KMAN PUBLISHING INSTITUTE
Journal Website

Article history:
Received 05 September 2024
Revised 24 November 2024
Accepted 02 December 2024
Published online 06 December 2024

International Journal of Innovation Management and Organizational Behavior

IN PRESS

E-ISSN: 3041-8992

Explaining and Prioritizing Factors Influencing Retirement Incentives Using a Multi-Criteria Decision-Making Approach

Jafar. Abrishambaf[1], Hassan Ghodrati. Ghazaani[2*], Hossein. Panahian[3], Meysam. Arabzadeh[4], Hossein. Jabari[5]

[1] PhD Student, Department of Industrial-Financial Management, Faculty of Accounting and Management, Kashan Branch, Islamic Azad University, Kashan, Iran
[2] Department of Industrial Management, Kashan Branch, Islamic Azad University, Kashan, Iran
[3] Professor of Financial Management, Faculty of Accounting and Management, Kashan Branch, Islamic Azad University, Kashan, Iran
[4] Assistant Professor, Department of Management, Faculty of Accounting and Management, Kashan Branch, Islamic Azad University, Kashan, Iran
[5] Assistant Professor, Department of Accounting, Faculty of Accounting and Management, Kashan Branch, Islamic Azad University, Kashan, Iran

*** Corresponding author email address**: dr.ghodrati42@gmail.com

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Abrishambaf, J., Ghodrati Ghazaani, H., Panahian, H., Arabzadeh, M., & Jabari, H. (IN PRESS). Explaining and Prioritizing Factors Influencing Retirement Incentives Using a Multi-Criteria Decision-Making Approach. *International Journal of Innovation Management and Organizational Behavior*.
https://doi.org/10.61838/kman.ijimob.5.x.x

A B S T R A C T

Objective: The purpose of the present study is to explain and prioritize factors influencing retirement incentives using a multi-criteria decision-making approach.

Methodology: This research is applied in its aim and relies on a survey design with a descriptive-inductive reasoning approach. Regarding the nature of data and analysis methods, the study is quantitative. For the expert population, the study employed multi-criteria descriptive reasoning with an analytical network process (ANP) using snowball sampling, selecting 21 experts. Furthermore, through multi-criteria decision-making methods, factors influencing social security retirement incentives were identified and subsequently prioritized using fuzzy DEMATEL analysis. The complementary statistical population comprises workers employed in over 600 industrial companies, several service organizations, self-employed individuals subject to social security laws, and government companies, totaling more than 8,200 individuals. Given the extensive population, a minimum of 384 participants was required based on Cochran's formula. In this study, 540 individuals were randomly selected using a computer-simulated method based on social security codes, focusing on their last five years prior to retirement.

Findings: According to the study's findings, retirement incentives include: accrued value, peak payments, and optional value, estimated based on each individual's social security pension and income profile. The dynamic interaction between wage income and retirement benefits may provide more accurate estimates of retirement incentives. The study hypothesizes that due to relatively low levels of social security pensions, workers in the study region are more likely to respond to changes in monthly wage income rather than retirement benefits.

Conclusion: The research findings indicate that for all three criteria, the estimates decrease with age. This trend suggests that retirement costs increase until a specific age and then begin to decline.

Keywords: *Retirement Costs, Aging Period, Retirement Incentives, Social Security*.

1 Introduction

Retirement and aging are distinct phases of human life. Retirement is a phenomenon that has gained increasing importance with the socio-industrial development of the modern era. Over the past century, advancements in socio-economic conditions, healthcare, and medical treatment have led to reduced mortality rates and increased life expectancy, thereby improving the quality of life. As a result, the number of retirees and elderly individuals has risen worldwide, significantly influencing the demographic composition of various countries and enhancing their social significance. In Iran, the retirement age typically ranges between 50 and 65 years. Considering the life expectancy of approximately 69 to 70 years in urban areas and the significant population growth, a relatively large proportion of the population in Iran is in retirement or old age. This proportion is expected to increase at a higher rate in the future (Alavi et al., 2021).

Workers approaching retirement age often face serious concerns about income and livelihood. One of the primary concerns is the insufficiency of social security income and pensions. In many countries, especially developing ones, social security systems are not designed to meet retirees' financial needs, exposing them to serious financial challenges and affecting their economic security. Furthermore, many elderly workers cannot continue working due to health issues or disabilities, reducing their ability to earn an income and increasing psychological stress and concerns (Miglino et al., 2023).

Additionally, socio-economic changes, such as decreased familial support and structural changes in family dynamics, exacerbate retirees' concerns. In the past, children were expected to provide financial support to their elderly parents, but declining fertility rates and changes in family connections have made these support systems less accessible. Consequently, elderly workers may need to manage living expenses, healthcare costs, and daily needs independently, leading to a sense of insecurity and financial stress (Frimmel, 2021).

A review of the literature indicates that if public support for financing retirement is insufficient, older workers may be motivated to remain in the labor market despite reaching retirement age. However, in developing countries like Iran, the labor market is not favorable for higher-paid workers. This creates significant challenges for policies aiming to maintain pension stability and minimize elder poverty (Izadbaksh et al., 2023).

A study conducted by the Organization for Economic Cooperation and Development (2017) revealed that South Korea is one of the countries with the fastest aging population among its peers. With low fertility rates and higher life expectancy, South Korea currently has the fastest aging population among OECD member countries (Doctrinal, 2024).

In 1946, labor law was passed by the Iranian government, requiring employers to establish two funds in every workplace: a health fund and a cooperative fund, in addition to complying with worker insurance laws. In 1949, the Ministry of Labor was officially established, and according to Article 16 of the labor law enacted on June 7, 1949, a "Workers' Cooperative and Insurance Fund" was to be established for treating workers and compensating them for work-related losses. By late 1952, the Workers' Social Insurance Law was enacted, and an independent organization called the "Workers' Social Insurance Organization" was formed, tasked with implementing the benefits specified in the law for insured workers and employees. In April 1963, the Workers' Social Insurance Organization was renamed the "Social Insurance Organization." In 1976, a law was passed to dissolve the Ministry of Welfare and establish the Ministry of Health and Welfare, resulting in the "Social Security Organization" being renamed the "Social Security Fund," with its healthcare commitments transferred to the Ministry of Health and Welfare. However, this change was short-lived, and in 1979, the Social Security Organization was reestablished by a decree of the Revolutionary Council (Asgari et al., 2021; Rezazadeh et al., 2022).

In recent years, the Iranian government has faced numerous challenges due to economic hardships, high inflation, and a growing aging population. To alleviate elder poverty, strengthening public support and social security networks has become essential. The Social Security Organization has also encountered significant financial difficulties, including substantial unpaid government debts and the acquisition of predominantly loss-making companies as compensation for some of these debts. Moreover, with the population pyramid aging at a rapid rate and inflation occasionally exceeding double digits, the resources required to meet its commitments have substantially increased. These issues underscore the need for reforms in the social security system, particularly concerning retirement planning (Raghfar & Akbarbigui, 2015).

Countries like Iran, with income levels below or around the global average, face similar challenges in developing

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E-ISSN: 3041-8992

social security systems, which are expected to worsen in the future. The benefits for workers may not be as sufficient as those in wealthier countries, leading to challenges in elder welfare and labor market structures. If older, higher-paid workers seek to work longer to prepare better for retirement, young job seekers may face reduced employment opportunities in the labor market (Rezazadeh et al., 2022).

In lower-income or middle-income countries, some elderly workers may need to settle for suboptimal jobs, contributing to the high share of self-employment in labor markets. For elderly self-employed workers, who generally have relatively low average incomes, implementing public pensions can be challenging. Furthermore, familial support, once a primary source of retirement financing, has declined in many Asian countries. While cultural factors play a role, the significant drop in fertility rates is a primary reason for this decline in support from children (Patel et al., 2020).

Theoretical studies in this field have been conducted, including the following examples. Rasoulian (2017) concluded that if current conditions persist, the first to fourth groups of retirees, comprising about 90% of retirees, will not have sufficient financial capacity to meet living costs. Timura (2022) highlighted that an integrated system for pension payments and tax collection is one of the most critical lessons from Canada's social security system (Timura, 2022). Khandan (2023) noted that pensions are gradually becoming insufficient to meet living costs, and retirees' livelihoods are influenced by political fluctuations. The Social Security Organization, operating under a pay-as-you-go (PAYG) system, has been significantly impacted by the support ratio and premium income, with pensions showing a positive correlation with minimum wages and a negative relationship with GDP, indicating counter-cyclical and automatic stabilizer properties (Khandan, 2022). Lee et al. (2020) concluded that unequal distribution of pension benefits is a primary driver of income inequality among retirees. Ensuring minimum retirement benefits for all current pensioners could reduce the Gini coefficient by 0.8% for every 1% increase in public retirement expenditures, making it the most financially effective option for reducing income inequality (Li et al., 2020). Jun (2020) found that older wage earners are more satisfied with the benefits of continued work due to additional income and increased retirement benefits rather than financial gains from greater pension wealth. Notably, significant financial transfers from children to parents during retirement underscore the impact of declining fertility rates, which make poverty alleviation and pension stability more challenging (Jun, 2020). Doctrinal (2024) concluded that a higher share of private pensions in retirement income significantly increases inequality. However, overall income inequality among retirees has not necessarily increased for two reasons. First, equal distribution of public pensions in emerging multi-pillar systems and reduced capital income shares in mature multi-pillar systems have partially or entirely offset the increased inequality from private pensions. Second, private pensions have been evenly distributed among retirees in most countries (Doctrinal, 2024).

Based on theoretical and empirical studies conducted globally and in Iran, the present study seeks to answer the following question:

What are the metrics for measuring retirement incentives, and how do the key determinants and metrics of retirement incentives, identified using a multi-criteria decision-making approach, shape expert opinions?

2 Methods and Materials

In this study, the selection of appropriate metrics and the prioritization of certain variables were conducted using a persuasive survey approach involving experts, university professors, and managers from the Social Security Organization. Thus, this part of the research relied on a "survey research design." After identifying the factors influencing the likelihood of social security retirement through knowledge domain analysis and content analysis, a survey design based on expert opinions was employed to select suitable metrics.

For the first statistical population (experts), 21 individuals were selected using snowball sampling to apply multi-criteria descriptive reasoning with an Analytical Network Process (ANP). The study used multi-criteria decision-making methods, as extensively documented in prior research (Bagherian et al., 2019; Asgari et al., 2021), to identify factors influencing social security retirement incentives. These factors were then prioritized using fuzzy DEMATEL analysis.

The supplementary statistical population comprised workers employed in over 600 industrial companies, numerous service organizations, self-employed individuals under social law, and employees of government enterprises, totaling approximately 8,200 individuals. Based on Cochran’s formula, at least 384 participants were required to represent the unlimited population adequately. However, 540 participants were randomly selected using convenience sampling (based on social security codes and computer

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E-ISSN: 3041-8992

simulation). These participants, predominantly in their last five years before retirement, were studied, generating 2,700 person-years of observations.

3 Findings and Results

This section presents an analysis of findings related to retirement behavior within the study's scope, focusing on the surveyed sample.

To assess retirement and its influencing factors, a sample of male workers aged 50 to 65 years was selected. It was assumed that there was no transition between wage employment and self-employment or vice versa. The final sample included 540 individuals insured under social security in Kashan and its suburbs during their last five years of employment before retirement. Consequently, the dataset comprises 2,700 person-years, with the proportion of retirees increasing with the sample's age.

Table 1

Descriptive Statistics of Workers Approaching Retirement

Category	Attribute	Percentage (%)
Demographic Features	Age:	
	Born 1967–1972	35.37
	Born 1961–1966	40.93
	Born 1956–1960	23.70
	Total	100.00
	Livelihood:	
	Urban residence	53.00
	Living with at least one child	34.00
Educational Features	Elementary or less	18.15
	Middle school or below high school	21.11
	High school diploma	39.81
	University education	20.93
Health Features	Relative physical health	21.00
	Relative mental health	97.00
Financial Features	Monthly income (million IRR)	21.00
	Regular financial support from children	25.00
	Occasional financial support from children	75.00
	Receipt of minimum pension	10.00
Occupational Features	Average work experience (years)	28.65
	Manual/trade professions	23.88
	Administrative/clerical	10.82
	Services and sales	3.54
	Handicrafts/machinery	29.10
	Agriculture, livestock, fisheries	1.68
	Other	30.97
	Sample size	540
	Observations (person-years)	2,700

Table 1 summarizes the sample's descriptive findings. The sample exclusively included male workers nearing retirement and insured under social security. Most of them resided in urban areas, with the remainder living in suburban or rural regions. Additionally, descriptive findings show that 34% lived with at least one child, which was typical for that generation. About 21% of the sample had completed university education, while 40% held a high school diploma.

Self-reported health statuses were assessed based on five qualitative categories: (1) Very good, (2) Good, (3) Average, (4) Poor, and (5) Very poor. Individuals who reported "very good" or "good" physical or mental health were classified as healthy. For a more scientific evaluation, mental health was measured using a 10-item scale derived from the CES-D (Center for Epidemiologic Studies Depression Scale), with scores ranging from 0 to 30. A score of 10 or higher indicated symptoms of depression or anxiety. Due to the lack of individual psychological records, self-reporting was used in this study. Findings showed that 21% of the sample had good physical health, while 97% reported good mental health.

A literature review indicated that financial security in old age significantly influences retirement decisions. Study findings revealed that the average monthly income of the sample, comparable to full-time workers in the country, was

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E-ISSN: 3041-8992

21 million IRR. Kashan, an industrial city, generally offers wages on par with national averages due to high job experience among its workers.

A unique finding among older individuals was their financial relationship with children. About one-quarter of the sample regularly received financial support from their children, while three-quarters received occasional transfers. Approximately 10% of the sample received a base monthly pension in 2022, the final year of the study period. The low percentage reflects that their retirement wave occurred after 2022, outside the study period. The occupational distribution of the sample showed that most wage-earning workers were employed in manual labor, handicrafts, machinery-related professions, and trade jobs.

Based on income analysis, the income profile of each individual was analyzed from the age at which they entered the social security system until retirement. Accordingly, the estimation of social security pensions (SSW) and required retirement incentives and years of service bonuses was conducted. Official records had gaps in income status and history, necessitating the use of supplemental data. For this purpose, data from individuals during a 10-year period (2013–2022) were examined and analyzed.

This study followed the model proposed by Aguila (2014) and Blundell, Meghir, and Smith (2004). An examination of panel data on labor income in Iran revealed annual labor force and population changes due to demographic shifts during the period under review. From 2004 to 2022, Iran observed 19 waves of household-level data for individuals aged 15 and older.

Based on this, average wage profiles for full-time male workers in each birth cohort were constructed using the following equation:

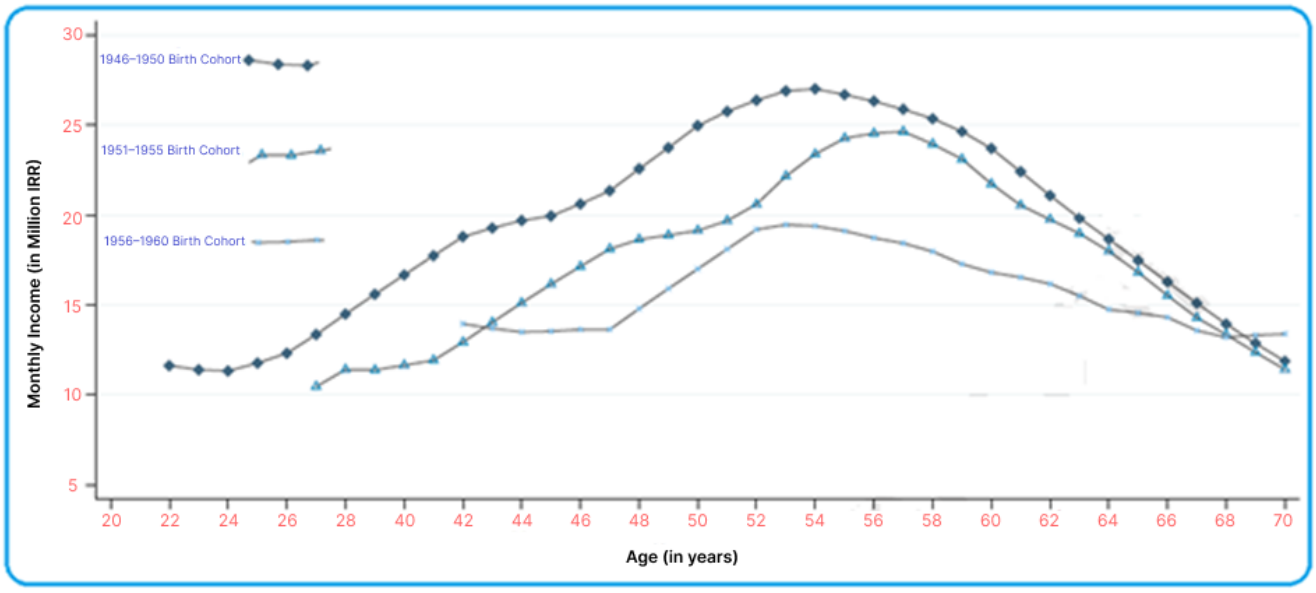
$$Yigt = \theta iYgt$$

Where i refers to the individual in the sample, g represents the cohort group based on year of birth, indicating the expected retirement age, t denotes the year, and Y is the monthly income. θ_i is a fixed individual effect estimated as θ_i = Y_ig_1992 / Y_g_1992. This fixed effect adjusts for income differences among individuals within the same cohort group. Y_gt represents the average income for cohort g in year t, calculated from 2004 to 2022. These data align with the wage records of each individual in the social security system for years without informational gaps.

Figure 1 illustrates the income profiles of individuals in this study based on age and cohort membership.

Figure 1

Income Profiles of Individuals Under Study by Age and Cohort



According to Figure 1, monthly income generally increased in the early to mid-career stages, followed by a decline in later years. This trend is attributed to older cohorts having lower educational attainment and higher proportions

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E-ISSN: 3041-8992

of part-time self-employment in informal sectors. In many factories or informal jobs, although actual monthly income may be higher, minimum wages are often reported for insurance purposes under self-employed or private industrial policies. Consequently, younger cohorts tend to have higher income levels than older generations.

Wages peaked for individuals in their mid-to-late 50s, aligning with average income levels across the sampled population. It was assumed that future incomes would decline with age to reflect the realities of older workers who experience reduced working hours, especially in self-employment and informal jobs.

The expected present value of retirement pensions for each individual was calculated using equation below, based on the average daily wages of social security-insured individuals during their last two working years. The analysis focused on individuals aged 55 to 70 (the potential retirement age range):

$$SSW_t\ (R) = \sum_{S=R}^{T} Pr_{s/t} * \ \beta^{(s-t)} * PB_R(s)$$

Where:

Pr_s/t is the probability of survival at age s, conditional on being alive at age t,

β is the discount rate for cash flows,

T is the maximum lifespan, and

PB_R(s) represents retirement benefits received at age s, assuming retirement occurs at age R.

In this calculation, SSW describes the income effects of retirement reform, as outlined in the previous section, based on the first metric of retirement incentives.

This study used "One-Year Accrued Benefits" (ACC) as the first metric for measuring the variable "retirement pension." This metric calculates the retirement benefits accrued for each year at book value. Accordingly, the second metric, "retirement pension," is defined as follows:

$$ACC_t = SSW_{t+1} — SSW_t$$

Here, the difference in retirement benefits between two consecutive years represents the "retirement incentive." This evaluation assumes that individuals compare current and future retirement benefits and decide to retire when there is a significant change in the following year's benefits.

In this analysis, the eligible retirement age was assumed to be 60 years for individuals born between 1957 and 1968 and 61 years for those born between 1969 and 1972. Additionally, it was assumed that early retirement benefits could be accessed starting at ages 55 and 56, respectively. For self-employed or informal workers covered by social security, the minimum work experience required to qualify for a pension was set at 10 years. Longer contribution periods and higher insurance payments were assumed for those engaged in hazardous or labor-intensive jobs (20 years for hazardous jobs) and for others qualifying for a full pension.

Moreover, it was assumed that individuals in the sample worked continuously from the start to the end of their careers without employment gaps (unemployment or temporary disability during their insurance payment period). This assumption implies that some individuals' years of insurance payment may be slightly overestimated, leading to potential measurement errors. However, the average SSW estimates align closely with the overall insured population in the study area, making this error negligible.

As shown in Table 2, the estimated monthly mean and standard deviation of SSW (retirement pension) for the potential retirement ages of 55 to 70 (the expected retirement age for the sample) are presented:

Table 2

Estimated Average Retirement Pension (SSW) by Age (in Million IRR)

Age	Retirement Pension (SSW)	Accrued Value	Peak Payment	Optional Value
	Median / SD	Median / SD	Median / SD	Median / SD
55	12.8 / 6.4	2.3 / 1.0	23.5 / 8.9	54.6 / 31.6
56	14.2 / 7.2	2.5 / 1.1	21.0 / 8.2	46.0 / 28.6
57	15.6 / 7.8	2.6 / 1.2	18.6 / 7.3	37.4 / 25.6
58	17.2 / 8.3	2.7 / 1.3	15.9 / 6.4	29.2 / 22.4
59	18.8 / 8.5	2.9 / 1.4	13.1 / 5.4	21.9 / 18.4
60	20.8 / 8.6	1.2 / 0.8	10.4 / 4.3	16.1 / 15.6
61	21.3 / 8.8	1.3 / 0.8	9.3 / 3.7	12.9 / 13.4
62	21.9 / 9.0	1.2 / 0.7	8.3 / 3.2	10.2 / 11.3

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E-ISSN: 3041-8992

63	22.7 / 9.2	1.1 / 0.6	7.1 / 2.8	7.7 / 9.4
64	23.4 / 9.4	1.1 / 0.6	6.0 / 2.4	5.5 / 7.8
65	24.4 / 9.6	1.1 / 0.6	4.8 / 1.9	3.8 / 6.3
66	25.1 / 9.8	1.0 / 0.5	3.7 / 1.5	2.5 / 4.7
67	25.7 / 10.0	1.0 / 0.5	2.7 / 1.1	1.5 / 3.5
68	26.4 / 10.1	0.9 / 0.5	1.8 / 0.8	1.0 / 2.4
69	26.9 / 10.3	0.8 / 0.4	0.8 / 0.4	0.8 / 2.0

As shown earlier, Table 2 summarizes the retirement incentives. These incentives include Accrued Value, Peak Payment, and Optional Value, which were estimated based on social security pensions (SSW) and the income profile of each individual. Although calculations were conducted for each individual, median and standard deviation (SD) metrics were used to describe the status of individuals at each age.

Accrued Value represents the one-year difference in retirement pensions. While it may provide insights, it can limit precise measurements of dynamic changes in retirement incentives over a life cycle.

Peak Payment indicates the difference between the accrued value and the maximum future social security pension (SSW).

Optional Value is the only metric that considers an individual's lifetime income. It reflects the amount by which retirement decisions depend on both retirement levels and the income profile.

The dynamic interaction between wage incomes and retirement benefits may yield more accurate estimates of retirement incentives. This study assumes that due to relatively low levels of social security pensions (SSW), workers in the study area are more likely to respond to changes in monthly wage income rather than retirement benefits.

The findings presented in Table 2 indicate that for all three metrics, estimates decrease with age. This suggests that retirement costs rise until a certain age, after which they decline. Notably, for most retirement incentives, there is a strong motivation to delay retirement beyond the official retirement age of 60. Older workers may prefer to remain in the labor market as long as possible. This generation may also work longer for reasons such as work ethics or lower preferences for leisure.

This study used retirement incentives, including social security pensions (SSW), accrued value, peak payment, and optional value, as the primary explanatory variables alongside factors influencing retirement (e.g., demographic features, occupational characteristics, physical and mental health) in regression estimates. Using the relationships defined in above equations, the financial factors or incentives affecting retirement decisions were estimated and are summarized in Table 3.

Table 3

Estimated Retirement Incentives by Age

Age	Accrued Value	Peak Payment	Optional Value
	1st Decile / Median / 9th Decile	1st Decile / Median / 9th Decile	1st Decile / Median / 9th Decile
55	24 / 45 / 75	244 / 469 / 703	587 / 1091 / 2155
56	24 / 49 / 79	204 / 419 / 640	462 / 920 / 1894
57	24 / 51 / 84	166 / 372 / 572	350 / 747 / 1625
58	23 / 54 / 90	140 / 318 / 487	260 / 583 / 1368
59	22 / 58 / 95	117 / 261 / 398	177 / 438 / 1063
60	-2 / 24 / 40	90 / 207 / 309	93 / 322 / 847
61	-1 / 25 / 40	89 / 186 / 272	62 / 257 / 681
62	4 / 24 / 38	81 / 165 / 239	37 / 204 / 542
63	3 / 22 / 36	71 / 142 / 205	18 / 154 / 413
64	3 / 21 / 34	64 / 119 / 168	10 / 110 / 336
65	6 / 21 / 34	55 / 96 / 135	4 / 76 / 250
66	10 / 20 / 31	48 / 73 / 106	1 / 50 / 191
67	9 / 19 / 28	37 / 53 / 79	0 / 30 / 136
68	12 / 18 / 28	23 / 35 / 52	0 / 20 / 100
69	11 / 16 / 26	11 / 16 / 26	0 / 15 / 63

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E-ISSN: 3041-8992

This section analyzes the relationships between financial incentives, influencing factors, and the probability of retirement based on the estimated logistic regression function and calculated covariances. In this estimation, each financial incentive is treated as a primary independent variable, influencing factors are considered additional explanatory variables, and the probability of retirement is defined as the dependent variable. The regression results interpreting these relationships are summarized in Table 4. In the table, the significance levels are denoted as follows: * significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 4

Relationships Between Financial Incentives, Influencing Factors, and Retirement Probability

Influencing Factors	Accrued Value	Peak Payment	Optional Value
	Coefficient / t-statistic / Relationship	Coefficient / t-statistic / Relationship	Coefficient / t-statistic / Relationship
SSW	0.0832 / 1.93 / Direct	0.0769 / 1.57 / Direct	0.0670 / 1.36 / Direct
Years of Service Bonus	0.0926 / 1.21 / Direct	-0.0049 / -0.07 / Inverse	-0.0915 / -2.55 / Inverse
Age	0.313 / 6.03 / Direct	0.296 / 4.87 / Direct	0.234 / 4.28 / Direct
Cohort (Birth Year)			
1946–1950	-1.332 / -5.87 / Inverse	-1.293 / -5.91 / Inverse	-1.251 / -5.74 / Inverse
1941–1945	-0.944 / -7.85 / Inverse	-0.866 / -7.81 / Inverse	-0.625 / -7.26 / Inverse
Urbanization	-0.266 / -1.88 / Inverse	-0.271 / -1.91 / Inverse	-0.311 / -2.16 / Inverse
Education			
Below High School Diploma	0.283 / 1.10 / Direct	0.265 / 1.02 / Direct	0.327 / 1.30 / Direct
High School Diploma	0.426 / 1.44 / Direct	0.419 / 1.43 / Direct	0.441 / 1.52 / Direct
University	-0.144 / -0.47 / Inverse	-0.110 / -0.35 / Inverse	0.0612 / 0.019 / Direct
Family Dependents	-0.34 / -1.50 / Inverse	-0.338 / -1.50 / Inverse	-0.284 / -1.26 / Inverse
Physical Health	0.0188 / 0.09 / Direct	0.0322 / 0.15 / Direct	-1.26 / -0.003 / Inverse
Mental Health	-0.0776 / -0.32 / Inverse	-0.0981 / -0.41 / Inverse	-0.0678 / -0.29 / Inverse
Income Group			
Medium Income	0.468 / 2.29 / Direct	0.507 / 2.39 / Direct	0.512 / 2.52 / Direct
High Income	0.423 / 1.52 / Direct	0.463 / 1.66 / Direct	0.697 / 2.63 / Direct
Experience	0.0676 / 0.42 / Direct	0.0851 / 0.51 / Direct	0.108 / 0.60 / Direct
Squared Experience	-0.0002 / -0.12 / Inverse	-0.0004 / -0.22 / Inverse	-0.0006 / -0.33 / Inverse
Job Type			
Administrative	0.0396 / 0.16 / Direct	0.0177 / 0.07 / Direct	0.0273 / 0.10 / Direct
Services and Sales	0.223 / 0.66 / Direct	0.226 / 0.67 / Direct	0.101 / 0.28 / Direct
Manufacturing	-0.313 / -1.31 / Inverse	-0.315 / -1.31 / Inverse	-0.411 / -1.67 / Inverse
Agriculture	0.0548 / 0.13 / Direct	0.0344 / 0.01 / Direct	-0.103 / -0.23 / Inverse
Self-Employed	-0.0415 / -0.18 / Inverse	-0.0472 / -0.20 / Inverse	-0.156 / -0.64 / Inverse
Constant	-22.92 / -4.81 / ---	-22.20 / -4.19 / ---	-18.72 / -3.48 / ---

The relationship between social security pensions (SSW) and the probability of retirement is direct but only significant at the 10% level when combined with the accrued value incentive.

Among influencing factors, age has a direct and significant relationship with the probability of retirement across all three financial incentives (accrued value, peak payment, and optional value) at the 1% level. Older individuals are more likely to retire. The relationship between birth cohorts and retirement probability is inverse and significant at the 1% level.

Urbanization has an inverse relationship with retirement probability across all financial incentives. Urban residents are less likely to retire than rural or suburban residents, possibly due to secondary employment. This relationship is significant at the 5% or 10% level.

The relationship between education level and retirement probability is direct but not significant for individuals with below high school or high school diplomas. For university graduates, the relationship is inverse and also not significant.

Family dependents have an inverse relationship with retirement probability across all financial incentives, indicating that individuals with dependents are less likely to retire, but this relationship is not significant.

Physical health shows a direct relationship with retirement probability for accrued value and peak payment but an inverse relationship for optional value. All relationships are weak.

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E-ISSN: 3041-8992

Mental health has an inverse relationship with retirement probability across all financial incentives, indicating that individuals with better mental health are less likely to retire. However, this relationship is also weak.

Income level has a direct and significant relationship with retirement probability for medium- and high-income groups. Medium-income individuals show stronger retirement inclinations as their income increases.

Experience shows a direct but weak relationship with retirement probability, while squared experience shows an inverse relationship.

Job type shows direct relationships with retirement probability for administrative, service, and agricultural jobs, but inverse relationships for manufacturing and self-employment. Overall, these relationships are weak.

The significant constant term suggests additional factors not included in the model, such as economic instability, inflation, or migration tendencies, may influence retirement probability.

4 Discussion and Conclusion

This study examined the factors influencing retirement incentives, including accrued value, peak payment, and optional value. Accrued value represents the annual differences in retirement pensions, which may have limitations in precisely capturing the dynamic changes in retirement incentives over a life cycle. Peak payment refers to the difference between accrued value and the maximum future social security pension. Finally, optional value (option value) is the only metric encompassing an individual's lifetime income. It reflects the extent to which retirement decisions depend not only on pension levels but also on wage profiles.

Regarding retirement incentives, decisions to work at older ages are significantly influenced by forward-looking motivations concerning the receipt of public or private retirement pensions. However, the evidence varies based on data and model specifications. Similar studies for less-developed countries are rare because their public retirement systems are still maturing, and relevant data is often unavailable. As the population in less-developed countries ages, there will be a growing need to expand retirement benefits and study the impact of such policy changes on retirement behavior and pension financing.

This study, leveraging demographic changes over the past two decades and functional labor data from male workers covered by social security in Kashan, an industrial hub, provides evidence on the impact of the social security system on retirement behavior in a typical middle-income country experiencing rapid aging and high poverty rates, especially among the elderly. The study utilized advanced estimation models from prior research, incorporating various forward-looking incentives for comparative purposes. While the estimated coefficients in this research align directionally with those found in previous studies, the details differ significantly.

First, among forward-looking models, only the optional value variable showed statistically significant effects. This indicates that workers who expect greater benefits from continuing work due to additional income and increased pension wealth are less likely to retire compared to those who anticipate fewer benefits.

Second, supplementary income variables, such as financial transfers from children and additional income support for poor retirees, demonstrated significant effects.

These findings suggest that the incentives embedded in the current social security system are insufficient compared to many developed countries. This insufficiency is largely attributable to economic conditions, the growing number of retirees, and the aging population. Older workers in Iran appear to consider various factors in their retirement decisions, including the benefits derived from additional wages. Furthermore, the significant impact of having dependent children and financial support from children—or vice versa—on retirement decisions highlights a common source of retirement financing in many Asian countries.

Middle-income countries experiencing rapid aging are likely to face difficult policy choices to reduce elder poverty and maintain pension stability. With declining fertility rates, shifting family structures, rising marriage ages, and reduced marriage rates, financial support from children is expected to diminish, raising concerns about the welfare of poor elderly populations.

Practical suggestions in this field include several strategies. For accrued value, individuals should engage in long-term financial planning, regularly evaluate their accrued value from the start of their careers, set clear career goals based on this value, and seek financial advice from experts to better understand calculations and projections. Regarding peak payment, individuals should carefully plan their retirement timing to maximize peak payments by analyzing critical career periods such as salary increases and changes in retirement policies, while also reviewing and analyzing working years that might offer higher benefits, particularly the final years with potential for maximum

IJIMOB
E-ISSN: 3041-8992

lifetime pension benefits. For optional value, it is essential to enhance education and awareness about retirement timing options and their financial impacts, evaluate and manage risks by selecting lower-risk combinations (e.g., fixed pensions versus volatile investments), and maintain flexibility by being open to revisiting and adjusting retirement decisions when circumstances change.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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