Research on Utility Evaluation and Optimization of the Third Pillar Pension in Multi-level Pension Security for Employees in New Business Forms

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Abstract

Against the backdrop of uneven pressure on the three-pillar pension system and a mismatch between pension funds and the demographic structure, a large number of employees in new forms of employment remain outside the pension security system, facing relatively high pension risks. Due to their high job mobility, weak long-term planning ability, and large income fluctuations, on the basis of maintaining the balance of the three-pillar pension system, individual pension schemes may become a breakthrough point for improving the pension situation of employees in new forms of employment.In line with the national goal of building a multi-level and multi-pillar old-age insurance system, to study the supplementary role of the third-pillar individual pension policy for employees in new forms of employment, this article constructs an evaluation system using the analytic hierarchy process and designs a questionnaire. After conducting a questionnaire survey in six cities in Shandong Province, the collected data are analyzed. It is found that the short-term effect of the current policy is that residents' awareness of pension issues is gradually improving, and the participation rate is increasing, but the behavior is short-term, and residents generally tend to avoid pension risks. Therefore, regarding the deepening of the individual pension system, the article puts forward three suggestions: (1) Conduct comprehensive publicity through multiple channels and with emphasis on key points; (2) Enhance the system's attractiveness according to the characteristics of the target population; (3) Improve the public's awareness of pension planning and financial literacy; (4) Strengthen the connection and transformation among different pillars of the pension system.

Keywords: New Business Format, Personal Pension System, Analytic Hierarchy Process, Policy Optimization

Competing interests:
The authors declare that there is no conflict of interest

1. Introduction

With the rapid development of the Internet and the platform economy, the scale of employees in new forms of business has expanded rapidly. Currently, there are 84 million employees in new forms of business in China, accounting for 21% of the total number of employees, with an average annual growth rate of 9%. New forms of business are characterized by point-to-point operations, mobility, and platformization. It is difficult for this group to participate in the first and second pillars of the old-age insurance system, making them fall through the cracks of the current labor laws and social security policies. At the same time, this group has strong job mobility, weak long-term planning ability, large income fluctuations, and frequent occupational injuries. The flexible and non-standardized employment characteristics of this group create significant tension with the current old-age insurance system, resulting in a relatively high old-age risk. Given the weakening support of the first pillar and the insufficient coverage of the second pillar, if we want to alleviate the old-age problems of employees in new forms of business and further address issues such as the large economic burden of social old-age support, developing the third pillar to share the old-age support pressure may become the main approach.

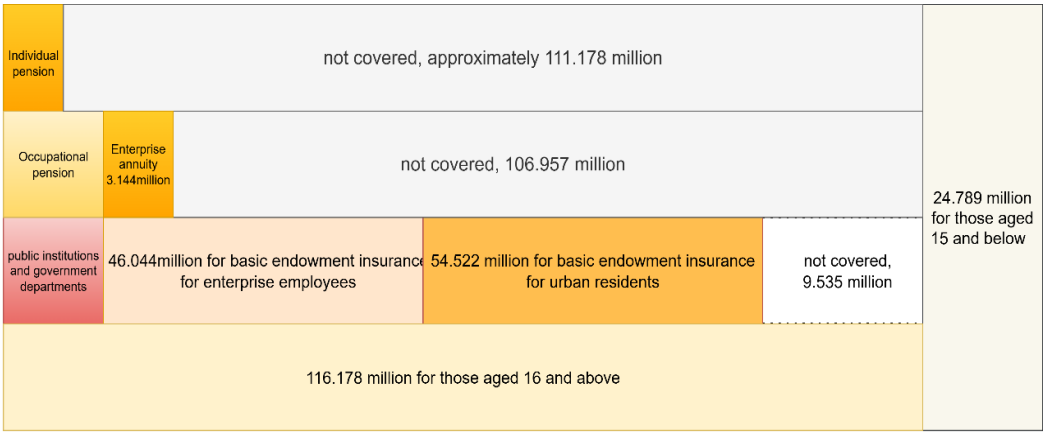

Figure 1-1: Relationship and Coverage of China's Three Pillars of Pension

Source: Ministry of Human Resources and Social Security, Ministry of Civil Affairs, Wind, Ping An Securities Research Institute

It has been nearly two years since November 2022 when the state officially launched the pilot program of personal pensions in 36 regions across the country until December 15, 2024, when it was fully implemented. However, the pilot situation and implementation effects of the personal pension policy still need to be investigated, studied, and empirically analyzed. Based on this, this article compares the development of the third - pillar pension systems at home and

abroad, conducts on - the - spot research in six cities of Jinan, Qingdao, Yantai, Dongying, Jining, and Weifang in Shandong Province, evaluates the implementation effects of the personal pension policy through the analytic hierarchy process, and puts forward optimization suggestions according to the current situation, with the aim of deepening the policy implementation and achieving the national goal of building a multi - level and multi - pillar old - age insurance system.

2. Literature Review

With the vigorous development of new economic forms such as the Internet economy and platform economy, the scale of the new - format flexible employment group relying on Internet platforms for employment has gradually expanded, and their old - age security issues have gradually attracted the attention of scholars at home and abroad. Some scholars mentioned the old - age security dilemmas of employees in the new formats in their research. From the perspective of the social insurance system, Liu Ping (2022) believes that China's current employee pension insurance and enterprise annuity are designed and implemented for regular employment with labor contracts and high stability. However, the employment of employees in the new formats is highly flexible and decentralized in terms of time and space, which has an impact on the original social endowment insurance system. From the perspective of the difficulties in participating in social insurance, Shi Wenkai and Dong Keyong (2023) believe that practitioners in the new formats may be unable to participate in occupational pension insurance due to household registration restrictions. Moreover, the annual payment base for flexible employees to participate in insurance is as high as 10,000 yuan, which imposes a relatively large burden, resulting in low willingness to participate in insurance. Due to unstable income, there have also been cases of "insurance suspension".

Some foreign scholars have also mentioned that flexible employees face pension problems. McWilliams (2019) pointed out that the group of cartoonists among the "gig economy" practitioners in the United States lack benefits such as insurance and retirement funds, which brings them a sense of insecurity. Herry (2021) mentioned that self - employed and flexible workers in the UK experience significant income fluctuations and face a relatively low level of social insurance.

It can be seen that the basic endowment insurance of the first and second pillars provides limited pension protection for employees in new forms of employment. This group has difficulty

benefiting from social endowment insurance due to issues related to labor relations and income fluctuations. Xuan Beibei (2023) believes that for practitioners, exclusive commercial endowment insurance can achieve "longevity risk protection + long - term savings". Provided by commercial insurance companies, it allows for diverse choices according to one's own situation. It has flexible payment methods and differentiated charging standards, with relatively low age and income thresholds for insurance application, offering new ideas for this group to apply for insurance.It can be seen that the third - pillar pension plays a positive role in supplementing the social endowment insurance for employees in new forms of business. Currently, the exclusive commercial endowment insurance has enabled many flexible employees to participate. However, the individual pension system, which has been in place for over a year, is still in the exploration stage, with a low participation rate and facing institutional dilemmas. Qi Chuanjun (2024) believes that the tax incentives of the individual pension system target high - income groups. Moreover, during the economic transformation, people think that saving for individual pensions weakens normal consumption levels. Low - income earners prefer short - term savings and have a weak awareness of pension savings. Optimizing the individual pension system to provide targeted protection for different population segments can improve the quality of pension security for employees in new forms of business.

3. Research and Analysis

3.1 Research Approach

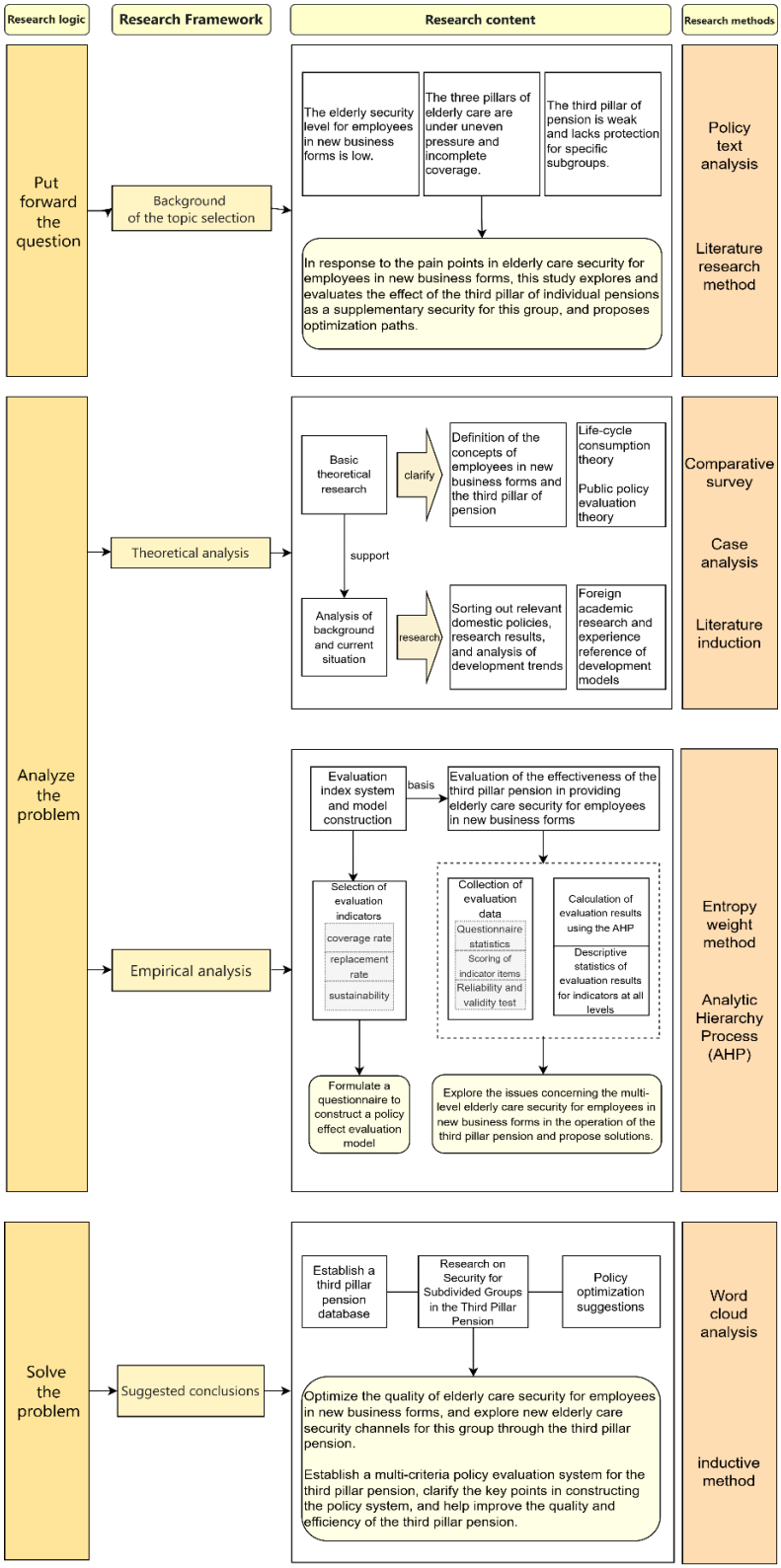

Figure 3-1 Research Idea Diagram

3.2 Research and Analysis

This research uses the Analytic Hierarchy Process (AHP) to construct an index evaluation system. It analyzes the data obtained from the questionnaires in two pilot cities, Qingdao and Dongying (during the survey period, these two cities were in the pilot phase, and among the six cities selected for the survey, only Qingdao and Dongying were pilot cities), and evaluates the effectiveness of the third - pillar personal pension in providing old - age security for employees in new forms of business.

3.2.1 Evaluation Indicator System

(1) Construction of the evaluation indicator system

Based on the principles of hierarchy, systematicness, operability, combination of quantitative and qualitative methods, and scientificity, and taking into account the group characteristics of new - format employees, such as high mobility, unstable income, and relatively high occupational risks, as well as the actual needs of the third - pillar personal pension in terms of policy adaptability and targeted protection, the team ensured that the indicator system could accurately reflect the actual role of the third pillar in the pension security of this group. The evaluation indicator system was constructed as shown in Figure 3 - 1.

Table 3-1.

Evaluation indicator system

Table 3-1

Target layer	Criterion layer	Indicator layer
Utility evaluation of the third - pillar pension in the multi - level pension security of new - format employees A	Coverage rate B1	Legal coverage degree C1
		Awareness level of policies among new - format employees C2
		Payment incentive mechanism C3
		Growth rate of the number of insured persons C4
	Replacement rate B2	Return on FDI C5
		Contribution years of account holders C6
		Contribution level of account holders C7
		Security coefficient of the third - pillar pension C8
	Sustainability B3	Completeness of the legal system C9
		Risk - aversion ability of new - format employees C10
		Financial status of the third - pillar endowment insurance fund C11
		Convenience of endowment insurance transfer and continuation for new - format employees C12

Target layer	Criterion layer	Indicator layer
		Contribution years of new - format employees C13

(2) Determination of evaluation index weights

① Single hierarchical sorting and consistency check

During single hierarchical sorting, it is necessary to sort the importance of each indicator at the same level relative to a certain indicator at the previous level. The sum - product method is used to judge the weights of single hierarchical sorting.

To avoid the phenomenon of logical contradictions in scoring and make the results of the judgment matrix more scientific and reasonable, a consistency check is required. Calculate the maximum eigenvalue, consistency index respectively, obtain the random consistency index from the table, and calculate the consistency ratio CR.

Calculate all judgment matrices and check their consistency. The results are shown in Table 3-2, which meet the consistency ratio CR and all pass the consistency check.

Table 3-2.

Consistency check table for each judgment matrix

Table 3-2

Judgment matrix	Maximum eigenvalue λmax	Consistency index CI	Random consistency index RI	Consistency ratio CR	Consistency check
A-B	4.171	0.057	0.882	0.065	Passed
B1-C	4.051	0.017	0.882	0.019	Passed
B2-C	4	0	0.882	0	Passed
B3-C	5.227	0.057	1.11	0.051	Passed

Based on the above results, conduct single hierarchical sorting on the effect evaluation index system of the third - pillar pension, and obtain the single sorting of the weights of indicators at each level. The results are shown in Table 3 - 2.

Table 3-3.

Weight of single level sorting for each judgment matrix

Table 3-3

Judgment Matrix	Single Level Sorting Weight		
A-B	B1	B2	B3
	0.633	0.192	0.175

Judgment Matrix	Single Level Sorting Weight				
B1-C	C1	C2	C3	C4	-
	0.233	0.085	0.14	0.542	
B2-C	C5	C6	C7	C8	-
	0.167	0.333	0.333	0.167	
B3-C	C9	C10	C11	C12	C13
	0.26	0.051	0.125	0.112	0.451

②Total Hierarchy Ranking and Consistency Check

By calculating the results of the single hierarchy ranking, the total hierarchy ranking is obtained, which reflects the relative importance of all indicators at a certain level compared with the evaluation target. The results are shown in Table 3-4.

Table 3-4.

Total hierarchy ranking weights

Table 3-4

A	B1 0.633	B2 0.192	B3 0.175	Total Hierarchy Ranking Weights
C1	0.233	-	-	0.147
C2	0.085	-	-	0.054
C3	0.14	-	-	0.089
C4	0.542	-	-	0.343
C5	-	0.167	-	0.032
C6	-	0.333	-	0.064
C7	-	0.333	-	0.064
C8	-	0.167	-	0.032
C9	-	-	0.26	0.046
C10	-	-	0.051	0.009
C11	-	-	0.125	0.022
C12	-	-	0.112	0.02
C13	-	-	0.451	0.079

The total ranking weight of the hierarchy is 1. Consistency check for the total ranking of the hierarchy:

$$\text{Total CI} = \sum(\text{Weights of the criterion layer} \times \text{CI}_k)$$

$$\text{Total CR} = \text{Total CI} / \text{Total RI}$$

Therefore, the total ranking of the hierarchy passes the consistency check. The weights of each indicator are presented in Table 3-4.

Therefore, the evaluation index system constructed by the team is reliable, stable, and internally consistent.

3.2.2 Analysis of Evaluation Indicators

(1) Data preparation and standardization

Data source: Based on the results of the questionnaire survey, extract the data of 13 indicators (C1 - C13) in the indicator system for each city.

Data standardization: Uniformly convert both positive and negative indicators into scores ranging from 0 to 1.

Positive indicators: Standardized value = (Actual value - Minimum value) / (Maximum value - Minimum value)

Negative indicators: Standardized value = (Maximum value - Actual value) / (Maximum value - Minimum value)

(2) Scoring using evaluation indicators

① Overview of scoring criteria

Evaluate the effectiveness of the third - pillar pension in the old - age security system for employees in new business forms according to their characteristics.This scoring data is derived from survey questionnaires (all respondents are employees in new business forms) and publicly available government data (such as the number of insured persons and the implementation of tax incentives), mainly covering the two pilot cities of Dongying and Qingdao.

The scoring range is from 0 to 1, using the segmented assignment method:

0.8 - 1.0: The policy yields significant results and is strongly supported by data (e.g., the insurance participation rate is 70% or higher, the awareness rate is 80% or higher);

0.5 - 0.79: The policy is partially effective, but there is room for improvement (e.g., the insurance participation rate ranges from 40% to 69%);

0 - 0.49: The policy has insufficient effects or the data is lacking (e.g., the insurance participation rate is less than 40%, with concentrated negative feedback).

② Scoring operations

Table 3-5.

Scoring operations and scores for each indicator

Table 3-5

Indicator	Scoring basis	Score for Dongying(D) Qingdao(Q)
C1	Calculate the participation rate of flexible - employed individuals: Score = Number of actual participants / Number of eligible individuals	D：0.65 Q：0.68
C2	Calculate the proportion of affirmative responses to the question "Do you know about personal pensions?" in the statistical questionnaire	D：0.55 Q：0.53
C3	Analyze the reasons why respondents choose to participate in the insurance: - Tax incentive policies (0.2 points per person) - Long - term returns (0.1 points per person) - Others (0.05 points per person) Score = Total score / Maximum possible score	D：0.60 Q：0.62
C4	Compare the growth rate of the number of participants in the new forms of employment from 2022 to 2023: Score = Actual growth rate / Target growth rate (10%)	D：0.50 Q：0.55
C5	Score for "Satisfaction with returns" in the questionnaire (Convert 1 - 5 points to 0 - 1 points)	D：0.45 Q：0.43
C6	Calculate the median of the planned contribution years: ≥20 years = 0.8 points, 10 - 19 years = 0.5 points, <10 years = 0.3 points	D：0.58 Q：0.60
C7	Ratio of monthly contribution amount to income: ≥5% = 0.7 points, 2% - 4.9% = 0.4 points, <2% = 0.2 points	D：0.40 Q：0.38
C8	Calculate the replacement rate of the third - pillar pension: Score = Actual replacement rate / Target replacement rate (20%)	D：0.35 Q：0.32
C9	Evaluate the adaptability of policies to the new forms of employment: - Exclusive clauses (+0.3 points) - Withdrawal flexibility (+0.2 points) - Dispute resolution mechanism (+0.1 points)	D：0.70 Q：0.72
C10	Calculate the proportion of "Conservative" in investment preferences:	D：0.62 Q：0.65

Indicator	Scoring basis	Score for Dongying(D) Qingdao(Q)
C11	≥70% = 0.8 points, 50% - 69% = 0.6 points Calculate the ratio of fund balance to the number of participants: Score = Actual value / National average level	D：0.50 Q：0.48
C12	Score for "Satisfaction with the transfer process" in the questionnaire (Convert 1 - 5 points to 0 - 1 points)	D：0.30 Q：0.28
C13	Same as C6, but only calculate the data of the new forms of employment group.	D：0.55 D：0.57

(3) Calculate the comprehensive score

The formula for calculating the scores of each city:

$$\text{Total score} = \sum(\text{Weight of the criterion layer} \times \sum(\text{Weight of the indicator} \times \text{Standardized value}))$$

① Qingdao City

Score of B1 = 0.633 × (0.68 × 0.233 + 0.53 × 0.085 + 0.62 × 0.14 + 0.55 × 0.542) = 0.3725

Score of B2 = 0.192 × (0.43 × 0.167 + 0.60 × 0.333 + 0.38 × 0.333 + 0.32 × 0.167) = 0.0866

Score of B3 = 0.175 × (0.72 × 0.26 + 0.65 × 0.051 + 0.48 × 0.125 + 0.28 × 0.112 + 0.57 × 0.451) = 0.0995

Total score = 0.372 + 0.0866 + 0.0995 = 0.5586

② Dongying City

Score of B1 = 0.633 × (0.65 × 0.233 + 0.55 × 0.085 + 0.60 × 0.14 + 0.50 × 0.542) = 0.3502

Score of B2 = 0.192 × (0.45 × 0.167 + 0.58 × 0.333 + 0.40 × 0.333 + 0.35 × 0.167) = 0.0882

Score of B3 = 0.175 × (0.70 × 0.26 + 0.62 × 0.051 + 0.50 × 0.125 + 0.30 × 0.112 + 0.55 × 0.451) = 0.0975

Total score = 0.3502 + 0.0882 + 0.0975 = 0.5359

(4) Analysis of the evaluation results

① Score comparison

In terms of the total score, Qingdao City is higher than Dongying City. The main differences are reflected in the coverage rate (B1) and sustainability (B3), while the gap in the substitution rate (B2) is relatively small.In terms of the criteria layer:

Coverage rate (B1): Qingdao has more comprehensive legal coverage, better incentive mechanisms, and a faster growth rate of the insured population. Dongying has a higher level of policy awareness and greater publicity efforts.

Replacement rate (B2): Dongying offers higher benefits and contributions and better security. Qingdao has a better payment period.

Sustainability (B3): Qingdao has a complete legal system, better risk control, and a longer payment period. Dongying has a good fund financial situation, which is conducive to sustainability.

(2) Score analysis

① Initial achievements

Preliminary formation of policy awareness: The policy awareness (C2) in both places exceeds 0.5 points, indicating that the publicity has reached some new - format industry groups. However, information acquisition mainly relies on non - official channels, and the direct publicity effect of the government is limited.Increasing participation rate but short - term behavior: The planned contribution periods (C6, C13) in the two regions are generally less than 20 years, reflecting that practitioners in the new forms of business lack confidence in long - term pension planning and pay more attention to short - term income.

Obvious risk - aversion tendency: The risk preference (C10) scores in both regions exceed 0.6, indicating that the new - format groups generally choose conservative investments.

② Changes in short - term behavior

Qingdao: The relatively good legal coverage (C1 = 0.68) gives some flexible employees confidence to participate in the insurance, but the low contribution level (C7 = 0.38) shows that the actual investment is limited.

Dongying: The slightly higher replacement rate (B2 = 0.0882) is due to the participation of some high - income practitioners. However, the inconvenient transfer and continuation (C12 = 0.30) restrains the participation of cross - regional mobile workers in the insurance.(3) Analysis of the potential impact on the personal pensions of employees in new forms of business and the

reasons

In terms of positive impacts: The policy framework has been initially established. The legal system completeness (C9) in the two regions scored relatively high, laying a foundation for subsequent policy optimization. Employees in new forms of business have a relatively strong risk awareness. Their conservative investment preferences (C10) indicate that they have more trust in savings and attach great importance to it. However, due to the characteristics of their occupations, they also focus on the flexibility of funds. Therefore, products with higher returns and relatively flexible payment methods are needed to meet their needs.

There are also limitations: The replacement rate is seriously insufficient. The third - pillar security coefficients (C8) in the two regions are both lower than 0.35, far from being able to make up for the gap in the first pillar. The stickiness of participating in the insurance is weak. The short payment period and high interruption rate (C13) reflect that the current system still does not match the volatile characteristics of employment in new forms of business.Behind the performance differences between the two places also reflects that the implementation effect of the third - pillar pension for employees in new forms of business is affected by the nature of the city. As a coastal open city, Qingdao has a large number of employees in new forms of business with high flexibility. However, due to the mismatch between policies and characteristics, the initial deposit amount is small but the potential is great. In Dongying, the traditional economy dominates, and the scale of new forms of business is relatively small. The difficulty of policy promotion is low, but the depth is insufficient. Affected by the nature of the main employers in the city, it is more deeply connected with the basic endowment insurance, and its role in sharing the burden is more obvious. Finally, practitioners in new forms of business generally have the common problem of "emphasizing immediate income and neglecting long - term planning", which also puts forward higher and more urgent requirements for the incentives of the current system and effective means for long - term participation.(4) Evaluation

The coverage of the new - format employees by the third - pillar pension has shown initial results, but the protection effect remains limited. Long - term follow - up surveys are needed to obtain time - series data. It is necessary to optimize the system according to the characteristics of this group, such as "unstable income and high occupational mobility". The differences among different cities indicate that areas with diverse economic structures need to strengthen policy

flexibility, while cities with relatively conservative traditional economic structures need to improve policy penetration.

4. Conclusions and Policy Recommendations

4.1 Conclusions

The research finds that although the third - pillar pension theoretically has the advantage of flexible adaptation in the old - age security of employees in the new forms of business, its actual effectiveness has not been fully realized. There are problems of insufficient universality and precision in the security of segmented groups, such as "high enthusiasm for account opening but low enthusiasm for deposit and payment", insufficient replacement rate, short and volatile payment plans, and inadequate publicity of the system at the grassroots level. At the same time, old - age security is a long - term activity. Therefore, both the popularity rate and the speed of popularization of the individual pension system are crucial in the initial stage of its implementation. On this basis, it is even more necessary to establish the public's awareness of old - age security and improve their acceptance and discrimination ability regarding pension products.

4.2 Policy Optimization Suggestions

4.2.1. On the basis of comprehensive publicity, focus on segmented groups and deepen the publicity work of the third - pillar pension.

In terms of the development of the insurance industry, insurance marketing remains the most penetrative and personalized promotion model. Therefore, within the scope of its financial capacity, the government can provide partial financial subsidies for the marketing commissions of personal pension insurance products, and cooperate with the internal measures of insurance companies to effectively realize the value of insurance agents through incentive - compatible strategies. At the same time, the government should also conduct investigations and research on the real and expected pension needs of people of different age groups, and introduce targeted promotion plans with different focuses. Only by taking "meeting the needs of the masses as closely as possible" as the promotion standard can the expected goal of "naturally integrating into the lives of the masses" be achieved.

4.2.2 Tailored to the characteristics of the target population, on the basis of maintaining the balance of the three - pillar pension system, enhance the attractiveness of the third - pillar personal pension to employees in new forms of business.

To promote "self-supported" elderly care through the individual pension system and enhance the system's attractiveness, the third-pillar pension should be optimized according to the work characteristics of employees in new forms of business. Strategies such as increasing the contribution limit, reducing administrative expenses, making the time rules more flexible, and setting up emergency withdrawal of funds can be adopted to appropriately improve the collection of individual pensions for this group, in response to their high rate of contribution suspension and large fluctuations in contributions. This will better meet the needs of employees in new forms of business and achieve in-depth promotion of individual pensions.

4.2.3. The government should provide guidance and cooperate with market operations to comprehensively upgrade financial education and consulting services, and improve the public's awareness of elderly care and financial literacy.

The government encourages financial institutions such as banks, insurance companies, and fund companies to provide a rich variety of high - quality pension financial products. At the same time, they should offer more convenient and accessible professional information services such as pension consultation and pension planning to enhance the public's awareness of pension and financial literacy. Based on the actual needs of employees in new business forms, financial institutions should assist them in making more suitable product choices. In addition, during the pension contribution and holding period, value - added services such as medical and pension consultation and green lanes should be provided to encourage long - term contributions and improve customer stickiness.

4.2.4. Enhance the flexibility of the system and strengthen the connection and transformation between different pillars of the pension system

The individual pension system should reduce insurance purchase restrictions. Compared with being bundled with the first pillar, the third - pillar individual pension can be developed as an independent supplementary type for insured persons under certain conditions, and the pillars can be connected by making up for deficiencies. At the same time, the individual pension strength of the beneficiaries of the second - pillar endowment insurance is relatively sufficient. In the development of the individual pension system, by promoting the transformation of the beneficiaries of the second pillar to the third pillar, the pension resources can be balanced and the popularization of the third - pillar pension can be promoted.

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