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The Influence of Extending Retirement Age on the Payment Balance of Endowment Insurance fund in Shandong Province

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ABSTRACT: *At present, our country is facing the critical situation of the aging population and the gradual reduction of the total labor supply, which leads to a serious imbalance in the payment balance of endowment insurance fund. This paper takes Shandong Province as an example, through the establishment of income and expenditure model of endowment insurance fund in Shandong province, analyzes the scale of income and expenditure under the current policy and the extending retirement age, respectively. By comparing the results, it shows that the extending retirement has a significant impact on the balance of pension payments.*

Key words: *Gelaying Retirement Age; Pension Insurance Fund; Payments Balance; Aging Population*

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I. INTRODUCTION

The system of retirement ages is a major social and economic policy. In view of our country's social and economic development and average life expectancy, it is no longer appropriate to follow the old retirement system and necessary to put the research on retirement age on the agenda. At present, the average life expectancy of China's urban reaches 75, which will run up to 85 in 2050. With the improvement of labor condition, the average labor intensity has been much lower than before. Remaining a lower retirement age is on the one hand, not conducive to arouse the enthusiasm of young and middle-aged. On the other hand, the pensions for the retirees cannot be improved sustainably and reasonably. Currently, our country's overall employment situation is that the supply of labor force exceeds the demand. In the future, labor force will be gradually reduced in aggregate. Beyond that, with the acceleration of the peak of aging populations, there is much need to adopt various policies to increase income and decrease expenditure in order to ensure the overall payment balance of pension insurance fund, of which extending the retirement age properly, thus slowing down the fast-growing dependency ratio, is one of the most important measures.

In China, Pension Insurance System with SP & IRA was established in the 1990s. The pension paid to the workers before the establishment of the pension insurance system was borne by the later payers, which thus brought about the system cost. The money of the private account is used to pay the current pension, which causes huge empty account. According to the "China pension report 2015" released by Chinese Academy of Social Sciences, the empty account amount of individual account of basic pension insurance for Urban Employees in China had reached 917.4 billion yuan by the end of 2014. Meanwhile, the accelerating process of population aging is widening the pension insurance fund gap. Based on data of the sixth national census, the average life expectancy rose to 74.83 years in 2010. It is estimated that by 2050, the ageing population over 60 years old will account for 35% of the total population. Due to the increasing remaining life after retirement, the pressure on the payment of per capita pension keeps growing. It is said in the white paper "Human Resources in China" released by the Information Office of the State Council that 2 taxpayers will have to support 1 pensioner in 2035, which will cause unbearable pressure on people at work. In order to improve the current situation, it is put forward at the Third Plenum of the 18th CPC Central Committee that policies will be stipulated for gradually suspending the retirement age of employees, which makes delaying retirement age become the focus of all the problems in social security field.

The influence of delaying retirement age on the pension insurance fund has been studied by many scholars at home and abroad. Shoven and Goda (2008) think the extension of life expectancy leads to the necessity of extending retirement age to prevent the rise in the proportion of pensioners [1]. The study by Breyer and Hupfeld (2010) shows that extending retirement age can enhance the payment ability of pension insurance system [2]. Zhang (2011) finds that when the extending retirement reform is adjusted at the rate of 4 months per year, the payment condition of endowment insurance can be greatly improved. Besides, combining extending retirement age and expanding coverage can achieve the best results [3]. Wang and Mi (2013) hold that it is easy to trigger a pension payment crisis if the retirement time is too early. The retirement age should be appropriately adjusted on the basis of change of life expectancy [4]. By simulating three plans of extending retirement age

under 72 assumptions, Yuan (2014) discovers that extending retirement age could slow down the pension gap, but could not solve the funds gap [5]. Lin (2014) puts forward that when thinking about extend retirement age, something should be taken into account concerning old-age security, employment, interests of different groups, short-term and long-term effects [6]. Wang and Zhao(2015) explore the relationship between longer life spans and extending retirement based on the international comparison's perspective. The results indicate that with the obvious trend of longer life spans, extending retirement can effectively relieve the payment pressure, but diversifies between genders [7]. Wang and Zeng(2015) investigate the difference of well-being brought about by retirement and pension income under the present retirement system [8]. Lin and Lin (2015) study the influence of extending retirement on the labor's pension income based on the Option Value Model. Results show that under the current system, extending retirement may cause significant economic loss to male and low-income workers and may also to the female workers under certain assumptions [9]. Jin and Yan(2015) build the population model based on the provincial level and payment model of pooling account of pension insurance, according to which predict the balance of pooling account of endowment insurance in urban areas in the future [10]. Tian and Zhao(2016) think the annual premium income of the basic pension will fail to meet the need of expenditure in 2020, and will be exhausted and cumulative deficit occurs in 2025 [11]. Wang and Jiang (2016) discuss the impact effect of longevity risk on endowment insurance for urban workers. The result reflects that longevity risk has great impact effect on the insurance and is greatly influenced by extending retirement age and pension adjustment index, less by urbanization rate and other factors [12]. Deng and Xian (2016) do the research on the influence of extending retirement age on payment balance of endowment insurance fund. In the article, they build the predicted population model and payment balance model of endowment insurance fund, designing 11 kinds of retirement age plans and measure their influence on the balance [13].

Based on these, this paper will study the influence of extending retirement age on the income, expenditure and the gap of endowment insurance fund in Shandong Province through building the income and expenditure model. The structure of this paper is as follows: Section 2 builds the income and expenditure model of endowment insurance fund; In Section 3, we analyze the influence of extending retirement age on the revenue scale of endowment insurance fund. In Section 4, we discuss the influence of extending retirement age on the expenditure scale of endowment insurance fund. In Section 5, we investigate the influence of extending retirement age on the annual gap of endowment insurance fund. The final Section 6 concludes.

II. ESTABLISHMENT OF INCOME AND EXPENDITURE MODEL OF PENSION INSURANCE FUND

2.1 One-year income model of pension insurance fund

Without considering the inflation factor in one-year period and government subsidies for the pension fund, factors that influence the pension revenue consist of two parts: of which one is to affect the pension scale through making effects on the number of people paying endowment insurance, the other is through making effects on the number of average payment of endowment insurance. The former includes employees in active service, coverage of endowment insurance and so on, and the later includes endowment insurance payment rate, average wages employees and so on. In practice, changes in wage level are often influenced by two factors: One is that wage level rises with the development of economy and society and the inflation factor is not considered; Another is that with the increase of working years, working proficiency and job promotion, people with older working age will have higher wage in the area and same economic level. Considering that according China's population policy, people of different ages show unbalances state, the fund revenue only concerning social average wage and endowment insurance rate doesn't take different wages of different ages into consideration. In fact, extending retirement mainly influence those old people because of their long working years and horizontal difference among their wages. If we use the social average wage as the contribution base, we tend to underestimate those old people's contribution ability. Therefore, considering the influence of age difference on wages, this paper introduces wage level connected with working age as the contribution base.

Wage difference related to working age is mainly reflected on the seniority pay. Most companies in China use linear growth calculation to calculate the seniority wage. When one working year is added, the seniority wage will be added on x yuan. The seniority wage of most companies increases in a linear manner between 1 to 100 yuan except several ones. The most common one is in those companies where the seniority wage rises 30~50 yuan per month when a working year is added. Here we set the seniority wage's linear growth rate as 50 yuan per month, and take a as the working age of company staffs, i as the age of workers, and so every year the seniority wage of the i-year-old worker is $12\times 50\times (i-a)$. After we introduce the seniority wage, the contribution base of endowment insurance fund is made up of two parts: one is the wage influenced by the seniority wage, the other is the average wage level screening out the seniority wage. We use W_i as the wage level of i-year-old people. And thus

$$W_i = 12\times 50\times (i-a)+[\overline{W}\times L-12\times 50\times \sum_{i=a}^{b\text{-}1}(i-a)]/L \quad (1)$$

In this formula, $\overline{W}$ is the average wage of workers, L is the total number of people at work, b is the retirement age of workers. Combine all these factors, we build the one-year endowment insurance fund revenue model as

$$I=\sum_{i=a}^{b-1} L_i\times C\times D\times V\times W_i \quad (2)$$

In this formula, I refers to one-year revenue of endowment insurance, L_i refers to the number of i-year-old workers, C refers to the endowment insurance's payment rate, D is the endowment insurance fund's coverage rate, V is the endowment insurance fund's collection rate, W_i is the wage level of workers.

2.2 One-year expenditure model of endowment insurance fund

According to the design of our country's endowment insurance system, the expenditure is mainly affected by the number of pensioners and the level of basic old-age insurance. The number of pensioners is decided by the number of people reaching retirement age and the proportion of pensioners in retired workers. The level of endowment insurance is determined by proportion of pensions received by retired workers and the wage before workers retire, of which the higher the proportion is, the higher the level of endowment insurance is, and so the expenditure also increases.

Combining all these factors, we build the one-year expenditure model of endowment insurance fund as

$$B=\sum_{i=b}^{\omega} L_i\times Z\times \overline{W}\times F \quad (3)$$

In this formula, B refers to one-year expenditure of the insurance fund, Z refers to the proportion of pensioners, $\overline{W}$ refers to social average wage, F refers to pension replacement rate, ω refers to the maximum survival age of urban workers.

2.3 One-year gap model of endowment insurance fund

According to the revenue model and expenditure model above, the one-year gap model of endowment insurance fund Q is

$$Q=I-B=\sum_{i=a}^{b-1} L_i\times C\times D\times V\times W_i-\sum_{i=b}^{\omega} L_i\times Z\times \overline{W}\times F \quad (4)$$

In this model, since the endowment insurance is paid according to the proportion of wage, which increases by years, the extending retirement policy mainly affect those who work long years. Therefore, if we use the social average wage to measure the policy's influence on the insurance's revenue, the base will be small and the policy's actual effect will be weakened. According to our country's current policies, the endowment insurance's expenditure is directly related to social average wage, so we use it as the base to calculate the expenditure scale in the expenditure model.

III. ANALYSIS OF INFLUENCE OF EXTENDING RETIREMENT AGE ON ENDOWMENT INSURANCE FUND'S REVENUE SCALE

3.1 Hypothesis of parameters

3.1.1 Research range.

The base year **is** 2015 and th**e targe**t range is 2016 to 2025, adding up to 10 years.

3.1.2 Working age a and retirement age b .

According to our country's current education system, the working age of man and woman is set as 20. Before the extending retirement policy has been made, the legal retirement age of man is 60, and woman 50.

3.1.3 Payment rate

Among the insurance payment, individuals pay 8% of wage and it goes to individual account. The enterprise pay 20% for the workers based on their wage and it goes to pooling account. Therefore, according to the current policy, the payment rate is set as 20%.

3.1.4 Coverage rate

According to the target put forward in the 18th CPC National Congress, our country will achieve the full coverage of social security. Therefore, we assume that the linear growth rate of social insurance coverage reaches 100% in 2020, and keep the rate after that. More specific are shown in the following table:

Table 3-1: Coverage rate of endowment insurance fund in 2015~2025

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024
Coverage rate %	65	73.75	82.5	91.25	100	100	100	100	100

3.1.5 The collection rate

Since some enterprises and workers don't pay the insurance expense although they should do, the actual revenue of the endowment insurance fund is less than the theoretical one. Seeing from the measurement of evasion rate in recent years, the actual collection rate fluctuates between 60% to 70%. Because of the increasing punishment strength, we set the actual collection rate as 0.7 in this paper.

3.1.6 Average annual rate of return of endowment insurance fund

At present, the return rate of endowment insurance fund is generally lower, which keeps between 2% to 3% in recent years. So we set the average annual rate as 2.5% in this paper.

3.2 People of different ages and forecast of their wage

3.2.1 Processing of population data

This paper uses the data of 6th census in 2010 and international population-forecast software PADIS-INT to calculate the working population of men and women in the target range.

Table 3-2: Number of people at work in Shandong Province in 2016~2025

Year	Number of male between 20-59 years old	Number of female between 20-49 years old	Total number of workers
2016	16015463	12142941	28158404
2017	15967062	11918518	27885580
2018	15902475	11663343	27565818
2019	15823881	11411421	27235302
2020	15730384	11162708	26893092
2021	15617283	10931856	26549139
2022	15486747	10704114	26190861
2023	15337710	10479460	25817170
2024	15177818	10267465	25445283
2025	15006618	10067717	25074335

In this paper, we take into account influence of wage difference of different ages on endowment insurance revenue. According to the result of the 6th census and age structure, we divide the above working population into more detailed groups, in which 5 years of age is a group. The result is in the following table:

Table 3-3: Male age segment table in Shandong Province in 2016~2025

Year	20-24 years old	25-29 years old	30-34 years old	35-39 years old	40-44 years old	45-49 years old	50-54 years old	55-59 years old
2016	1824562	1806910	1708588	2087514	2442523	2090545	1649713	1738335
2017	1819047	1801450	1703424	2081206	2435141	2084227	1644728	1733082
2018	1811689	1794163	1696534	2072787	2425291	2075796	1638075	1726071
2019	1802736	1785295	1688149	2062543	2413305	2065537	1629979	1717541
2020	1792084	1774747	1678174	2050356	2399046	2053333	1620348	1707393
2021	1779199	1761986	1666108	2035614	2381797	2038569	1608698	1695116
2022	1764328	1747259	1652182	2018600	2361888	2021530	1595251	1680948
2023	1747349	1730444	1636283	1999174	2339159	2002076	1579900	1664771
2024	1729133	1712405	1619225	1978333	2314774	1981204	1563429	1647416
2025	1709629	1693090	1600961	1956018	2288664	1958857	1545795	1628834

Table 3-4: Female age segment table in Shandong Province in 2016~2025

Year	20-24 years old	25-29 years old	30-34 years old	35-39 years old	40-44 years old	45-49 years old
2016	1879613	1386491	1287652	1560473	1853727	1623389
2017	1844874	1360867	1263854	1531633	1819467	1593386
2018	1805376	1331731	1236795	1498840	1780512	1559271
2019	1766380	1302966	1210081	1466466	1742054	1525592
2020	1727882	1274568	1183707	1434505	1704086	1492342
2021	1692148	1248209	1159227	1404838	1668844	1461479
2022	1656896	1222205	1135077	1375571	1634077	1431032
2023	1622122	1196554	1111254	1346701	1599782	1400998
2024	1589307	1172348	1088774	1319458	1567419	1372657
2025	1558388	1149541	1067593	1293789	1536926	1345952

It can be known from the table above that the distribution of population diversifies in different age groups. It will cause huge disparity if the payment base is calculated with the same average wage when the number of people is different.

3.2.2 Calculating the average wage

We calculate the seniority pay in sections according to the age group, and five years as a group. We use the median seniority pay as the standard to calculate the level of wage among different age groups. The result is as follows:

Table 3-5: Wage related to age (yuan per year)

Age	20-24 years old	25-29 years old	30-34 years old	35-39 years old	40-44 years old	45-49 years old	50-54 years old	55-59 years old
Seniority pay	1200	4200	7200	10200	13200	16200	19200	22200

Thinking about the seniority, we should not use the social average wage as the standard to calculate the insurance expense. Instead, we should use two part (the seniority pay and the remaining average pay) to calculate the insurance payment. According to the statistics of annual average pay of urban workers in Shandong province since 1998, we predict the pay between 2016 to 2025 and the result is as follows:

Table 3-6: Predicted annual average wage of urban workers in Shandong Province in 2016~2025 unit:yuan

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Average pay	47328	49817	52307	54796	57286	59775	62265	64754	67244	69733

According to all the tables above and the formula (1), we figure up the number and the result is as follows:

Table 3-7: Average pay of men in different age groups unit:yuan

Year	20-24 years old	25-29 years old	30-34 years old	35-39 years old	40-44 years old	45-49 years old	50-54 years old	55-59 years old
2016	37305	40305	43305	46305	49305	52305	55305	58305
2017	39794	42794	45794	48794	51794	54794	57794	60794
2018	42284	45284	48284	51284	54284	57284	60284	63284
2019	44773	47773	50773	53773	56773	59773	62773	65773
2020	47263	50263	53263	56263	59263	62263	65263	68263
2021	49752	52752	55752	58752	61752	64752	67752	70752
2022	52242	55242	58242	61242	64242	67242	70242	73242
2023	54731	57731	60731	63731	66731	69731	72731	75731
2024	57221	60221	63221	66221	69221	72221	75221	78221
2025	59710	62710	65710	68710	71710	74710	77710	80710

Table 3-8: Average pay of women in different age groups unit: yuan

Year	20-24 years old	25-29 years old	30-34 years old	35-39 years old	40-44 years old	45-49 years old
2016	39512	42512	45512	48512	51512	54512
2017	41860	44860	47860	50860	53860	56860
2018	44187	47187	50187	53187	56187	59187
2019	46518	49518	52518	55518	58518	61518
2020	48853	51853	54853	57853	60853	63853
2021	51210	54210	57210	60210	63210	66210
2022	53575	56575	59575	62575	65575	68575
2023	55950	58950	61950	64950	67950	70950
2024	58339	61339	64339	67339	70339	73339
2025	60744	63744	66744	69744	72744	75744

According to the two tables above, we can see that in the same age group, the wage is raised with the growth of the year. In the same year, the wage is also raised with the growth of working years. Since the extending retirement policy mainly affect those people with old work age, using them as the payment base will more closely fit the actual situation.

3.3 The influence of extending retirement age on revenue scale of endowment insurance fund in Shandong province

3.3.1 Forecast of revenue scale when the retirement age is not extended

When the retirement age is not extended, we calculate the revenue scale of endowment insurance fund according to formula (2), number of people in different age groups, their corresponding earnings, payment rate and collection rate. The result of female is in the 3-9 table and female in the 3-10 table.

Table 3-9: One-year revenue of pension for men when retirement is not extended unit: 10,000 yuan

Year	20-24 years old	25-29 years old	30-34 years old	35-39 years old	40-44 years old	45-49 years old	50-54 years old	55-59 years old
2016	634879	679299	690146	901619	1123299	1019925	851017	945377
2017	766092	815876	825563	1074731	1334817	1208637	1005992	1115057
2018	906912	961860	969776	1258468	1558624	1407744	1169072	1293178
2019	1056908	1116815	1122360	1452297	1794081	1616687	1339808	1479253
2020	1215432	1280076	1282667	1655401	2040203	1834596	1517493	1672515
2021	1270253	1333818	1332964	1716219	2110621	1894231	1564051	1721046
2022	1322664	1385088	1380845	1773986	2177355	1950615	1607966	1766710
2023	1372357	1433576	1426011	1828333	2239965	2003365	1648932	1809180
2024	1419822	1479806	1468990	1879946	2299306	2053257	1687594	1849172
2025	1464882	1523598	1509613	1928618	2355131	2100075	1723780	1886503

Table 3-10: One-year revenue of pension for women when retirement is not extended unit: 10,000 yuan

Year	20-24 years old	25-29 years old	30-34 years old	35-39 years old	40-44 years old	45-49 years old
2016	654035	521245	520118	673984	852515	792011
2017	776969	616336	612525	790932	997336	924000
2018	903751	713948	706979	910003	1144254	1057451
2019	1035594	815088	804518	1032582	1295065	1194074
2020	1171889	919311	904734	1158180	1449193	1333366
2021	1208103	944890	927436	1184414	1478840	1358001
2022	1242126	968867	948663	1208880	1506407	1380832
2023	1274005	991278	968452	1231618	1531942	1401901
2024	1305009	1013106	987756	1253839	1556946	1422577
2025	1335292	1034462	1006678	1275665	1581561	1442985

Through adding up the data in different age groups, we can get the revenue scale in target years and the result is in the 3-11 table.

Table 3-11: Predicted revenue of pension when retirement is not extended unit: 10,000 yuan

Year	Male	Female	Total
2016	6845560	4013909	10859469
2017	8146763	4718098	12864862
2018	9525634	5436387	14962021
2019	10978209	6176920	17155129
2020	12498383	6936672	19435056
2021	12943203	7101684	20044887
2022	13365229	7255775	20621004
2023	13761720	7399195	21160915
2024	14137894	7539232	21677126
2025	14492200	7676643	22168843

It can be known from the analysis of the table above that the total revenue of endowment insurance fund is stepping up, for the earnings of urban workers is increasing and also the coverage of the insurance in the target zone. However, because of the population policies, although the revenue is keep increasing, the rate of growth is gradually slowing down.

3.3.2 Forecast of revenue scale of the endowment insurance fund when extending retirement age

According to the age structure in the 6th census in 2010 and the population forecast in the table 3-2, 3-3 and 3-4, we have predicted the number of workers in active service when extending the retirement age from 1 to 5 years. The result is in the table 3-12 and 3-13.

Table 3-12: Increased male workers with different extending years

Year	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	290938	635940	978633	1358654	1738335
2017	290059	634018	975675	1354548	1733082
2018	288886	631453	971728	1349069	1726071
2019	287458	628332	966926	1342402	1717541
2020	285760	624620	961213	1334470	1707393
2021	283705	620129	954301	1324875	1695116
2022	281334	614946	946325	1313801	1680948
2023	278626	609028	937218	1301158	1664771
2024	275722	602678	927448	1287593	1647416
2025	272612	595881	916987	1273070	1628834

Table 3-13: Increased female workers with different extending years

Year	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	175465	484061	896607	1256529	1623389
2017	172222	475114	880036	1233307	1593386
2018	168535	464942	861194	1206901	1559271
2019	164895	454900	842593	1180833	1525592
2020	161301	444985	824229	1155097	1492342
2021	157965	435782	807183	1131208	1461479
2022	154674	426704	790367	1107642	1431032
2023	151428	417748	773779	1084395	1400998
2024	148365	409298	758126	1062459	1372657
2025	145478	401335	743377	1041789	1345952

It can be known from the table above that no matter for men or women, extending retirement age will increase the number of people at work and thus increase the revenue of the insurance fund. Since active staffs increased due to the extending retirement policy are almost those with long work age and thus have higher pay, we should not just multiply the average pay with the number of active staffs after extending retirement, instead we should take into consideration the increased staff and their corresponding wage level in the original basis. The result in table 3-14 and 3-15 is got using the formula (1) to figure out the wage level of staffs extending retirement, and then put the data in table 3-12 and 3-13 into formula (2) and finally get the increased revenue.

Table 3-14: Increased revenue of pension for men with different extending years unit: yuan

Year	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	1663651202	3636446938	5596042857	7769091349	9940193804
2017	1958319928	4280540596	6587223473	9145166005	11700817814
2018	2266941891	4955133558	7625338752	10586400935	13544811387
2019	2588689771	5658417449	8707605828	12088932634	15467231347
2020	2922242983	6387505709	9829582641	13646594105	17460187307
2021	3002581053	6563110504	10099816739	14021765177	17940201377
2022	3077988028	6727936799	10353464057	14373908510	18390752519
2023	3147902408	6880757253	10588635867	14700401949	18808485805
2024	3213584449	7024326565	10809571311	15007130774	19200931179
2025	3274724342	7157967544	11015228279	15292648202	19566237551

3-15: Increased revenue of pension for men with different extending years unit: yuan

Year	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	941275781	2596724817	4809812895	6740603850	8708608219
2017	1091033572	3009865980	5575058286	7813039751	10094155316
2018	1240775851	3422964352	6340224415	8885364573	11479558904
2019	1393057327	3843067681	7118365555	9975872932	12888454941
2020	1547424931	4268926070	7907166569	11081320330	14316651660
2021	1568845901	4328020721	8016625305	11234718807	14514836759
2022	1588656001	4382671419	8117852678	11376581627	14698118219
2023	1606915080	4433043270	8211154508	11507337373	14867049755
2024	1625278488	4483702938	8304989450	11638840238	15036946542
2025	1643870436	4534993084	8399992203	11771979704	15208957755

On the basis of the predicted revenue in the table above and the data in table 3-11, we get the insurance fund's revenue scale of men and women against different extending retirement years.

Table 3-16: Revenue of pension for men with different extending years unit: yuan

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	68455603580	70119254782	72092050518	74051646437	76224694929	78395797384
2017	81467634753	83425954681	85748175349	88054858226	90612800758	93168452567
2018	95256335876	97523277767	100211469434	102881674628	105842736811	108801147263
2019	109782091120	112370780891	115440508569	118489696948	121871023754	125249322467
2020	124983830823	127906073806	131371336532	134813413464	138630424928	142444018130
2021	129432027392	132434608445	135995137896	139531844131	143453792569	147372228769
2022	133652292840	136730280868	140380229639	144005756897	148026201350	152043045359
2023	137617197857	140765100265	144497955110	148205833724	152317599806	156425683662
2024	141378939888	144592524337	148403266453	152188511199	156386070662	160579871067
2025	144921995070	148196719412	152079962614	155937223349	160214643272	164488232621

Table 3-17: Revenue of pension for women with different extending years unit: yuan

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	40139088504	41080364285	42735813321	44948901399	46879692354	48847696723
2017	47180981388	48272014960	50190847368	52756039674	54994021139	57275136704
2018	54363869446	55604645297	57786833798	60704093861	63249234019	65843428350
2019	61769202467	63162259794	65612270148	68887568022	71745075399	74657657408
2020	69366724393	70914149324	73635650463	77273890962	80448044723	83683376053
2021	71016843043	72585688944	75344863764	79033468348	82251561850	85531679802
2022	72557750581	74146406582	76940422000	80675603259	83934332208	87255868800
2023	73991948862	75598863942	78424992132	82203103370	85499286235	88858998617
2024	75392317827	77017596315	79876020765	83697307277	87031158065	90429264369
2025	76766432032	78410302468	81301425116	85166424235	88538411736	91975389787

It can be seen from the table 3-16 and 3-17 that extending retirement could markedly increase revenue of urban endowment insurance fund. The longer the retirement is extended, the more the revenue will increase. Considering the gender differences, men's endowment insurance revenue is obviously higher than the one of women, which is, mainly because against the same extending years, men's retirement age is older than it of women.

IV. THE INFLUENCE OF EXTENDING RETIREMENT AGE ON EXPENDITURE OF ENDOWMENT INSURANCE FUND

4.1 Hypothesis of parameters

4.1.1 Pension payment rate

The pension payment rate is the ratio of number of people supported by the endowment insurance and number of total retired people. Since many people don't attend endowment insurance, they cannot get the support of the insurance. Therefore, the payment rate is not 100%, and is the same as the coverage rate without thinking about that the insured person died before he retired. So, here we assume that the payment rate is the same as the coverage rate and the data is in the table 3-1.

4.1.2 Substitution rate

The substitution rate is the ratio of number of pension got by the retired workers and their wage. The higher the substitution rate is, the higher the insurance level is. But, it also means the expenditure is higher. Viewed from the payment balance of endowment insurance fund, it is more difficult to keep the balance if the substitution rate is higher. According to our country's actual situation, we set the rate as 50%.

4.2 The expenditure of pension when retirement is not extended

4.2.1 The number of retired people when retirement is not extended

The number of retired men can be figured up by adding up people over 60 years old according to the prediction, and women's can be got in a similar way. The result is in the following table 4-1.

Table 4-1: Number of retired people

Year	Female	Male	Total
2016	3919084	7756052	11675136
2017	4081173	8099905	12181078
2018	4238875	8454033	12692908
2019	4406412	8800546	13206958
2020	4584637	9139592	13724229
2021	4788416	9466957	14255373
2022	5005325	9786609	14791934
2023	5236216	10098510	15334726
2024	5473507	10392265	15865772
2025	5717451	10668144	16385595

4.2.2 The expenditure of endowment insurance when retirement is not extended

When we try to get the revenue scale of endowment insurance, we calculate different people's payment base separately in consideration of their different conditions. But, we needn't do that when we calculate the expenditure of pension and just need consider the social average pay and substitution rate. We get the result according to the table 4-1 and 3-6, and the formula (3) in the table 4-2.

Table 4-2: Expenditure of pension when retirement is not extended unit: yuan

Year	Female	Male	Total
2016	60282223699	119301362688	179583586387
2017	74972449975	148797838860	223770288834
2018	91461162617	182410589362	273871751978
2019	110164782143	220022601798	330187383941
2020	131318256984	261786329210	393104586194
2021	143115424938	282946923141	426062348079
2022	155828664894	304682356153	460511021048
2023	169534592393	326962596009	496497188402
2024	184030496700	349409197757	533439694457
2025	199349098002	371963814602	571312912604

From the table above, we can know that with the growth of years and social average income, the scale of pension expenditure is getting large. Considering the gender differences, women retire earlier under the current policy, and the time they could receive the pension is longer, so the expenditure for women is larger than men.

4.3 The expenditure of pension when extending retirement age

4.3.1 The situation of retired people with different extending years

According to the data of the 6th census in 2010, we get the total number of retired people (men and women) with different extending years. The result is in the table 4-3 and 4-4.

Table 4-3: Number of retired men with different extending years unit: 10 thousand

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	3919084	3647420	3358595	3072871	2790334	2530077
2017	4081173	3808827	3539388	3253217	2970402	2691023
2018	4238875	3965730	3695590	3428599	3145310	2865621
2019	4406412	4118202	3847245	3579532	3315200	3035007
2020	4584637	4280404	3994477	3725927	3460851	3199376
2021	4788416	4453131	4151281	3867866	3601930	3339687
2022	5005325	4651168	4318479	4019250	3738563	3475437
2023	5236216	4862037	4510594	4180765	3884387	3606635
2024	5473507	5086799	4715454	4366997	4040275	3746961
2025	5717451	5317704	4933895	4565673	4220464	3897084

Table 4-4: Number of retired women with different extending years unit: 10 thousand

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	7756052	7331685	6927040	6536480	6159540	5803721
2017	8099905	7660926	7237226	6833283	6443465	6067303
2018	8454033	7999906	7561609	7138635	6735450	6346426
2019	8800546	8348910	7895480	7457925	7035736	6633363
2020	9139592	8690399	8239447	7786775	7350022	6928672
2021	9466957	9024213	8575692	8125485	7673633	7237738
2022	9786609	9346203	8904114	8456325	8006923	7555949
2023	10098510	9660407	9220645	8779269	8332272	7883733
2024	10392265	9966893	9529421	9090359	8649753	8203602
2025	10668144	10255111	9830345	9393561	8955255	8515473

It can be seen from the table 4-3 and 4-4 that with the growth of extending years, the total number of retired people has a clear downward trend. Considering the gender differences, women's pension expenditure is far larger than men's because of their earlier retirement age.

4.3.2 The expenditure of endowment insurance when extending retirement age

We can calculate the expenditure of pension of people with different extending years using the data in table 4-3 and 4-4 and the formula (3). The result is in the table 4-5 and 4-6.

Table 4-5: Expenditure of pension for men with different extending years unit: yuan

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	60282223699	56103566131	51660942992	47266018544	42920115615	38916917242
2017	74972449975	69969367072	65019686686	59762634122	54567232350	49434950993
2018	91461162617	85567580177	79738835883	73978036787	67865579756	61830799040
2019	110164782143	102959238980	96185038366	89491941052	82883372177	75878262169
2020	131318256984	122604078026	114414239820	106722132917	99129532175	91640075268
2021	143115424938	133094479546	124072834179	115602171196	107653917819	99816040245
2022	155828664894	144802844898	134445379060	125129609241	116391099662	108199309263
2023	169534592393	157419682648	146040903439	135361927423	125766004829	116773142024
2024	184030496700	171028583061	158543204893	146827368084	135842306414	125980490012
2025	199349098002	185411207869	172029024453	159190309515	147153983751	135878764897

Table 4-6: Expenditure of pension for women with different extending years unit: yuan

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	119301362688	112773871462	106549738371	100542256703	9474427959	89271168368
2017	148797838860	140733654588	132950150420	125529588645	118368507627	111458291684
2018	182410589362	172612002851	163154976354	154028570457	145329146943	136935271840
2019	220022601798	208731242400	197395031177	186455711102	175900556657	165840822368
2020	261786329210	248920045181	236003377924	223037444520	210527480766	198458706819
2021	282946923141	269714260044	256308934878	242853218809	229348337239	216320375978
2022	304682356153	290971382542	277208012804	263267187378	249276145106	235236162423
2023	326962596009	312777999054	298539688140	284249120247	269776559490	255254072920
2024	349409197757	335107321384	320398618271	305636456106	290822381505	275821872666
2025	371963814602	357562684449	342752462383	327523211372	312240893124	296907111511

Through the analysis on the data of table 4-5 and 4-6, we can find that the expenditure of pension is significantly reduced and is clearer with the growth of extending years. Regarding the gender differences, the expenditure for women is higher than men with the same extending years.

V. THE INFLUENCE OF EXTENDING RETIREMENT ON THE GAP OF ENDOWMENT INSURANCE FUND

According to the analysis above, we know the influence of extending retirement age on revenue and expenditure of endowment insurance fund. In the formula of one-year payment of pension (refer to formula(4)), we can get the predicted number of gap deducting the expenditure from the revenue.

5.1 The influence of extending retirement on gap of men' pension

Put the number of revenue (when extending retirement) in the table 3-15 and expenditure in the table 4-5 into the formula (4), and get the number of one-year gap of the pension in the table 5-1.

Table 5-1: Gap of pension for men with different extending years

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	8173379881	14015688651	20431107526	26785627893	33304579314	39478880142
2017	6495184778	13456587609	20728488663	28292224104	36045568408	43733501574
2018	3795173259	11955697590	20472633551	28903637841	37977157055	46970348223
2019	-382691023	9411541911	19255470203	28997755896	38987651577	49371060298
2020	-6334426161	5301995780	16957096712	28091280547	39500892753	50803942862
2021	-13683397546	-659871101	11922303717	23929672935	35799874750	47556188524
2022	-22176372054	-8072564030	5934850579	18876147656	31635101688	43843736096
2023	-31917394536	-16654582383	-1542948329	12843906301	26551594977	39652541638
2024	-42651556812	-26436058724	-10139938440	5361143115	20543764248	34599381055
2025	-54427102932	-37214488457	-19949061839	-3253086166	13060659521	28609467724

5.2 The influence of extending retirement on the gap of women's endowment insurance fund

In a similar way, we can put the number of revenue (women) in table 3-16 and expenditure in table 3-16 into the formula (4), and get the result of gap in the table 5-2.

Table 5-2: Gap of pension for men with different extending years

Year	Normal	Extend 1 year	Extend 2 years	Extend 3 years	Extend 4 years	Extend 5 years
2016	-79162274184	-71693507177	-63813925050	-55593355304	-47864581605	-40423471645
2017	-101616857472	-92461639628	-82759303052	-72773548971	-63374486488	-54183154980
2018	-128046719916	-117007357554	-105368142556	-93324476596	-82079912924	-71091843490
2019	-158253399331	-145568982606	-131782761029	-117568143080	-104155481258	-91183164960
2020	-192419604817	-178005895857	-162367727461	-145763553558	-130079436043	-114775330766
2021	-211930080098	-197128571100	-180964071114	-163819750461	-147096775389	-130788696176
2022	-232124605572	-216824975960	-200267590804	-182591584119	-165341812898	-147980293623
2023	-252970647147	-237179135112	-220114696008	-202046016877	-184277273255	-166395074303
2024	-274016879930	-258089725069	-240522597506	-221939148829	-203791223440	-185392608297
2025	-295197382570	-279152381981	-261451037267	-242356787137	-223702481388	-204931721724

5.3 The analysis of influence of extending retirement on the gap of endowment insurance fund

Through the calculation of pension's gap of men and women, we can see that no matter for men or women, the gap of the pension is clearly diminishing when extending retirement. With the growth of extending years, the gap between revenue and expenditure is gradually widening. Considering the gender differences, women's pension gap is larger than men's. Even with the same extending year, the gap is also clear.

VI. CONCLUSION

With the development of society and economy, China's retirement system is not adapted to the economic development. The retirement age (men 60 and women 50) is obviously low. With the increase of average life expectancy, the current retirement system causes great pressure on the expenditure of the endowment insurance fund. Unbalanced payment leads to the gap of the insurance fund. Therefore, our country put forward at the Third Plenum of the 18th CPC Central Committee that policies will be stipulated for gradually suspending the retirement age of employees.

It can be known from the findings in this paper that expenditure pressure for women is much higher than men since women retire earlier than men. When women extend the same years with men, the pension for them still fails to make ends meet. Therefore, if we want to extend retirement age, women should be firstly considered and their retirement age should be gradually the same as men. This paper introduces the seniority pay, considering that with the growth of age and work proficiency, people's pay tends to positively correlate with seniority under the same economic development level. The extending retirement system mainly affects those who are going to retire, the average pay of whom is higher than the social level, so using the data of social level as the revenue base will often lower than the actual one. In this paper, based on study of relationship between seniority and wage, we find that the extending retirement has a significant impact on increasing revenue, reducing expenditure and relieving the gap crisis of the endowment insurance fund.

However, to make the extending retirement policy, it is also necessary to take into full account its negative effect on employment and society's level of acceptance on the years of extending retirement. For those whose situation does really not meet the requirement, differentiated retirement system should also be made. In the process of making the policy, it is essential to think about people's acceptance and make the schemes and policies scientifically and reasonably, while meeting the social interests and needs.

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