Journal of Economic Statistics

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# The Gender Differences in Pension Wealth of Individual Retirement Accounts in China

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## ABSTRACT

The gender characteristics of initial wage levels in the labour market were investigated using data from the China Family Panel Studies (CFPS), and gender differences in the individual retirement accounts wealth of urban employees were studied on this basis. The results indicate that for female employees, the individual retirement accounts wealth they obtained through longer life expectancy is largely offset by their low level of income and short contribution period, and the net pension wealth of female employees who retire at statutory retirement age is even lower than that of male employees. Due to the inheritability of account balances, extending the retirement age will increase the individual retirement account net pension wealth of all employees, and each year of extension will bring more net pension wealth increase to male employees.

## KEYWORDS

Individual Retirement Account; Pension; Labour Market; Gender Difference; Delayed Retirement

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ISSN 2972-3728
doi: 10.58567/jes03010003


Received 27 January 2025; Accepted 25 March 2025; Available online 29 May 2025; Version of Record 15 March 2025

## 1. Introduction

Gender interests are an important part of the research on the fairness of income redistribution in the pension system. Compared with male workers, female workers assume more family care responsibilities in the family relationship due to childbearing and raising, which may place them in a disadvantageous position in the labour market and cause them more difficulties in terms of labour entry and fair wages. Additionally, child raising requires considerable labour time, which will further affect women's participation in the pension system and thus affect their redistribution benefits. Given these two aspects, female workers, as independent individuals, need to pay more attention to their redistributive benefits in the pension system.

With the reform of multi-pillar pensions, many countries have established individual retirement accounts systems, and the fairness of the income redistribution designed by these systems has attracted considerable attention from scholars in China and abroad. From the perspective of insured members, an individual's pension wealth is usually used as an important indicator to measure the income redistribution results of the pension system. Among them, pension wealth refers to the amount of pension that the insured person can obtain in his or her lifetime, while net pension wealth refers to the surplus of the amount of pension that the insured person can obtain in his or her lifetime minus the amount of his or her contributions.

The gender gap in pension benefits exists in many countries. Most scholars have examined the gender gap in pensions through micro-databases. Based on the European Union Statistics on Income and Living Conditions (EU-SILC), Zanier and Crespi (2015) find that the average pension gender gap in the EU-27 is 39%, with 4% in Estonia, 24% in Poland, 33% in Spain, 34% in Portugal, 38% in France, 42% in the UK and 46% in the Netherlands. According to the Survey of Health, Ageing and Retirement in Europe (SHARE), Haan et al. (2017) find that female pension incomes were 19.6 % less than those of males in Denmark. Based on the Linked-Employer-Employee-Data of the IAB, Niessen-Ruenzi and Schneider (2022) find that a substantial gender pension gap in Germany of about 26% on average still exists. The above studies all point to the fact that the pension benefits of older males are higher than those of older females.

In brief, the gender pension gap results from three main factors. Firstly, the annual pension for women is lower than that for men because of their disadvantages in the labor market. OECD pension data show that the high employment differences between men and women lead to large differences in pension entitlements. Across the 34 OECD countries where data are available, pension payments for men are 26% higher than those for women (OECD, 2021). Women participate less in the labor market, and even when they do, they work fewer days and earn lower wages on average (Warren, 2006； Grady, 2015; Kuhn, 2020； Cordova et al., 2022). In China, researchers find that the most notable labour market disadvantage affecting women's old-age pensions is the disproportionate employment of women in low-benefit sectors (Zhao and Zhao, 2018). Many scholars have found that there exists "motherhood penalty" in the labour market, which manifests in more part-time employment and fewer career opportunities for women after childbirth, further exacerbates the wage penalty for motherhood (Anderson et al., 2002; Budig et al., 2012; Kingsbury, 2019; Chhaochharia et al., 2021). Moreover, motherhood contributes to productivity penalty leading to stymied professional advancement and career growth (Krapf et al., 2017), eventually increasing the gender pension gap.

Secondly, the gender investment gap. Women and men show different levels of returns from their investments due to diverging risk preferences, which results in different wealth portfolios (Sunden and Surrette, 1998; Giannikos and Korkou, 2022; Niessen-Ruenzi and Schneider, 2022). It has been shown that women have lower financial knowledge than men, which leads them to have more conservative investment patterns and thus lower returns than men (Almenberg and Dreber, 2015).

Thirdly, studies have shown that female members obtain more net pension wealth due to their longer life expectancy. Simonovits (2015) finds that the nonfinancial defined contribution (NDC) pension system in Hungary

has achieved a strong regressive redistribution from rich men to poor women. The pension income of system members with the shortest life expectancy is approximately 59% of the minimum net wage and that the pension income of members with the longest life expectancy was 108% of the highest net wage. Caselli and Lipsi (2018) find that in the defined contribution pension scheme in Italy, the actuarial fairness results in a difference in the income annuities between men and women of no less than 4%, and these differences represent the impact of the annuity redistribution from lower male survival to higher female survival.

In China, studies have shown that the annual pension income of female workers accounts for only approximately 80% of that of male workers due to their lower wages (Wang and Xia, 2021). Regarding net pension wealth, on the basis of actuarial analysis, many studies (Yu, 2014; Yang et al., 2014; Zheng and Wang, 2017; Yu et al., 2021) have found that female employees obtain more individual retirement account net pension wealth than male employees due to a longer life expectancy and earlier retirement age. Confronted with population ageing, extending the retirement age has become an important policy option in China. Many studies, including Peng (2012), Liu (2013), Feng (2017), and Fan and Yang (2021), have found that the individual retirement account net pension wealth of system members can be reduced by extending the statutory retirement age for employees, which can alleviate payment pressure and the pension fund payment crisis.

In summary, those studies have reached two main conclusions. First, the pension wealth of female employees is statistically greater than that of male employees. Second, extending the retirement age will increase the sustainability of pension funds by reducing individual retirement account net pension wealth. However, the income characteristics of system members in the labour market have been ignored in the above studies, and China's individual retirement accounts system has unique institutional attributes in that it does not adopt an actuarially fair payment formula, which should be valued.

As mentioned above, in the basic pension system for urban workers in China, the monthly amount of pension of the individual retirement accounts for participating members is the amount accumulated in the account at the time of retirement divided by the monthly divisor, and this amount is received for life. When all the money in the participant's account has been withdrawn, the government pays for the pension. Any remaining balance in a individual retirement account can be inherited when the participant dies. Therefore, China's individual retirement account has pension benefits that differ from both the defined benefit (DB) formula for pooled accounts and the typical defined contribution (DC) pension system. Considering these factors, it is of particular significance to study the distribution of pension wealth in China's individual retirement accounts system.

Based on the above understanding, this study uses two databases to examine the gender characteristics of the initial wage level of individuals in the labour market to more truly reflect the gender wage gap in China's labour market. The estimated gender difference in the contribution wage level is incorporated into the actuarial model of individual retirement accounts wealth, and the net pension wealth of male and female workers under the current retirement regulations and the possible delayed retirement policy are measured to more comprehensively reflect the gender pension benefits in China. On this basis, the study proposes policy recommendations for improving the fairness of the individual retirement accounts system and the sustainability of pension funds. Since the individual retirement account balance can be inherited in China, the net pension wealth in individual retirement accounts refers to the actuarial surplus of the amount of pension that the insured person can obtain in his or her lifetime plus the account inheritance minus the amount of his or her contributions.

The remainder of this paper is arranged as follows: Section 2 is an introduction to the individual retirement account pension system in China; Section 3 contains the econometric analysis of the labour wage level to investigate the gender characteristics of individual wage income; Section 4 is the establishment of the actuarial model of personal account pension and the comparative analysis of the net pension wealth of the personal accounts of the system members; and Section 5 contains the conclusions and final policy recommendations.

## 2. Profile of individual retirement account system in China

In 1997, China established a basic old-age insurance system for urban employees. This system stipulates that during the contribution period, insured employees contribute 24 percent of their wages, of which 16 percent of their wages are paid by employers on employees' behalf and credited to a pooled account, while the remaining 8 percent is contributed by the insured individual and credited to his or her individual retirement account. During the payment period, participants who have accumulated 15 years of contributions are eligible to receive a pension, which is payable at the ages of 60 and 55 for men and women, respectively. In the case of retirement accounts, the monthly pension is determined by the amount accumulated in the recipient's individual retirement account at the time of retirement divided by the number of monthly divisions of payment (see Table 1 for the number of monthly divisions of payment) and is paid for the duration of the recipient's life. If a recipient dies before the amount accumulated in his or her individual retirement account has been distributed, the account balance can be inherited in full by his or her heirs. The relevant institutional provisions for individual retirement accounts can be found in Table 2 as follows. Because occupational pensions and commercial old-age insurance have not yet been fully developed in China, individual retirement accounts, as an important part of the basic old-age insurance system for urban employees, play a significant role in providing pensions and safeguarding the lives of employees after retirement.

**Table 1.** The number of monthly divisions of payment.

| Retirement age | Monthly divisor of pension payment |
|---|---|
| 55 | 170 |
| 56 | 164 |
| 57 | 158 |
| 58 | 152 |
| 59 | 145 |
| 60 | 139 |
| 61 | 132 |
| 62 | 125 |
| 63 | 117 |
| 64 | 109 |
| 65 | 101 |
| 66 | 93 |
| 67 | 84 |
| 68 | 75 |
| 69 | 65 |
| 70 | 56 |

**Table 2.** China's individual retirement account contribution and payment regulations for urban employees.

| Contribution rule | Contribute 8% of wage monthly |
|---|---|
| Pension benefits | The monthly pension is the amount of accumulated funds divided by the monthly divisor; it is payable for life. The account balance can be inherited |
| Minimum contribution period | 15 years |
| Retirement age | 60 years old for men, 55 years old for women |

## 3. Gender characteristics of wages in the labour market

A large number of studies in China have demonstrated gender wage differences in the Chinese labour market. Most of these studies use the regression of the *Mincer* equation to obtain the average gender wage difference,

followed by some form of statistical decomposition. Studies have found that the wage difference is due mainly to gender discrimination and differences in ability and endowment between male and female employees, that the market discrimination component accounts for most of the total wage differentials (Xia et al., 2015; Zhang and Liu, 2017), and that it is more significant among low- and middle-income workers (Hou, 2016). These results indicate that gender discrimination may lead to wage differences between men and women when entering the workforce. This difference gives rise to differences in employees' ability to contribute and ultimately to differences in pension rights and institutional benefits between men and women. Based on this understanding, in this paper, we model and estimate the difference in the initial wages for men and women when they enter the labour market.

### *3.1. Regression model*

To obtain the gender wage difference in the workforce at initial job entry, we use the following equation similar to *Mincer's* for regression:

$$ln\, y = \alpha + QX + \varepsilon \tag{1}$$

In Formula (1), $ln\, y$ is the logarithm of wage, $\alpha$ is the intercept term, and $\varepsilon$ is the random error term. $Q$ represents the vector of variable coefficients, and $X$ is the vector of variables that affect wage income, including the core explanatory variable gender and control variables, such as years of education, physical health, foreign language ability, job specification, employer type, etc.

### *3.2. Data introduction and variable description*

3.2.1. Data sources and preprocessing

The data for this study were acquired from the 2020 survey data from the China Family Panel Studies (CFPS) conducted by the Institute of Social Science Survey of Peking University (Biomedical Ethics Committee, Peking University, review lot number: IRB00001052-14010). The CFPS surveyed individual Chinese residents to investigate in detail the basic identity information, labour participation, and economic activities of residents. The survey covers 25 provinces (municipalities and autonomous regions) in mainland China, and the database used to study the individual wage levels of the labour force is representative.

The raw data from the CFPS individual questionnaires were preprocessed. To obtain sample data on the initial wages of workers, we calculated working years through the formula "age - years of education - 6". The data for the explanatory variables in the model were extracted, and missing values and outliers were deleted.

3.2.2. Variable descriptions

Based on the needs of the study, the following variables were selected for the regression analysis of gender wage levels of individuals in the labor force. The explanatory variable is the annual wage income (logarithmic) of individuals in the labor force. Wage income (including all wages, bonuses, cash benefits, subsidies, and deductions for personal income tax and social insurance and housing provident fund) is chosen to reflect the income gap between individuals in the labor force. The core explanatory variable is gender, and other variables affecting labor force earnings include factors such as years of education, self-assessment of physical health, work experience, foreign language ability, marital status, work specification, and employer type. Table 3 provides descriptive statistics for these variables.

**Table 3.** Definition of variables and descriptive statistics.

| Variable | Definition |
|---|---|
| Gender | Male=1, Female=0 |
| Age (years) | Age of the respondent |
| Wage Income | Logarithm of annual wage income |
| Education | Years of education (years) |
| Self-assessment of physical health | Healthy=1, Others=0 |
| Full-time work experience | If there is full time work experience (=1) |
| Foreign language ability | If a foreign language is used at work (=1) |
| Marital status | Married=1, Others=0 |
| Work specification | If non-agricultural work (=1) |
| Government and party agencies | If working in a government and party agency (=1) |
| Public institutions | If working in a public institution (=1) |
| State-owned enterprises | If working in a state-owned enterprise (=1) |
| Private enterprises | If working in a private enterprise (=1) |

### *3.3. Regression results*

We performed regression analysis on the above established labour wage level model; the detailed results are shown in Table 4. To address the aims of the study, we needed only to obtain a statistically significant representative value of the difference in the initial wage levels of male and female workers; other variables and regression coefficients are partially provided. According to the results of the regression, gender has a significant impact on the wage level, and the initial wage level of male workers is approximately 24.11% higher than that of female workers.

**Table 4.** Regression results for initial wage levels.

| Variable | Model results |
|---|---|
| Gender (Male=1) | 0.2411** |
| | (0.1023) |
| Education (years) | 0.1075*** |
| | (0.0259) |
| Full-time work experience | 0.7833*** |
| | (0.1277) |
| Foreign language ability | 0.2261* |
| | (0.1301) |
| Marital status | -0.3426 |
| | (0.4590) |
| Self-assessment of physical health | -0.5728** |
| | (0.2413) |
| Work specification | 0.0731 |
| | (0.2927) |
| Employer type | Yes |
| Constant coefficients | 7.8387*** |
| | (0.5254) |
| R-squared | 0.201 |

*Notes: Standard errors are presented in parentheses; ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Source: 2020 survey data from the China Family Panel Studies (CFPS) conducted by the Institute of Social Science Survey of Peking University. Please refer to http://www.isss.pku.edu.cn for more information concerning the CFPS data.*

According to Table 4, the regression results show that the gender coefficient is 0.2411 and is statistically significant at the level, which indicates that the male workers have higher wage levels than the female workers. There is no doubt that this result will have a difference on the level of contribution to the pension account of male

and female workers, and the gender coefficient of this regression result will be studied in the actuarial model in this paper.

## 4. Actuarial analysis of individual retirement account net pension wealth

### *4.1. Actuarial model*

In calculating the income and expenditure of individual retirement accounts, the parameters involved fall into three main categories. The first category is the parameters of the pension system, namely, the age of the employee participating in the system ( $a$ ), retirement age ( $R$ ), individual retirement account contribution rate ( $\theta$ ), and monthly divisor of pension payment ( $m$ ). The second type is the population parameters, including the probability ( ${}_{k-n}p_n$ ) of $n$ -year-old employees surviving until age $k$ , the probability ( $q_n$ ) of $n$ -year-old employees dying within one year, and the maximum survival age ( $T$ ). The third category is the economic environment parameter, which includes the employee's wages ( $w_a$ ) for the year in which he or she is enrolled in the pension system, the wage growth rate ( $g_w$ ), and the interest rate ( $r$ ). There is no intergroup annual income adjustment for individual retirement accounts, in this study, group measurements were obtained separately by gender.

(1) Contribution accumulation

The insured employees contribute a certain percentage of their wages each year, $\theta$ , until retirement. The contributions and payments were assumed to be the beginning of the year. Because the remaining balance in a individual retirement account can be inherited when the participant dies, For employees who survive at the age of participating in the system ( $a$ ), the accumulated contribution value at retirement age is as follows:

$$C = \theta w_a \sum_{k=a}^{R-1} (1+g_w)^{k-a} v^{k-R} \, {}_{R-a}p_a \tag{2}$$

Where $v$ is the discount rate, $v = (1+\mathrm{r})^{-1}$ .

(2) Pension payment

The monthly pension from a individual retirement account is the amount of individual retirement account accumulations ( $\mathrm{C}$ ) of the insured employee divided by the monthly divisor. If the pension received by the insured employee in the month of retirement is $b$ , then $b = \mathrm{C}/m$ . Beginning in the year of retirement, insured employees receive monthly pensions ( $b$ ) from their individual retirement accounts until death. The actuarial present value of the pension of the insured employee at the time of retirement is as follows:

$$P = \frac{C}{m} * 12 \sum_{i=R}^{T-1} \left( \frac{1+g_p}{1+r} \right)^{i-R} * {}_{i-R}p_R \tag{3}$$

### *4.2. Parameter settings*

(1) Insured age $a$ : The Labour Law of the People's Republic of China stipulates that the minimum age for employment is 16 years old. Due to the increase in the average level of education in society, most employees complete at least a high school education before entering the labour market. Therefore, it is assumed that the initial

age of enrolment of male and female employees is 18 years old; that is, an individual joins the workforce at the age of 18 and starts contributing to a individual retirement accounts system.

(2) Retirement age $R$: According to China's current retirement age policy, the retirement age is set at 55 for women and 60 for men.

(3) Maximum survival age $T$: The census data in the China Statistical Yearbook include individuals up to 100 years old; therefore, the maximum survival age is set to 100 years old.

(4) individual retirement account contribution rate $\theta$: The monthly contribution rate is set to 8% of an individual's monthly wage.

(5) Monthly divisor of pension payment $m$: According to State Council document No. 38 issued in 2005, the monthly divisor of payment is determined based on factors such as the average life expectancy of the urban population at the time of retirement, retirement age, and interest. The monthly divisors of payment for individuals who retire at 55, 60, and 65 years of age are 170, 139, and 101, respectively.

(6) Contribution wage $w_a$: According to the regression results for the gender difference in wages for individual workers when entering the labour market, the contribution wage level is set to 1 for female workers and 1.241 (CFPS) for male workers.

(7) Wage growth rate $g_w$: In general, wages increase simultaneously with GDP, and the growth rate of wages is set as 5%, which corresponds to the growth rate in China.

(8) Interest rate $r$: Currently, the annual interest rate for most five-year certificates of deposit (CDs) is approximately 3 to 4% in China. For the long-term accumulation of pension funds, the interest rate is set as 3.5%.

(9) Pension growth rate $g_p$: Generally, $g_p$ ranges between 0% and 30% of the wage growth rate; the value range is [0, 1.5%]. In this study, $g_p$ is set as 1.5%.

(10) Survival probability ${}_{i-a}p_a$: Using age- and sex-specific crude mortality rates reported by the Sixth National Population Census of China, the *Farlle* method is used to calculate ${}_{i-a}p_a$.

The parameter assignments are shown in Table 5.

**Table 5.** Parameter assignments for the actuarial model of pension wealth.

| Variable | Numerical value |
|---|---|
| $a$ | 18 |
| $R$ | Women: 55; Men: 60 |
| $T$ | 100 |
| $\theta$ | 8% |
| $m$ | 55 years old: 170; 60 years old: 139 |
| $w_a$ | Women: 1; Men: 1.241 (CFPS) |
| $g_w$ | 5% |
| $g_p$ | 1.5% |
| $r$ | 3.5% |

### *4.3. Gender differences in net pension wealth*

4.3.1. Calculation of the equilibrium age

Due to the inheritability of individual retirement accounts balances, an insured person's individual retirement accounts is fully received by himself/herself and his/her heirs. According to the system, individuals continue to receive pension from a individual retirement account after the accumulated amount has been paid out; therefore, insured individuals who are still alive at this time receive a net increase in pension wealth. The age at which the insured person receives all self-accumulated pension funds is the equilibrium age N; then, N satisfies the following:

$$12 * \sum_{i=R}^{N-1} \left( \frac{1+g_p}{1+r} \right)^{i-R} = m \tag{4}$$

As shown in Formula (4), the equilibrium age is not related to gender and life expectancy but is related to the monthly divisor, the interest rate, and the pension growth rate. If the calculation formula remains unchanged as the life expectancy of the population continues to increase, individual employees will obtain more individual retirement account net pension wealth.

Document No. 38 [2005] in China stipulates the monthly divisor of pension payment for insured employees retiring at different ages. Because the calculation of the equilibrium age is affected by the monthly divisor, the equilibrium age corresponds to different retirement ages. Formula (4) is used to calculate the equilibrium age at which accumulated pension funds corresponding to different retirement ages are fully withdrawn; the results are shown in Table 6. The equilibrium age for receiving pension from a individual retirement account increases with the employee's retirement age, indicating that the design of the current individual retirement accounts system is reasonable. Next, the individual retirement account net pension wealth of employees is calculated on the basis of equilibrium age estimations.

**Table 6.** Monthly divisor of pension payment and the equilibrium age for different retirement ages.

| Retirement age | Monthly divisor of pension payment | Equilibrium age |
|---|---|---|
| 55 | 170 | 71.5 |
| 56 | 164 | 71.7 |
| 57 | 158 | 72 |
| 58 | 152 | 72.4 |
| 59 | 145 | 72.6 |
| 60 | 139 | 73 |
| 61 | 132 | 73.2 |
| 62 | 125 | 73.5 |
| 63 | 117 | 73.7 |
| 64 | 109 | 73.9 |
| 65 | 101 | 74.1 |
| 66 | 93 | 74.3 |
| 67 | 84 | 74.4 |
| 68 | 75 | 74.6 |
| 69 | 65 | 74.7 |
| 70 | 56 | 74.8 |

4.3.2. Measurement of net pension wealth

Because the remaining balance of a individual retirement accounts can be inherited, an insured individual who does not live beyond the equilibrium age receives a balanced pension. The net pension wealth of the individual retirement account is based on the pensions received by the participants who live beyond the equilibrium age, and

it comes entirely from the state treasury. The actuarial present value of the employee's expected individual retirement account net pension wealth (*IRANPW*) at the time of retirement is the following:

$$IRANPW = \frac{C}{m} * 12 \sum_{i=N}^{T-1} \left( \frac{1+g_p}{1+r} \right)^{i-R} * {}_{i-R}p_R \tag{5}$$

We calculated the individual retirement account net pension wealth of insured individuals at different retirement ages. The retirement age for female employees was assumed to be 55 to 65 years old and for male employees to be 60 to 70 years old. Figure 1 reflect the net pension wealth of female and male employees at different retirement ages in the labour market.

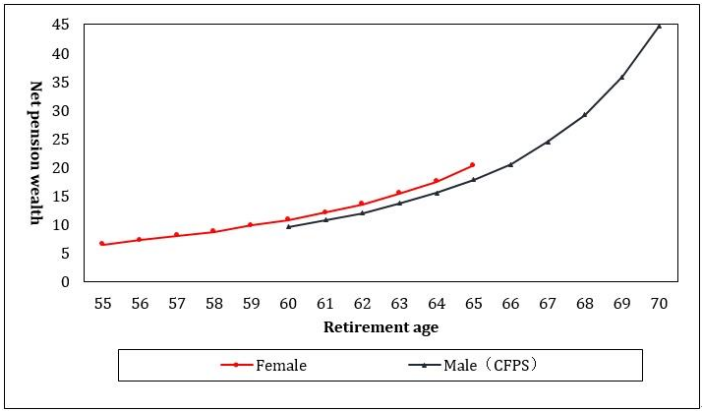


**Figure 1.** The net pension wealth of male and female employees at different retirement ages.

Under the parameter settings of the model, the following two results are obtained. First, at the same retirement age, the net pension wealth of female employees was slightly higher than that of their male counterparts. However, when retiring at the statutory retirement ages (55 for women and 60 for men), female employees had significantly lower net pension wealth than male employees. This finding is different from most other results reported in the literature.

The difference in the individual retirement account net pension wealth of male and female employees is closely related to their wage level and retirement age. On the one hand, under the current retirement policy, female employees retire earlier than male employees and have fewer working years, resulting in fewer years of pension fund accumulation in individual retirement accounts than male employees. On the other hand, the significantly lower contribution level of female employees compared to that of male employees in the labour market causes less pension fund accumulation. Both lead to the net pension wealth of female workers being substantially lower than that of male workers when they retire at the statutory retirement age. If men and women retire at the same age, female employees' individual pension contributions and accumulation period are extended, and female employees can obtain slightly more net pension wealth due to a longer life expectancy. This finding demonstrates that in terms of the benefits of individual retirement accounts under the current system, the disadvantage of female employees' wage income largely offsets their advantage of a longer life expectancy.

Second, delaying retirement increases net pension wealth for insured employees in individual retirement accounts. The older the retirement age is, the greater the increase. In terms of gender interests, under the existing statutory retirement age regulations, each year of retirement age extension will bring more net pension wealth increase to male employees.

After the retirement age is extended, the accumulation of pension funds in individual retirement accounts will increase as the contribution period is extended, and the monthly divisor of pension payment will be smaller, which

will greatly increase the monthly pensions received by retired employees. Under the stipulation that the account balance can be inherited, although the extension of the retirement age reduces the retirement life of the insured person and shortens the pension payment period, the net pension wealth of the individual retirement account will increase due to the substantial increase in the monthly pension payment. This result also indicates that in terms of the contribution of extending the retirement age to the sustainability of retirement funds, the two accounts, that is, the individual retirement account and the pooled account, will have diametrically opposite policy effects in China's basic pension system for urban workers.

4.3.3. Sensitivity analysis

To test the robustness of the above results, a sensitivity analysis of the three important parameters in the model, that is, the wage growth rate, the interest rate and the insured age, was performed, and the flexible floating parameter method was used to analyse the retirement of male and female employees both at the same age and at the age stipulated by the system. The wage growth rate was set to vary from two percent to twelve percent by one percentage point. The results are shown in Figure 2.

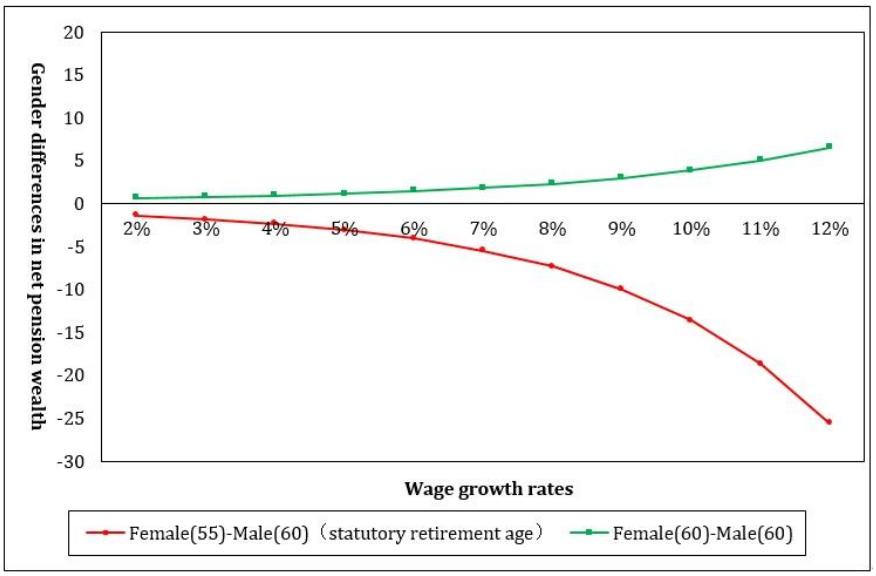


**Figure 2.** Gender differences in employee IRANPW under different wage growth rates.

As shown in figure 2, the gender gap in individual retirement account net pension wealth increases with an acceleration when the wage growth rate increases. Under the current pension system, male employees benefit more from economic development due to their longer contribution periods.

Furthermore, the interest rate was set to vary from 2% to 11% by one percentage point, and other parameters were fixed. The results, shown in Figure 3, indicate that the gender difference in net pension wealth does not vary monotonously with the change in interest rate. In this case, the impact of the interest rate on the net pension wealth of insured employees is compound. On the one hand, the increase in interest rate leads to an increase in the monthly pension. On the other hand, for the monthly divisors, the increase in interest rates extends the payment period of the accumulated amount in the pension account and shortens the period for employees to receive pensions from financial funds. Combining the above impacts, the net pension wealth for female employees is also lower than that for male employees.

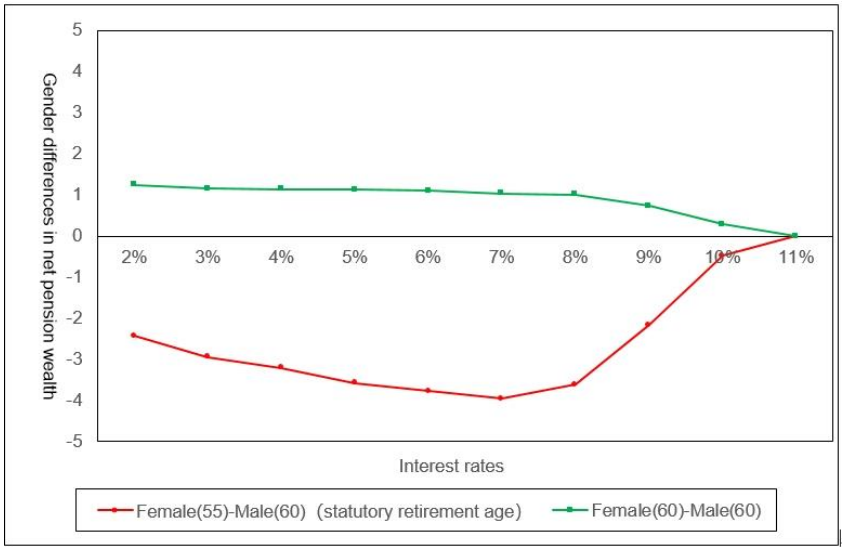


**Figure 3.** Gender differences in employee IRANPW under different interest rates.

In addition, as shown in figure 4, the sensitivity analysis on the age of participation in the pension system indicates a reduction in the pension wealth of employees and the gender gap as age of initial participation in the system increases. In summary, the changes in these three key parameters do not change the previous conclusions about gender differences in net pension wealth.

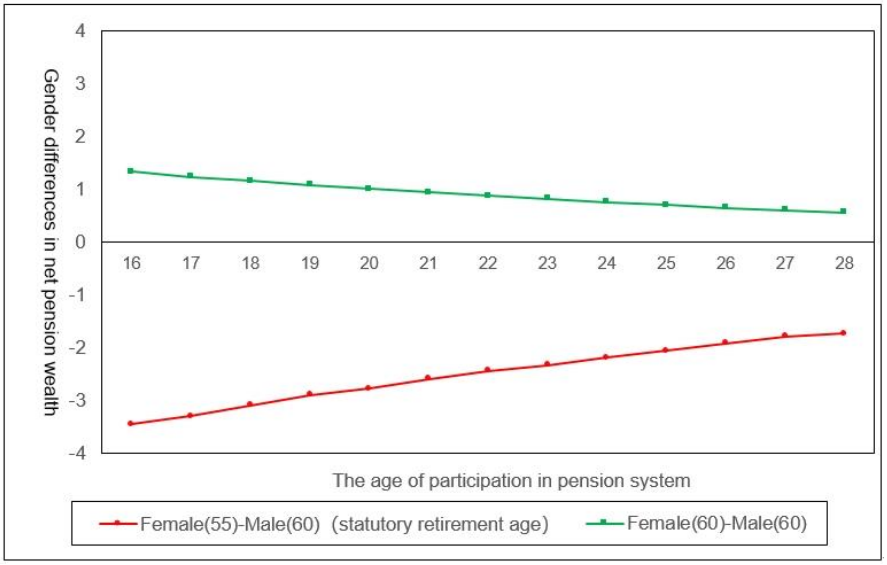


**Figure 4.** Gender differences in employee IRANPW under different ages of participation in the pension system.

## 5. Conclusion

In this study, the gender difference in the initial wage level of employees in China was confirmed by regression analysis based on CFPS data and was incorporated into an actuarial model to measure the individual retirement account net pension wealth of insured employees. The results indicate that due to the relatively low level of income during the work period and the short contribution period, the advantage in individual retirement account net pension wealth obtained by women as a result of a longer life expectancy is largely offset. Under the current system, female employees who retire at the statutory retirement age have less net pension wealth. Due to the inheritability

of account balances, increasing the retirement age will increase individual retirement account net pension wealth of the system members, and each year of extension will bring more net pension wealth increase to male employees. Accordingly, we propose the following recommendations:

First, moderately delay the retirement age for women. Under China's current statutory retirement system, women retire 5 to 10 years earlier than men, which means women contribute to individual retirement accounts for 5 to 10 fewer years than men. As a result, women's individual retirement account accumulations are significantly lower than those of men, leading to generally lower pension benefits after retirement. Undoubtedly, if women are forced to retire early when their career earnings are rising substantially, it will result in a loss of future pension benefits. Appropriately delaying women's retirement age has multiple positive effects. On one hand, it can help alleviate the impact of population aging on the pension system and reduce the financial pressure of pension payments. On the other hand, it ensures that women have equal employment rights and opportunities to accumulate individual retirement accounts as men, thereby helping to narrow the gender gap in pension income after retirement.

Second, it is essential to establish a sound mechanism for enterprise wage growth. In the pension insurance system, wage levels significantly influence the accumulation of employees' pension wealth. Relatively low wage levels or slow wage growth may hinder or even reduce the increase in individual pension wealth, compromising financial security after retirement. Moreover, gender-based wage disparities in the labor market can translate into gender differences in pension wealth. To address these issues, a well-designed wage adjustment mechanism should be implemented to ensure that employee wages align with the broader market economy. Such a mechanism should also safeguard the legitimate rights of low-income workers, particularly female employees, to equitable wage increases. Ultimately, this would help ensure stable growth in employees' pension wealth.

Third, setting the number of pension payment months in individual retirement accounts based on gender differences. Under the current individual retirement account pension scheme, male and female employees share the same table for determining the number of pension payment months, without considering gender differences in life expectancy. Given the continuous increase in overall life expectancy in China and the significant gap between male and female life expectancy, this uniform approach may lead to disparities in lifetime pension wealth across genders. To improve the rationality and equity of the system, it is necessary to develop gender-specific policies for calculating the number of pension payment months, making pension calculations more targeted and reasonable. Meanwhile, the pension benefit calculation mechanism for employees with interrupted employment should also be enhanced. A flexible adjustment mechanism should be established to dynamically revise pension benefits in cases of contribution interruptions, ensuring pension wealth is not disproportionately affected. This would help protect the pension rights of such employees and promote fairness and sustainability within the system.

## Funding Statement

This research received no external funding.

## Acknowledgments

Acknowledgments to anonymous referees' comments and editor's effort.

## Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

## Author contributions

Conceptualization: Dehua Li; Investigation: Dehua Li; Methodology: Dehua Li; Formal analysis: Dehua Li; Writing – original draft: Dehua Li; Writing – review & editing: Dehua Li, Fei Yi.

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