

# Analysis of Flexible Retirement System Based on Analytic Hierarchy Process Model

## Taking Builders as an Example

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**Abstract**—With the aging population becoming a challenge around the world, China has to make an advanced preparation for the coming aging population. Currently it has made adjustments on the rigidity of legal retirement ages and decided to take to a flexible retirement system. Starting with the definition of flexible retirement system, this article chooses five indices that may affect the system design through the literature research method, including economics, efficiency, applicability, justness and sustainability and builds an Analytic Hierarchy Process (AHP) Model. Then according to the data related to the status quo of builders together with interviews to experts, this article finds problems that should be valued for builders, a special group, while making a system design, and raises several suggestions for improvement upon the allocation of macro-social security institutions and the status quo of micro-laborers.

**Keywords**—flexible retirement system; architecture; analytic hierarchy process; encouragement system

### I. INTRODUCTION

In face of the discordance between retirement ages and the expected average lifetime, rigid retirement system, gap of pension as well as the disappearance of demographic dividend and so on, it has been a must for China to postpone the retirement. Under the background where the whole system needs to be transited, the system design has been much more important, how to achieve the optimal combination between the postponed retirement and the protection of laborers' benefits is what the decision makers should value. As an intermediate method, the flexible retirement system has advantages of its own. Scholar Li Xiaohui (2014) raised to carry out the flexible retirement system and the retirement range shall be formed as per the differences in the trade, profession, individual physical conditions as well as willingness, which will enable laborers to re-invest the human capital, compared with the retirement age extension, it relieves the dilemma to some degree, achieving a dynamic balance of all parties concerned.

In this article, the flexible retirement system is defined as a retirement age range confirmed by policy makers, where workers may freely choose the retirement ages and corresponding retirement income, according to the different demands varying with the people, a flexible range can be

selected. The labor market in the country is rather special and the laborers offering physical strength are in a large proportion; for the relation between the flexible retirement system design assessment and relevant attributes is more than a linear one, so the article adopts the analytic hierarchy process (AHP) to analyze builders, a specific group, which can be used as a theoretical reference to the current research on the flexible retirement system.

### II. SELECTION OF INDICES FOR ASSESSMENT THROUGH THE AHP MODEL

According to the references that are referred to in a wide range, the selections that scholars at home and abroad make on policy indices are in a diverse trend. And it has taken a long period for western scholars to determine standards for the policy assessment. In the late 1970s, Borst raised seven standards for the policy assessment making a significant sense in his works *Public Project Analysis: Application Methods*: effect, efficiency, adequacy, propriety, justness, response and execution. Chen Zhenming (1998), a domestic scholar proposed five assessment standards namely productivity, benefit, efficiency, justness response to policies; and Ning Sao (2003) offered seven standards namely policy efficiency, policy benefit, impact, response, development of social productivity, social justice, and sustainable development.

For the flexible retirement policy is a new attempt born out of the current retirement policy, so it is special to some degree, however, it is still necessary to follow the standards designed for the public policies and the policy design shall be covered as possible as it can. In this article five indices are taken as level I indices including economics, efficiency, applicability, justness and sustainability, which are expected to create a pre-assessment system for the policy design.

#### A. Economics

The index Economics means whether the public resources needed are securable while designing a flexible retirement system and how hard it is to get them. It consists of design cost and operating cost, of which, the design cost is a sum of the costs that a series of assessments need in the early stage for the policy implementation and we will make a questionnaire and population census in a large scope to see if the policy will go

well; the operating cost is an expenditure that it needs to access to public resources after the policies are implemented and to assess the consumption of resources caused by the policies so as to weigh whether it is rational between the social prices and the long term benefits.

*B. Efficiency*

Efficiency corresponds to the proportion between yield and investment after the flexible retirement starts. In order to make a policy get high efficiency in the implementation, the pre-preparation and mass base are main points and share the same system framework with other policies in harmony. So the efficiency acts as a key role in the system assessment, determining whether a policy will work after being issued.

*C. Applicability*

The index Applicability means that the system design and relevant policies exist in the same system where they are correlated and mutually inclusive, rather than fragmented or discordant. It has sub-indices: first, pooling rationality, which shall be valued while designing the pension system, currently the pension system in our country takes on a "segmentation" phenomenon and the low pooling causes a low flow of people; second, policy stability, this factor determines that the trust authorities can get from the people and the overall recognition on the policy as a whole; third, policy consistency, any policy has the ways it goes, which cannot go along, and it must be closely related other policies, so it needs to understand the policies overall and avoid policy conflicts or from being separated.

*D. Justness*

The assessment of public policies must be kept just, which is a redistribution of social benefits for the retirement system, where a large number of stakeholders are involved, so the public policies must be a reflection of interests of the mainstream in the society so as to get supported in the implementation. The justness of a flexible retirement system design is embodied in the just participation in the social security, meeting demands and the people's involvement in policies. The purpose of the public policy design is to bring welfare to as may as people in support of the "Pareto Improvement".

*E. Sustainability*

Sustainability means a system is dynamic and adaptable to the changing time. And policy makers are required to have a long-term vision, being only satisfied at current interests but having no any level of planning will not only cause a waste of public resources, but also lead to the distrust of the people on the governments. An energetic system must be flexible while keeping its stability, in order to make it continue, it needs to establish an effective supervision mechanism, otherwise a rigid system in lack of supervision will have no other result but rejection, so the factor shall be valued as well.

III. DATA ANALYSIS

*A. Introduction to Builders*

The acceleration of urbanization rate in China indicates an arrival of an employment boom in the construction industry, so it is extremely important to design a pension system for the builders.

Currently a majority of urban builders receive junior high school education, who own low labor skills, mainly providing physical labor and starting to work early and with a long work period compared with brain workers. Researches show the prime working age for the construction is between 25-50 years old, where laborers have the best physical conditions and good health, yet their physical functions will weaken after 45 years old, though the workers' life increase, yet it cannot make up the physical injuries suffered from the labor relations.

The sixth census (2010) shows, the energetic builders have ages of mainly 35-44, which are universal. However, it is remarkable that the builders aged 55 or more as shown in "Fig. 1" occupy 7.5% of the total in that year, indicating that some of builders, even getting no obvious incentives, will still continue their jobs.

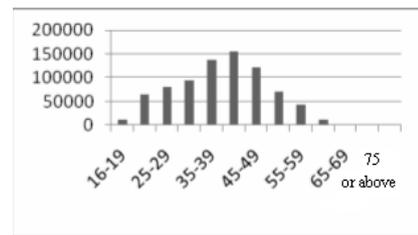


Fig. 1. Age distribution of builders<sup>1</sup>

Seen from the income, in 2014, the builders' average monthly wage was 3,817 yuan only, 5,140 yuan for those working in the mining industry, 9,023 yuan and 6,855 yuan respectively for those in finance and scientific research and technical service. It is estimated that in 2010 the average monthly wage of urban builders totaled 2,294.08 yuan, which though was a little higher than "consumption + family maintenance + social insurance contributions" totaling 1,805.55 yuan, yet the builders are found to have a low saving under the current social security contributions, accounting for 21% of the total income. With the growth of age and the declination in physical strength, the physical workers will have low contributions together with the savings reduced, as a result of it; the macroeconomic development will be influenced to some degree.

*B. Introduction to Social Security in China*

The pension gap in current stage is in an increasing trend, besides, the workers' retirement ages are low under the existing retirement system, correspondingly the period to receive the pension is extended, which produces a negative effect for narrowing the hidden debts, when it goes as such for a long

<sup>1</sup>Data source: China Economic and Social Development Statistics Database.

time, the pension insurance fund will be beyond its income and difficult to last.

TABLE I. INCOME AND BALANCE OF SOCIAL PENSION INSURANCE FUND (UNIT: 100M YUAN)<sup>2</sup>

| Year                      | Basic Endowment Insurance |
|---------------------------|---------------------------|
| Fund Income 2014          | 27619.9                   |
| Fund Expenditure 2014     | 23325.8                   |
| Balance Accumulation 2010 | 15787.8                   |
| 2011                      | 20727.8                   |
| 2012                      | 26243.5                   |
| 2013                      | 31274.8                   |
| 2014                      | 35644.5                   |

The balance accumulation of endowment insurance fund rose a little from 2010 to 2014, but the gap between the receipts and the transfer was gradually narrowed with the increase rate slowed down. In the meantime, the situations among provinces are not optimistic, for example, the basic endowment insurance fund income was less than the expenditure and the endowment insurance system was difficult to continue. It is estimated that

if the current retirement age is maintained, the basic endowment insurance gap will reach 557.554 billion yuan by 2050, accounting for 1/5 of the endowment insurance income in 2050.

In the meantime, it's a fact that the social security agencies in China increased from 4,784 in 2000 to 8,411 in 2012, severe problems still could be found: first, the gap between social security workers and performances was large, and the social insurance service quality was restricted; second, the social security fund was in a low amount and the implementation of social insurance was in a low-end state, all of which will be barriers for the design of new systems, having an impact on the resources allocation efficiency and policy implementation efficiency, so it shall be considered when designing the hierarchy weight.

IV. ESTABLISHMENT OF A FLEXIBLE RETIREMENT SYSTEM ASSESSMENT

With the preliminary preparation completed, it needs to clearly define the nature and purpose of the problem and select corresponding indices to create the following analytic hierarchy process (AHH) model.

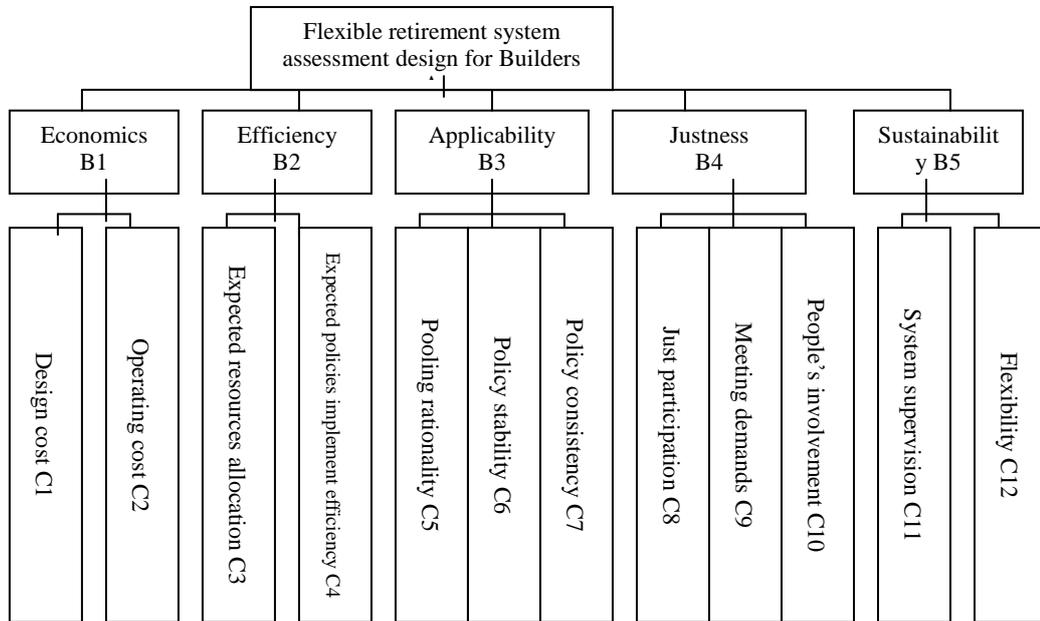


TABLE II. DESIGN AND ASSESSMENT OF LEVEL ANALYSIS MODELS OF FLEXIBLE RETIREMENT SYSTEM OF WORKER IN CONSTRUCTION INDUSTRY

Assignments are needed for each index before calculation via the model. The subjective weighting method is adopted in this article, according to the meaning of the indices and relevant data analysis, seven experts from different colleges are invited for one-by-one interviews, who will rate impersonally on the basis of theoretical experience of their own. After integration of the weights, they will classify the weights on the experts' professional qualifications according to titles and works, then calculate the weights of the indices by the weighted average method to get the single hierarchy permutation of level indices.

TABLE III. SINGLE HIERARCHY PERMUTATION FOR ASSESSMENT OF FLEXIBLE RETIREMENT SYSTEM DESIGN

| A  | B1 | B2  | B3  | B4  | B5  | $W_i$ |
|----|----|-----|-----|-----|-----|-------|
| B1 | 1  | 1/3 | 1/5 | 1/3 | 1/5 | 0.452 |
| B2 | 3  | 1   | 1/3 | 1/3 | 1/5 | 0.263 |
| B3 | 5  | 3   | 1   | 1   | 1/3 | 0.111 |
| B4 | 3  | 3   | 1   | 1   | 1/3 | 0.123 |
| B5 | 5  | 5   | 3   | 3   | 1   | 0.052 |

<sup>2</sup> Data source: China Statistics Yearbook 2015.

The numbers 1,3,5 in "Table III" represent the importance of indices in rows vs that in lines, the greater the number is, the greater the importance it represents is. And their reciprocals correspond to the importance of the latter vs the former.  $B_{12} = 3$  represents the economics (B1) index is slightly important vs the efficiency (B2) index;  $B_{31} = 1/5$  represents the economics (B1) index is more important than the applicability (B3) index. For there are more for comparison in pairs, in order to solve the problem, the AHP method needs some calculations to help decision makers to understand the importance of the indices vs the previous-level indices: first, calculate the maximum eigenvalue  $\lambda_{max}$ , if it is to judge whether the matrix B is consistent, it needs to confirm  $CR = \frac{CI}{RI} < 0.1$ . If this requirement is met, the consistency of the judgment matrix is considered passed, otherwise, the judgment matrix needs to be readjusted.

Use Yaahp software to calculate and get the maximum eigenvalue  $\lambda_{max}$  and the permutation weight vector  $W_i$  of the judgment matrix, then calculate the consistency of indices to test the consistency of the single hierarchy permutation matrix, which is not discussed here due to the limited contents. Finally all the hierarchy permutations pass the test, which proves that under the AHP, the rating of experts on the indices of the flexible retirement system meet requirements, and the weight ratio is relatively reasonable and can be taken as reference.

Based on the single hierarchy permutation matrix, we can directly see the weight proportion of each element in factors, calculate the total hierarchy permutation, the size of index weights represent the strength of corresponding programs, according to the permutations of comprehensive weights, get the permutations of the influence on target A by all factors.

TABLE IV. TOTAL HIERARCHY PERMUTATION FOR FLEXIBLE RETIREMENT SYSTEM DESIGN ASSESSMENT

| First hierarchy  | Second hierarchy  |         | Third hierarchy                               |         |
|--|-------------------|---------|---|---------|
|  | Index             | Weights | Index   | Weights |
| Builder-related flexible retirement system design evaluation A | Economics B1      | 0.452   | Design cost C1                                | 0.339   |
|  |                   |         | Operating cost C2                             | 0.113   |
|  | Efficiency B2     | 0.263   | Predicted resource allocation efficiency C3   | 0.066   |
|  |                   |         | Predicted policy implementation efficiency C4 | 0.197   |
|  | Applicability B3  | 0.111   | Pooling rationality C5                        | 0.067   |
|  |                   |         | Policy stability C6                           | 0.022   |
|  |                   |         | Policy consistency C7                         | 0.022   |
|  | Justness B4       | 0.123   | Just for participation C8                     | 0.013   |
|  |                   |         | Meeting demands C9                            | 0.078   |
|  |                   |         | People's involvement in policies C10          | 0.032   |
|  | Sustainability B5 | 0.052   | System supervision C11                        | 0.039   |
|  |                   |         | Flexibility C12                               | 0.013   |

V. CONCLUSION

According to the final weight calculated through the Analytic Hierarchy Process, the importance-based permutation of the factors relative to the flexible retirement system design by experts is: economics > efficiency > justness > applicability > sustainability. Statistical data show the possibility and necessity for the builders to implement the flexible retirement system. Besides, considering the current situations of the social security in the country, the efficiency to implement the flexible retirement system still needs to be improved. Based on the analysis results, this article raises several suggestions for improvement upon the allocation of macro-social security institutions and the status quo of micro-laborers.

A. Reduce the Costs of Policy Transition and Improve the Operation Quality of Social Security Executing Agencies

Seen from the weight results made through the Analytic Hierarchy Process, we can find that according to the experience of experts, the most important consideration to the establishment of a new system is "cost-benefit". If the flexible retirement system contradicts the social development in the future, this impact of the policy on builders will be negative. Only after making adequate investigation and understanding of the operation of the policy, as well as reasonably predicting the possible economic losses caused by the policy, can the flexible retirement system established by policy makers get more workers recognize and be satisfied so as to reduce the barriers during the implementation.

Currently the social insurance service agencies are inadequate in China, in the face of challenges brought by new policies, it is difficult to guarantee the service quality. Therefore, more considerations shall be taken into the coming plans to reform the social insurance service agencies and design rationally and simplify the system process.

B. Perfect the Social Security Workers Training Chains and Supporting Policies Chains

Before the implementation of a new system, first of all, the system performers shall be guaranteed to have a certain professional accomplishment and a deep understanding of the system, which requires internal training on the workers while the flexible retirement system is implemented, besides, relevant theories and policies shall be popularized regularly, and the social security workers shall seem professional when asked about the systems by builders to which practical social security shall be offered.

Moreover, the flexible retirement system is not an isolated one and it must be kept a close consistency with other systems, which is also an important factor for assessment, and relevant researches shall be made for the policy evaluation in early stages so as to increase the policy applicability.

C. Increase the Contribution Capability and Design the Rational Retirement Incentive System

Under the current endowment contribution rates as shown above, the builders have a low savings rate. As the decision makers of the system design, they should effectively guarantee

the institutional basis of the income distribution. With the wage growth ratio guaranteed, they should set up a contribution standard under dynamic adjustments and the payment period will be increased from the current 15 years, which not only can help increase the savings, but also ensure the builders' work period in the labor market.

Meanwhile, set reasonable and effective incentives, for example, increase the pension as per the age postponed, which is executed in the US; or reduce the social security contribution rate in case of delay, as such, the wages of employees will be increased relatively per month, increasing the social welfare, besides, based on it, commitments can be conducted to reduce endowment insurance contribution rates of the workers whose retirements are postponed, reduce the employment costs of enterprises, and encourage the employment of aged people..

#### *D. Strengthen Labor System Supervision and Protect Their Legal Rights and Benefits*

A perfect supervision system should contain internal supervision and external supervision. *Labor Contract Law* and *Social Insurance Law* both give a clear statement to the obligations and rights related to supervisions by labor agencies under the State Council and individuals. The *Architecture Law* also provides that "it is must for construction enterprises to underwrite accident insurances at their costs for workers who are in dangerous operations. However, for most construction patterns are outsourced, labor agencies are unable to make supervision on them, besides, the authorities concerned make little or no punishment on the illegal employment existing, and the construction enterprises pay little attentions, as a result, the rights and benefits of the builders fail to be protected.

For most of the construction workers are farmers who seek jobs in cities, they have no identities as urban residents and been floating frequently. The implementation of new retirement systems will cause new employment contradictions; the authorities are expected to make early preparations and improve the flexible retirement system as early as possible, and strengthen the protection of builders' rights and benefits.

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