and benchmark status show a trend of first increasing and then decreasing throughout the entire prediction period. The current balance under both two deferred retirement schemes are higher than the current balance under the benchmark status in each year of the forecast period, and the current balance under deferred retirement scheme 2 is higher than the current balance under deferred retirement scheme 1. The average annual growth rate of the current balance of the basic pension fund under the deferred retirement scheme 1, scheme 2, and benchmark status during the forecast period is RMB 0.9 billion, RMB 1.4 billion, and RMB 1.6 billion, respectively. In summary, delayed retirement can increase the current balance of Jiangxi Province's basic pension fund, and the favorable effect of delayed retirement scheme 2 on increasing the current balance is higher than that of delayed retirement scheme 1.

5.4 Impact of Delayed Retirement on Pension Fund's Cumulative Balance

Similarly, the cumulative balance AF_t of the individual accounts pension fund for basic pension insurance in Jiangxi Province from 2023 to 2045 under two deferred retirement schemes and the benchmark status are shown in Figure 4.

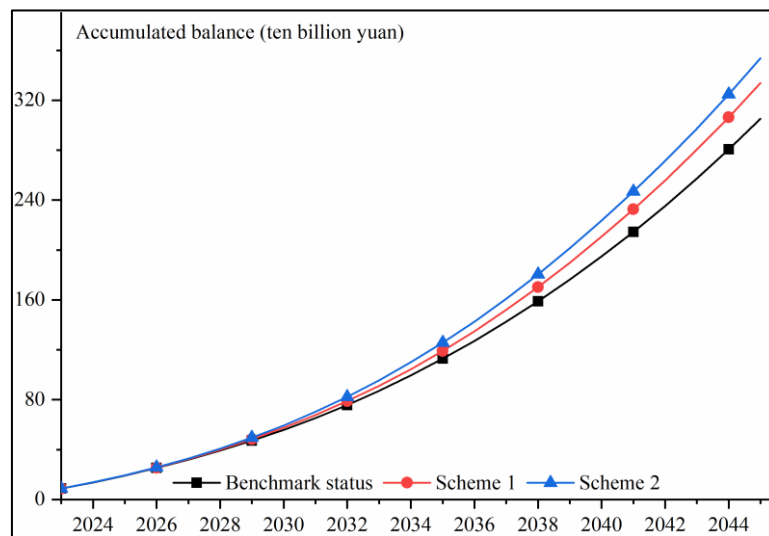


Figure 4: Fund's cumulative balance under two delaying schemes and benchmark status

The cumulative balance of pension funds under deferred retirement scheme 1, scheme 2, and benchmark status show a continuous upward trend during the forecast period. The cumulative balance under scheme 2 is higher than that under scheme 1, while the cumulative balance under scheme 1 is higher than the cumulative balance under benchmark

status. And the cumulative balance of these three scenarios has an average annual growth rate of RMB 13.48 billion, RMB 14.78 billion, and RMB 1.568 billion during the forecast period, respectively. The above indicates that delayed retirement can be beneficial for increasing the cumulative balance of the basic pension insurance fund in Jiangxi Province, and the favorable effect of scheme 2 is stronger than that of scheme 1.

In summary, the delayed retirement policy can increase the contribution incomes of pension funds. And this policy can relatively save pension expenses for most of the forecast period. What's more, delaying retirement can significantly increase the current and cumulative balances of basic pension fund, and the favorable effect of scheme 2 is stronger than that of scheme 1. Thus, the delayed retirement policy can significantly improve the payment capacity of Jiangxi Province's basic pension fund and enhance the sustainable operation ability of this province's basic pension.

6. CONCLUSION AND POLICY IMPLICATIONS

This study uses actuarial methods to evaluate the impact of delayed retirement policy on the payment capacity of the basic pension fund of Jiangxi Province in China during 2023 to 2045. Considering different delay rates of retirement age, two representative delayed retirement policies were designed. By constructing actuarial models of the impact of retirement age on the payment ability of basic pension fund, and combining the parameter values of the actuarial model during the prediction period, the impact of delayed retirement policy was obtained through actuarial simulation. We found that from 2023 to 2045, the payment capacity of the individual accounts pension fund for basic pension insurance in Jiangxi Province is strong, and delayed retirement can also effectively improve the payment capacity of basic pension fund. Moreover, the favorable effect of delayed retirement scheme 2 is stronger than that of scheme 1.

Policy implication: The Chinese government should seize the time to develop a delayed retirement policy and introduce it as soon as possible at an appropriate time. Because delaying retirement can effectively improve the future payment capacity of the basic pension insurance fund, enhance the financial sustainability of the basic pension fund, and indeed ensure the timely and full payment of pension benefits for retirees.

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REFERENCES

- Breyer, F., & Hupfeld, S. (2010). On the fairness of early-retirement provisions. *German Economic Review*, 11(1), 60-77.
- Cao, Y. C., & Lu, J. F. (2010). 'The financial burden of Shanghai's basic social pension system in the long-term actuarial model,'. *East China Econ. Manage*, 24(5), 153-157.
- Cremer, H., & Pestieau, P. (2003). The double dividend of postponing retirement. *International tax and public finance*, 10, 419-434.
- Galasso, V. (2008). Postponing retirement: the political effect of aging. *Journal of Public Economics*, 92(10-11), 2157-2169.
- Karlstrom, A., Palme, M., & Svensson, I. (2004). A dynamic programming approach to model the retirement behaviour of blue-collar workers in Sweden. *Journal of applied econometrics*, 19(6), 795-807.
- Miyazaki, K. (2014). The effects of the raising-the-official-pension-age policy in an overlapping generations economy. *Economics Letters*, 123(3), 329-332.
- Ren, X., Xi, H., Zhai, S., & Zhou, M. (2019). Research on the accumulation effect of pension income and payments caused by progressive retirement age postponement policy in China. *Journal of aging & social policy*, 31(2), 155-169.
- Sin, Y. (2005). Pension liabilities and reform options for old age insurance. *World Bank working paper*, 1.
- Tian, Y., & Zhao, X. A. (2016). Study on the aging population, postponing retirement age and basic pension financial sustainability. *Popul Econ*, 1, 39-49.
- Wang, X., & Ren, W. (2013). Studies on the financial sustainability of social pension system in China. *Ins Studies*, 4, 118-27.
- Weller, C. (2002). Don't Raise the Retirement Age. *Challenge*, 45(1), 75-87.
- Wu, L. (2012). The Research on the JiangXi Urban Social Pension Insurance—the Balance on Payments and Regional Comprehensive Level, *Nanchang University*.
- Yang, H. L. (2019). Overlapping generations, population policy adjustment and economic growth. *Econ. Sci*, 3, 30-40.
- Yang, Z., & Chen, X. (2021). Early Warning on the Fiscal Risk of the Basic Old-Age Insurance for Enterprise Employees under Comprehensive Scheme for Reducing Social Insurance Contribution Rates, *Insurance Studies*, 1, 91-106.
- Yang, Z., & Liao, P. (2019). Actuarial report of basic old-age insurance for Chinese enterprise employees, Beijing: *China Labor and Social Security Press*.
- Yang, Z., & Shi, C. (2016). Fiscal burden of pensions in pooled accounts for employees of urban enterprises in China. *Econ Sci*, 2, 42-52.
- Yu, L. (2012). Can we increase solvency of social pension system by delaying retirement age?. *South China Journal*

of Economics, 30(6), 74-84.

- Yu, W. G., Li, Q., Wang, Q., Huang, Y. J., Nie, X. S., & Liu, J. (2018). The influence of extending retirement age on the income and payment balance of endowment insurance fund based on the differences in ages and wage levels. *China Soft Science*, 2, 54-67.
- Zeng, Y., Zhang, R., & Li, S. (2021). Progressive Delaying Retirement Age: Taking a “Small Step Forward” or a “Step Forward”? Based on the Perspective of Fund Sustainability and Fiscal Responsibility of Pension Insurance, *Public Finance Research*, 4, 102-115.
- Zhang, X., Zeng, Y., Shi, C., & Liu, T. (2018). Fiscal responsibility assessment of basic pension insurance for urban employees from a sustainable perspective—re-examination on the effect of universal two-child policy and delaying retirement policy. *Public Finance Research*, 12, 97-113.
- Zheng, B. (2019). China Basic Pension Actuarial Report (2019-2050), Beijing: China Labor and Social Security Press.