

Pension Investment and Withdrawal: What Concerns are Influencing Participant Preferences? Results from China's Occupational Pension





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Introduction

Abstract

This project aims to understand pension participants' investment and withdrawal behaviors and provide guidance in pension plan design, using data from China. We carried out a survey of employees' preferences on occupational pension investment and withdrawal in China. To understand employees' preferences about financial arrangements comprehensively, several decisions apart from investment and annuitization, are considered in the survey. The existence of an 'annuity puzzle' in China is found in this paper. We reexamine the influencing effects of many behavioral factors on employees' preferences and find that different concerns, such as illiquidity concerns and health-related concerns, influence their preferences in different manners. This paper carries significances in understanding pension participants' behaviors and guiding enterprises to customize their occupational pension plans.

Introduction

Understanding the motives that underlie pension participants' investment and withdrawal decisions are important for the design of the pension plan, which determines retirees' utility of living to a great extent. Many pension plans require employees' agreement before enforcement and allow some customization options. Such pension plans provide options to participants during both accumulation phase and payout phase, including investment options during accumulation, withdrawal options at retirement, early withdrawal, and payment cash flow options after retirement, etc. Occupational pensions in China, the 'second pillar' of the pension system, is one of such pensions.

During the accumulation phase of an occupational pension, employees care most about two main design elements: the contribution rate and investment strategy. Very often, the contribution rate of occupational pension is regulated or fixed. For instance, for the occupational pension of public institutions in China, the contribution rate of employees and employer are regulated to be 4% and 8% of pre-tax salary, respectively. For investment options, many pensions allow participants to select investment strategy from a portfolio pool. At retirement, options for payout phase mainly focus on arrangements of payout cash flow. The first decision for the retirees is whether should they withdraw the amount by lump sum or by installments. The other possible options include whether should they annuitize the accumulated pension amount, the expected installment term they expect, and the possibility of early withdrawal.

1.1 Related literatures

Literature has shown that retirees' pension investment and withdrawal decisions are influenced by many factors. Sunden and Surette (1998) find that that gender will significantly affect individual choice in allocating assets in their DC plans: women are less likely to choose risky portfolios (mostly stocks) than men. Pang and Warshawsky (2010) claim that concerns over health and medical expense shift one's optimal investment portfolio from risky equities to safer assets. As for pension withdrawal behaviors, most literature focuses on explaining the 'annuity puzzle': a phenomenon that notes that the percentage willing to annuitize a pension is surprisingly low, even though the annuity is proved to be optimal for retiree theoretically (Yaari, 1965; Brown and Diamond, 2005). According to literature (Mottola and Utkus, 2007; Benartzi et al., 2011; Previtero, 2012; Banerjee, 2013; Johnson et al., 2004), 50% to 75% of eligible DB benefits are withdrawn as lump sum; for DC plans, only 10% of retirees choose to annuitize their pension. A number of behavioral factors have been put forward to explain this annuity puzzle, most of which are reviewed and listed in Section 3.2, including adverse selection, liquidity need, bequest motive and investment attitude, etc. However, there is still a lack of research on retirees' preferences about other pension payment arrangements, apart from annuitization choice. Beshears et al. (2014) discover that match-inflation income arrangement, whose payment amount increases by certain percentage yearly, is

more preferred by potential retirees to a steady income. There are few studies on other aspects of payment arrangements, like preference about installment payment, the preferred payment term, which might be affected by the same factors with annuity puzzle.

1.2 Contributions

Understanding pension participants' behavior and designing better occupational pension plan are important for China's dealing with the arrival of its aging population, retirement and pension withdrawal peak in the next 20 years. This paper carries out telephone surveys on investment and withdrawal preferences of occupational pension participants in three biggest cities in China. Empirical analysis of influencing factors on employees' decisions is based on survey data. This paper contributes to the existing empirical literature in the following aspects.

First, this paper supplements existing literature with evidence from China. We first show the existence of the annuity puzzle in China, reexamine explanations in previous literature and find some consistent results with Chinese data. Though the annuity puzzle has been identified in a wide range, there are few literatures studying the annuity puzzle of an immature pension system or developing country. Our result shows that only 17.7% of occupational pension participants are willing to purchase an annuity at retirement, first indicating the existence of annuity puzzle in China.

Second, we consider both investment and withdrawal behaviors, including preferred investment strategy, annuity or lump sum choice and other payout arrangements preferences. In line with other empirical studies, China's result shows that investment and withdrawal behaviors of occupational pension participants are influenced by some individual concerns. We find investment preferences are affected by concerns towards pension investment profitability and guarantee, and health risk concerns. It's also revealed that liquidity concerns, investment attitudes, and health-related expense concerns are influential in different manners. For instance, liquidity concern affects the employees' likelihood of annuitization, expected payment term and installment preference.

Third, our results have significance in designing suitable pension plans. The analysis result supports enterprises to understand employees' needs and concerns better when designing pension plans. In China, enterprises and public institutions are responsible for making their own occupational pension plans under the regulatory requirements. Enterprises are encouraged and motivated to take considerations of employees' needs and provide competitive benefits. Our results contribute to understanding pension recipients' investment and withdrawal behaviors, which is critical and practical for the enterprises in customizing occupational pension plans.

Background introduction on China's occupational pension system

The World Bank has defined a ‘three pillars’ pension system, which is: standardized state-run pension system; supplementary pension plan funded by recipients and employers; voluntary individual saving plan or insurance. To date, China's pension system is still in development and unbalanced among regions. It has just completed its coverage on three pillars, which carries great significance for aging problems. China's first pension system was established in 1951 under the State Council's Regulations on Labor Insurance. Since then, China's pension system has gone through several stages of reform precipitated by changes in the political, economic, and social environment. The current social insurance pension system in China was established by State Council Document No. 26, issued on July 1, 1997, and updated by Document No. 38 in 2005. The plan is broadly consistent with World Bank recommendations, its goal is to transform the defined benefit, pay-as-you-go system to a three-pillar model while incorporating all enterprise and self-employed workers in cities and townships (Ebbers et al., 2009).

Table 1

Pillar	Contribution rate (%)	Target Replacement rate (%)	Financing	Mandatory or voluntary
1A	Enterprise: 20 Individual: 0	35	PAYG	Mandatory
1B (Individual accounts)	Enterprise: 0 Individual: 8	24	Funded	Mandatory
2 (Occupational Pension)	For Institutions: Institutions:4 Individual: 8 <hr/> For Enterprise: N.A.	20-30	Funded	Voluntary
3 (Individual savings and commercial insurance)	N.A.	N.A.	Funded	Voluntary

2.1 The first pillar

The first pillar is a public pension system, pay-as-you-go financed, which comprises an urban and a rural system, aiming at providing a basic retirement income. In the public pension system, region difference is considered: the system in rural areas differs considerably from urban areas. The eligibility requirements are age 60 for males (age 55 for certain hazardous industries), age 55 for female managers, age 50 for female workers, and an employee must have 15 years of contributions. By its contribution source, this public pension system composes of two parts as in Table 1: Social Pooling (Pillar IA) paid by Enterprises, a tax-deductible 20% of their total wage bill; Individual Account (Pillar IB): contributed by employees before tax to individual accounts, generally the contribution rate is 8% of wages.

2.2 The second pillar

The second pillar is a voluntary, employer-based fully-funded supplementary pension scheme, called the occupational pension or enterprise pension. These two DC pension plans are differentiated by categorization of types of sectors. Generally the enterprise pension is mainly for enterprises, while occupational pension is for state-owned non-profit public institutions like schools, civil service institutions. Though there is a difference between regulatory filings of enterprise pension and occupational pension, they share great similarities.¹ For simplicity, hereafter we use the occupational pension for the second pillar pension throughout the paper, which consists of the occupational pension and enterprise pension.

Comparing to the public pension system, there is a great degree of freedom for enterprises and institutions in designing individual occupational pension plan. According to relevant regulations, enterprises and institutions in China are responsible for their own occupational pension plans' design, whose validity of enforcement requires employees' agreement.² An occupational pension plan should cover the legality of

¹ Enterprise pension follows 'The Proposed Regulation for Enterprise Pension'; similarly, occupational annuity pension follows 'The Proposed Regulation for Occupational Pension for Public Institutions' and 'Notice of the General Office of the State Council on Issuing "The Regulation for Occupational Pension for Public Institutions"'.

² By 'The Proposed Regulation for Enterprise Pension' and 'The Proposed Regulation for Occupational Pension for Public Institutions', it is stipulated that enterprise pension plans should be negotiated and determined by enterprise and labor union (or employee representatives) together, while the plans for state-owned and state-holding enterprises should be discussed by assembly of employees or of employee representatives before they are passed. As for occupational pension plans, they should be negotiated democratically and determined by public institution and labor union (or employee representatives). What is more, these plans should be discussed by assembly of employees or of employee representatives before they are passed, while plans for those public institutions which enjoy regular financial subsidies should be audited by financial departments.

participants, contributions and benefits, management of pension funds and so on. Hence, such pension plans are quite flexible in designing characteristics like investment, withdrawal options, and payment arrangement, etc. The investment of occupational pension should also be stated in the pension plan. Usually, enterprises and institutions allocate pension assets themselves or entrust them to a licensed asset management company.

Comparatively, some aspects of occupational pension are regulated. For example, both employers and employees can contribute to the occupational pension fund, but only employers are obligated. Besides, lump sum and annuity option must be provided as withdrawal options at retirement.³ Investment of occupational pension fund is also regulated to prevent its being too volatile: equity investments are capped at 30%; no less than 20% must be invested in money market instruments; up to 50% can be invested in fixed-income securities but at least 20% must be kept in government bonds.

Therefore, with the legislation of China's second pillar system, occupational pension plans may vary from enterprise to enterprise or from institution to institution, even though there are some regulations. It's possible for enterprises to tailor their occupational pension plans to the needs of employees and increase their utility.

2.3 The third pillar

The third pillar is individual (and family) savings and commercial insurance. Currently China has an extremely high saving rate (estimated at 40% of GDP), which is thought to be resulted from a high personal savings rate.

³ For enterprises pension, it is stated that 'employees who reach the legal retirement age can withdraw enterprise pension in a lump sum or in installments from their personal enterprise pension account.' For occupational pension, in 'Notice of the General Office of the State Council on Issuing "The Regulation for Occupational Pension for Public Institutions" issued on April 6th, 2015, it is stipulated that 'employees who reach legal retirement age and have completed legal retirement formalities can choose the approach to withdraw their occupational pensions. These pensions can be used to purchase commercial annuities all at once, receive treatment according to annuity contract and enjoy corresponding right of inheritance.'

Model and simulation analysis

The overlapping generations model (OLG) of Samuelson (1958) and Diamond (1965) is often used for analyzing an individual's consumption decisions at different life cycle stages. The OLG model considers that the representative agents live a finite length of time long enough to overlap with at least one period of another agent's life. The OLG models explicitly the different periods of life, such as schooling, working, and retirement periods, it is the natural framework to study the allocation of resources across the different generations. However, the OLG model is too rough to describe the post-retirement consumption decision, where the retirees are considered to have several different stages, including the health active period, slow action period, care period, etc. (Robert Atchley, 1985).

This section will establish a three--period consumption decision model to analyze retiree's pension withdrawal decision-making. We assume that retirees survive up to three periods after retirement and face an unexpected expense uncertainty in the second period. Each retiree has a certain probability of surviving to the third period. It is worth emphasizing that the unexpected expense uncertainty in the second period of the model is compulsory to pay by the retirees. There are various such unexpected expenses, including the different liquidity requirements, disability risks, and medical expenses. Under different pension withdrawal methods, retirees have different consumption cash-flows in each period. The model discounts the utility of consumption of each withdrawal method to retirement time, to compare the utility of each withdrawal method.

3.1 Assumptions and parameters in the model

The specific assumptions and parameters of the model are as follows:

1. Assume that the retirement time is $t = 0$, when the retirees decide the pension withdrawal method, which affect the consumption of each period;
2. Assume that there are three consumption periods after retirement: $t = 0, 1, 2$; the consumption cash-flows at three times is denoted as C_0, C_1, C_2 ;
3. The investment return of the pension account after retirement (continuous compound interest) is r ;
4. The total amount of the pension account at retirement time is A ;
5. The uncertainty of pension retiree's life expectancy: all retirees can survive at least two periods ($t = 1$), and up to three periods ($t = 2$); but only survive to the third period.

6. The retiree’s consumer utility function is a concave function, with a decreasing marginal utility;

7. The time discount rate during the intervals is $\beta, 0 < \beta \leq 1$.

3.2 Four withdrawal methods

The following four methods of withdrawal are considered in this model; when there is no risk of unexpected expenses, the consumption of each period under each withdrawal method is as follows.

1. Annuity withdrawal

If the retirees choose to withdrawal the total amount of the retirement account by annuity at the time of retirement, the annuity payment during each period of survival flat and based on the actuarial fairness principle, the cash-flows an annuity recipient will receive at each period are:

$$C_0^{\text{an}} = C_1^{\text{an}} = C_2^{\text{an}} = \frac{A}{1 + e^{-r} + pe^{-2r}}; \tag{1}$$

then the discounted utility of an annuity is:

$$U_0^{\text{an}} = U(C_0^{\text{an}}) + \beta U(C_1^{\text{an}}) + p\beta^2 U(C_2^{\text{an}}). \tag{2}$$

2. Lump Sum withdrawal method

If the retirees withdraw the total amount of the retirement account at the time of retirement by lump sum, their consumption will be arranged on their own in each period. After receiving the lump sum value, the retirees will arrange the consumption cash-flows according to the optimal multi-period consumption decision, and the discounted utility at the beginning of the decision-making period is:

$$U_0^{\text{ls}} = U(C_0^{\text{ls}}) + \beta U(C_1^{\text{ls}}) + p\beta^2 U(C_2^{\text{ls}}). \tag{3}$$

In the consumption decision-making process, every individual is to maximize their utility. According to the backward induction method of the inter-period consumption problem, $C_0^{\text{ls}}, C_1^{\text{ls}}, C_2^{\text{ls}}$ meet the following Euler equation:

$$U'(C_1^{\text{ls}}) = p\beta U'(C_2^{\text{ls}}), \tag{4}$$

$$U'(C_0^{\text{ls}}) = \beta U'(C_2^{\text{ls}}) + p\beta^2 U'(C_2^{\text{ls}}), \tag{5}$$

where $C_0^{\text{ls}} + e^{-r}C_1^{\text{ls}} + e^{-2r}C_2^{\text{ls}} = A$.

3. Installment method

The installment withdrawal method assumes that the retirees will receive the total amount of the retirement account by the three-term withdrawals. Different from the annuity withdrawal, the instalment is paid according to the withdrawal period. Considering the rate of return on pensions, we have:

$$C_0^{\text{ist}} + e^{-r}C_1^{\text{ist}} + e^{-2r}C_2^{\text{ist}} = A, \tag{6}$$

by the principle of equal installment,

$$C_0^{\text{ist}} = C_1^{\text{ist}} = C_2^{\text{ist}} = \frac{A}{1 + e^{-r} + e^{-2r}}. \tag{7}$$

4. Increasing payout stream

The method of increasing payout stream installments is a special withdrawal, allowing the number of retirees to receive a stream of cash-flows with an increasing proportion $\Delta > 0$. This method of withdrawal is found to be highly favored in Beshears (2014). According to

$$\begin{aligned} A &= C_0^{\text{inc}} + e^{-r}C_1^{\text{inc}} + e^{-2r}C_2^{\text{inc}} \\ &= C_0^{\text{inc}} + e^{-r}C_0^{\text{inc}}(1 + \Delta) + e^{-2r}C_0^{\text{inc}}(1 + \Delta)^2, \end{aligned} \tag{8}$$

then,

$$C_0^{\text{inc}} = \frac{A}{1 + e^{-r}(1 + \Delta) + e^{-2r}(1 + \Delta)^2}, \tag{9}$$

$$C_1^{\text{inc}} = C_0^{\text{inc}}(1 + \Delta), C_2^{\text{inc}} = C_0^{\text{inc}}(1 + \Delta)^2. \tag{10}$$

The amount of cash-flows in each period under different withdrawal methods determines the utility. With certain parameters condition, we can conclude that the annuity, the lump sum withdrawal and the instalment method are equivalent.

Proposition 1: When there is no life uncertainty, $r = 0$, $p = 1$ and $\beta = 1$, the withdrawal method of annuity, lump sum and installment are equivalent.

Proof: When $r = 0$, $p = 1$ and $\beta = 1$, according to the utility function is a concave function:

$U'(C) < 0, U''(C) > 0$ and the Euler equation, the lump sum withdrawal consumption cash-flows are

$C_0^{\text{ls}} = C_1^{\text{ls}} = C_2^{\text{ls}} = \frac{A}{3}$. At this time, the cash-flow of annuity withdrawal is

$C_0^{an} = C_1^{an} = C_2^{an} = \frac{A}{2+p} = \frac{A}{3}$, that of the installment method is $C_0^{ist} = C_1^{ist} = C_2^{ist} = \frac{A}{3}$. It can be

seen that the three methods of withdrawal are equivalent under this condition.

Of course, the proposition 1 requires special circumstances. Under normal circumstances, the utility of each withdrawal method will be affected by various factors, resulting in the difference in the choice of the retirees.

3.3 With the unexpected expense risk

Let us analyze the impact of unexpected expense risks after retirement on the choice of pensioner retirees. An important advantage of the lump sum withdrawal method over the annuity withdrawal method is that it can better meet the liquidity needs after retirement.

In the above three-periods consumption decision model, we assume that the retirees have an urgent risk of uncertainty in the second period $t = 1$, the probability that the retirees are facing an unexpected expense demand is q , the amount is L . This hypothesis stems from the fact that some retirees may experience emergency medical expenses and various urgent liquidity needs after retirement (Beshears, 2014).

Therefore, after considering the unexpected expense risk in the second period after retirement, the above utility function may face the possibility of a “negative consumption”: the pension withdrawal at the period is less than the unexpected expenditure L . In that occasion, we assume that:

$$U(C) = C, \text{ if } C \geq 0.$$

In the case of a “negative consumption”, when the emergency liquidity demand is not met, the utility of the retirees is

$$U(C - L) = C - L < 0 \tag{11}$$

Thus, the probability q and magnitude of unexpected expenses L describe the unexpected expense risk of retirees. After considering such risk, the utility function of each method at time 0 is as follows:

$$U_0^I = U(C_0^I) + \beta[qU(C_1^I - L) + (1 - q)U(C_1^I)] + p\beta^2U(C_2^I), \quad I = an, ls, ist, ir. \tag{12}$$

3.4 Analysis of simulation results

Because it is difficult to compare the utility value of each method by analysis, we compare the utility of each withdrawal method by simulation calculation. First, we consider the retirees' consumption utility function is a CRRA function, in the form:

$$U(C) = \frac{1}{\gamma} C^\gamma, \quad \gamma < 1 \tag{13}$$

Then, the consumption of each period of the lump sum withdrawal method should meet the following Euler equation:

C_0^{ls} is:

$$U'(C_0^{ls}) = q[h\beta U'(C_{1-L}^{ls} - L) + p(1-h)\beta^2 U'(A - C_0^{ls} - C_{1-L}^{ls})] + (1-q)[h\beta U'(C_{1-NL}^{ls} - L) + p(1-h)\beta^2 U'(A - C_0^{ls} - C_{1-NL}^{ls})], \tag{14}$$

where C_1^{ls} and C_2^{ls} are:

$$C_1^{ls} = \begin{cases} C_{1-L}^{ls} = h(A - C_0^{ls}) + (1 - e^{-r}h)L, & \text{with the unexpected expen} \\ C_{1-NL}^{ls} = h(A - C_0^{ls}), & \text{without the unexpected expe} \end{cases} \tag{15}$$

$$C_2^{ls} = (A - C_0^{ls}) e^{2r} - C_1^{ls} e^r, \tag{16}$$

where $h = \frac{1}{e^{-r} + \beta^2 p^2}$, C_{1-L}^{ls} and C_{1-NL}^{ls} are the amount of consumption for the cases with and without the occurrence of the unexpected expense, respectively.

In the following, we are concerned with the impact of different factors on the utility of different withdrawal methods, including the probability of survival, the probability and magnitude of unexpected expense risk, and the return rate. Under the given parameters, the effects of various factors on the utility of each receiving method are simulated and analyzed. The parameters of the simulation analysis are shown in Table 2 below. The results of each simulation analysis are shown in Fig. 1 to Fig. 4. The main vertical axis is the utility of all withdrawal methods, and the secondary vertical axis are the ratio of utility of the annuity with respect to the lump sum method, and the ratio of utility of the increasing payout streams to the instalment withdrawal.

Table 2

Simulation Analysis: Concerned Factors and Parameter Setting

Concerned Factors	The impact of survival probability	The impact of unexpected expense risk		The impact of investment return
		the unexpected expense probability	the unexpected expense amount	
Parameter Setting	Pension account $A = 10$, time discount rate $\beta = 0.95$, the increasing ratio $\Delta = 0.1$, $\gamma = 0.5$			
	the unexpected expense probability $q = 0.6$ the unexpected expense amount $L = 3$ the investment return $r = 0.03$	the survival rate $p = 0.7$ the unexpected expense amount $L = 3$ the investment return $r = 0.03$	the survival rate $p = 0.7$ the unexpected expense probability $q = 0.6$ the investment return $r = 0.03$	the survival rate $p = 0.7$ the unexpected expense probability $q = 0.6$ the unexpected expense amount $L = 3$
Factor Parameter	the survival rate p in the range $[0,1]$	the unexpected expense probability q in the range $[0,1]$	the unexpected expense amount L in the range $[0,5]$	the investment return r in the range $[0,0.4]$
Simulation Result	Figure 1	Figure 2	Figure 3	Figure 1

1. The impact of survival probability

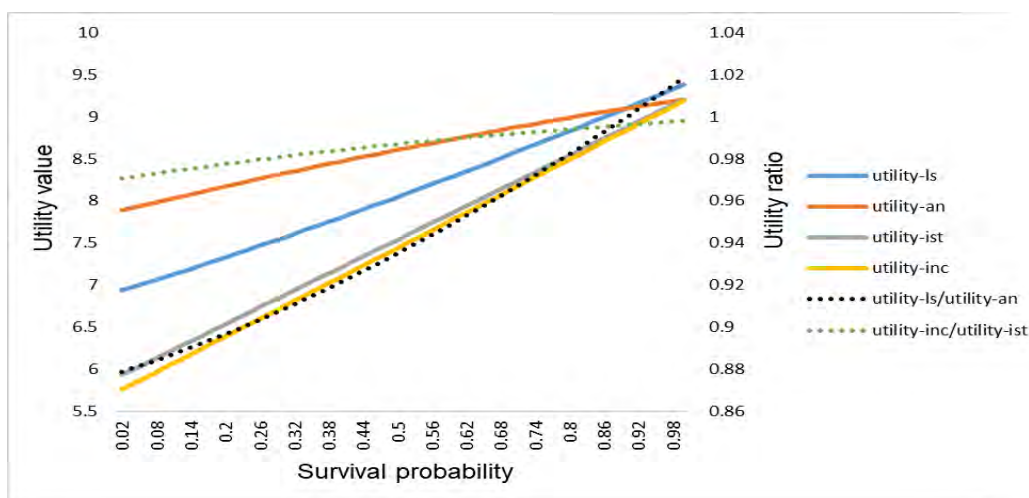


Figure 1: Effect of survival probability on the utility of the withdrawal methods

The probability of survival in the model is an estimate of the expected survival probability of the retirees from time 1 to 2, which describes the average survival probability of the population. The results in Figure 1 show that as the probability of survival increases, the life expectancy and the utility of all methods of withdrawal increase, but the annuity withdrawal method is gradually losing its advantage over the lump sum withdrawal method.

2. The impact of unexpected expense risk

(1) The impact of unexpected expense probability q

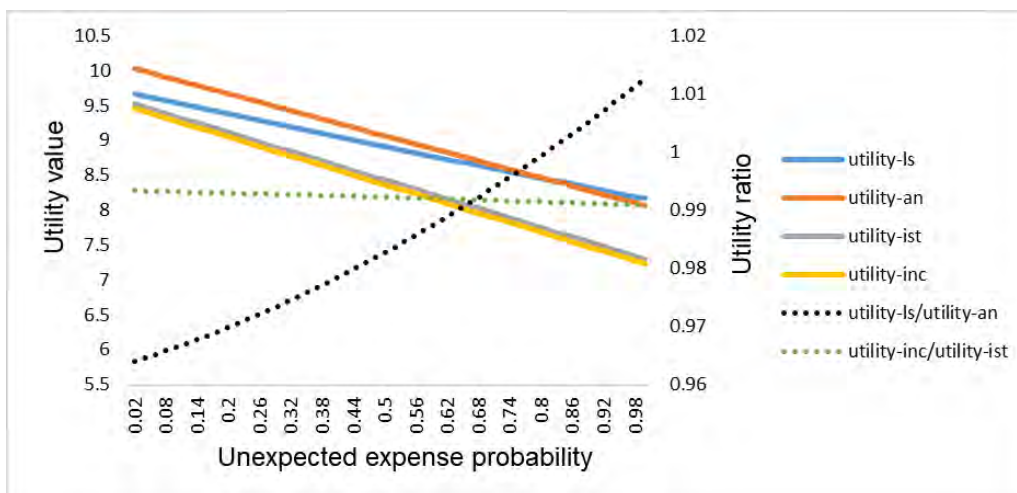


Figure 2: Effect of unexpected expense probability on the withdrawal methods

In fact, there are many kinds of unexpected expense which can cause the rigid expenses of retired seniors, mainly including temporary medical expenses. Figure 2 shows that the probability of unexpected expense reduces the utility of retirees', but as the probability of risk increases, the advantage of lump sum withdrawal method is gradually increasing compared to the annuity. Also, the utility of an increasing payout stream increases compared to the flat installment is slowly decreasing.

(2) The impact of unexpected expense amount

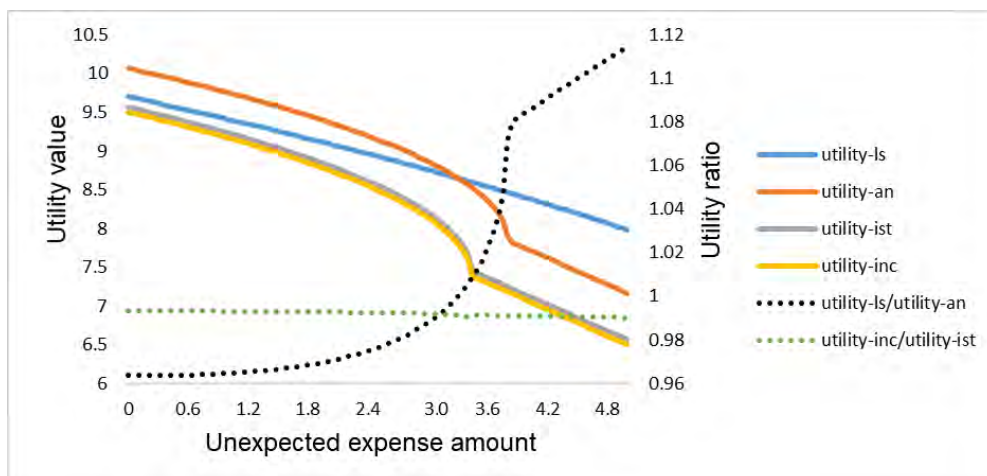


Figure 3: Effect of unexpected expense amount on the withdrawal methods

Figure 3 shows that, similar to the probability of an unexpected expense probability, the increase in the amount of expense also reduces the utility of the retirees. In the meanwhile, the utility ratio of the lump sum over the annuity withdrawal is gradually increasing, and the ratio of the increasing streams to the installment is decreasing.

3. The impact of investment yield

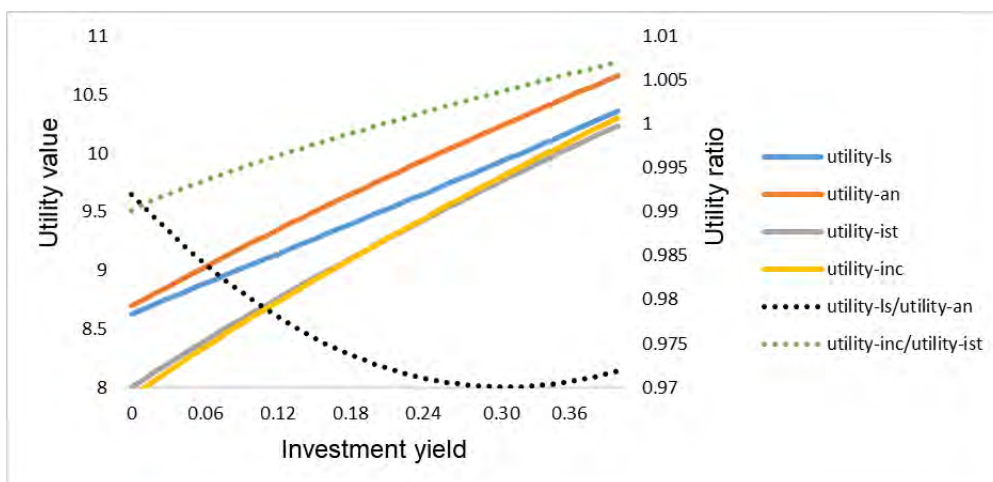


Figure 4 Effect of investment yield on the utility of the withdrawal method

Studies have found that retirees' attitudes toward pension investment income affect the choice of the preferred withdrawal method. The Figure 4 shows the increase of pension investment yields also improves the utility of retirees. With the increase of investment return, the lump sum withdrawal method is gradually losing its advantage over the annuity, and the utility ratio of lump sum withdrawal over annuity is

U-shaped. In the meanwhile, with the increase of the investment yield, the ratio the utility of the increasing payout streams to that of flat installment gradually increases and exceeds 1, indicating that when the investment return is higher, the increasing payout streams is more attractive.

It is worth noting that the impact of the investment return in the model is consistent for any withdrawal methods. When the return rate of the lump sum and the annuity withdrawal are the same, the annuity withdrawal is more attractive than the lump sum withdrawal. Therefore, the phenomenon of annuity puzzles is related to the higher investment returns of a lump sum withdrawal of than that of the annuity withdrawal (Beshears, 2014).

Survey design and data

4.1 Design of questionnaire

We designed and conducted a telephone interview survey in three biggest cities in China: Beijing, Shanghai, and Guangzhou. This telephone survey was entrusted to Tsinghua Media Survey Lab as a third party in conducting, and 1010 valid samples were collected. There are pros and cons for telephone interview survey: advantages are wider coverage and less pressure on interviewees, which contribute to higher accuracy rate; the main disadvantage is that interviewees' limited patience restricts the duration of the call and interview. Therefore, it's vital to design a suitable questionnaire considering as many potential factors as possible. We refer to the explanations for the annuity puzzle in literature, which are considered to be potential determinants.

The questionnaire consists of two parts and 13 questions in total due to limited call time, with the first part, focused on interviewees' pension investment and withdrawal preferences, the second part on individual concerns such as liquidity concerns, investment attitudes, and medical concerns. Apart from the annuity or lump sum options, the survey considers several aspects of pension withdrawal behaviors, including attitudes towards installments, expected term and increasing payment stream, etc. Samples are collected from three biggest cities in China: Beijing, Shanghai, and Guangzhou. There are two reasons for selecting these three cities: first, these three cities located in the north, center, and south of China, which guarantees geographical diversity; second, since occupational pension is not mandatory for enterprises, its coverage is still limited in China. So far, most enterprises providing occupational pensions are located in developed cities. Also, for the efficiency of the survey, our samples are selected within these biggest cities in China.

A primary description of the collected data is given as follows. The sample number of three cities reaches a proportion of 5:3:2 respectively, which approximates the ratio of population (including estimated permanent and transient population) of three cities. The gender ratio approximates 1:1, with slightly more male participants. Most of the interviewees are over 45 years old, close to retiring age, considered to have efficient considerations of retirement planning. The specific description of sample distribution is as follows in Table 3.

Table 3

Sample distribution summary. Source: Authors' calculations

Variable	Percentage
Cities:	
Beijing	53.70%
Shanghai	30.30%
Guangzhou	16%
Gender:	
Male	54.40%
Female	45.60%

4.2 The data and variables introduction

4.2.1 The dependent variables: investment and withdrawal preferences

This paper is interested in employees' investment and withdrawal preferences in several aspects. Participants are asked about their preferences with respect to how risky the investment portfolio they favor and how they like different withdrawal arrangements. For investment preference, four options (from least risky to most risky) are given as choices. Similarly, preferences about different arrangement aspects, including payment term, installment, annuitization and increasing payout streams, are asked with sorted choices. There are five preferences (dependent variables), whose specific summary descriptions are given as follows in Table 4.

Table 4

Investment and withdrawal preferences summary descriptions.

Source: Authors' calculations.

Investment and withdrawal Preferences	Options and Distribution			
	Scale 1	Scale 2	Scale 3	Scale 4
How risky is preferred investment strategy	57.10%	33.30%	8.40%	1.20%
How long is preferred payment term	10 years	15 years	20 years	30 years
	25.70%	24.70%	34.60%	15%
	Prefer	Indifferent	Not prefer	
Preference about annuitizing their pension amount	17.70%	28%	54.30%	
Preference about installment payment	33.70%	20%	46.40%	
Preference about increasing payout stream	77.60%	--	22.40%	

(1) Investment preference. For preferred investment strategy, most interviewees prefer conservative investment choice. To make the question understandable, the preferred extent of risky investment strategies are asked and options are designed in the form of scales, with scale 1 represents the least risky, while scale 4 the most. Results show that 57.1% choose the least risky investment strategy, 33.3% choose scale 2, 8.4% scale 3, only 1.2% choose the riskiest strategy.

(2) Annuity preference. Asked about the preference for choosing annuity at retirement, 17.7% of interviewees prefer annuity. This proportion is revealed to be rather low, given 54.3% hold the opposite preference and is unwilling to annualize their pension assets. And a considerable 28% choose the default option, who are indifferent to whether they should annualize or not. The result shows that the default withdrawal option has a considerable impact. This statistic first indicates the existence of an annuity puzzle in China and shows the contrast of DC plan annuitization rate between China and US., which holds a proportion of 10% (Johnson et al., 2004). Moreover, the 28% indifferent group, who follows a default option, is found to be close to the result of Madrian and Shea (2000) that default withdrawal option increases annuitization rate of DC plans by 25%.

(3) Installment payment preference. Question about preference for installment payment of pension is asked, the result shows the relatively high popularity of installment payment among employees. According to the survey, 33.7% of interviewees don't prefer installments payment, 46.4% favors installments, with the remaining 20% following default option. Such a considerable proportion justifies the importance of default setting in pension plan again with Chinese data.

(4) Payment term. As for the payout term they expect, the most preferred payout term is shorter than 20 years. Options on withdrawal terms in the questionnaire are 10 years, 15 years, 20 years and 30 years, with most interviewees choose the 20-year term (34.6%), then 10-year (25.7%), then 15-year (24.7%), finally 30-year (15%).

(5) Increasing payout stream preference. Whether one prefers the increasing payout streams is also asked, the result shows increasing payout streams dominates a steady one during the payout phase, consistent with the finding of Beshears et al. (2014). Given the same pension amount, 77.6% of the interviewees prefer increasing payout streams, while the rest prefer steady payout streams each year (22.4%).

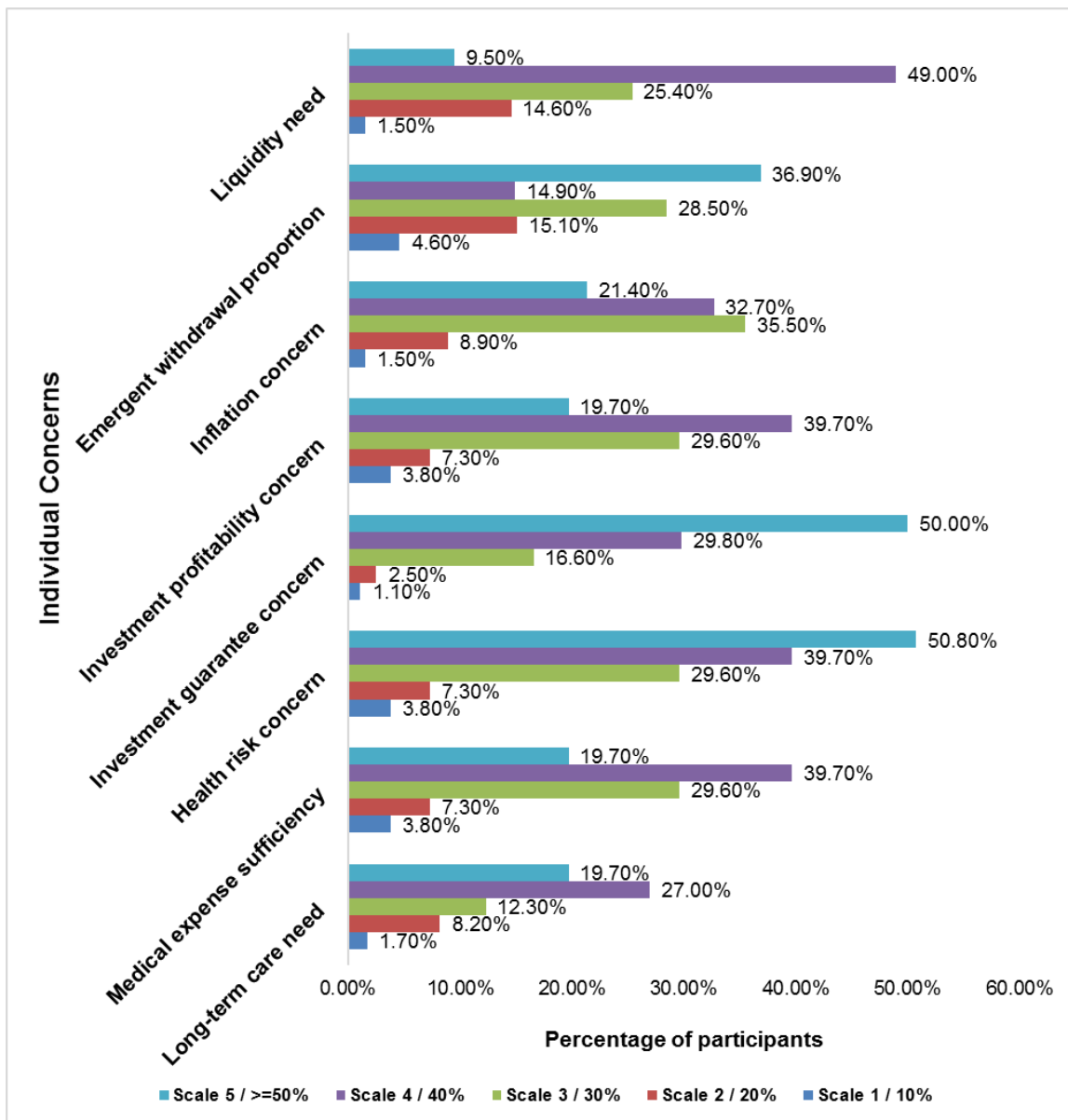
4.2.2 The explanatory variables: individual concerns

The explanatory variables come from the questions designed to assess the degree of different concerns of employees. These interested concerns are proposed by previous studies on optimal pension investment the annuity puzzle, which provide insights for exploring retirees' investment and withdrawal preferences at retirement. Hence, it is reasonable to list them as potential determinants for explaining employees' investment and withdrawal behavior.

These concerns include liquidity concerns, investment attitudes, and health-related need concerns. For each concern, there are more than one variables, each measures a certain aspect of the given concern. Sample summary of potential explanatory variables and concerns are shown in Figure 5.

Figure 5: Distribution of explanatory variables: individual concerns.

Source: Authors' calculations.



Explanations of each concern and variable are in the following.

Liquidity concerns

Lump sum withdrawal of pension better fulfills liquidity needs after retirement than installment arrangements. Beshears et al. (2014) discover that liquidity requirement works as an important influencing factor in pension withdrawal: when partly annuitization is allowed to maintain some liquidity, the percentage of choosing lump sum withdrawal drops from 49.8% to 20%.

Our survey considers two variables measuring employees' liquidity concern, including the existence of liquidity concern (liquidity need), and extent of the concern (emergent withdrawal proportion). Summary of liquidity concerns is presented as follows.

(1) Liquidity need. Asked about the extent one concern about liquidity need (unexpected emergent need of money) after retirement, most interviewees show to worry about emergent liquidity demands. The question in the survey, asked about employees' preference over such an option: allow one to early withdraw full or part of his pension account for emergent liquidity needs during the payout period. The options are scaled from 1 to 5, with scale 1 meaning the least preferred, while scale 5 the most. In total, 83.9% are in fond of such emergent liquidity, the most preferred (scale 5) account for 9.5%, second most (scale 4) 49%, preferred (scale 3) 25.4%, less preferred (scale 2) 14.6%, and least preferred (scale 1) 1.5%.

(2) Emergent withdrawal proportion. Also, the extent of one's potential liquidity need is also considered: "what's your preferred proportion if an early withdrawal is possible in case of an emergent liquidity?". Most interviewees prefer high withdrawal proportion, indicating high financial impacts of potential liquidity need after retirement. The choices of proportion options listed are: more than 50% (including 50%), 30%, 20%, 40% and 10% of remaining account, and the percentage of interviewees are 36.9%, 28.5%, 15.1%, 14.9% and 4.6%, respectively.

Investment attitudes

Attitudes towards pension investment influence both the preferred investment strategy and annuitization needs. Obviously, individual attitudes towards pension investment, including the preference for guarantee and return feature, affect one's investment strategy. According to framing hypothesis proposed by Brown et al. (2007), individual perception of annuitization can be divided into consumption mode and investment mode: in the consumption mode annuitization is very attractive, which is consistent with Yaari (1965); however, in investment mode annuitization loses attractiveness from the perspective of return and risk. It's also pointed out by Beshears et al. (2014) that retirees' attitudes towards investment affect willingness to annualize.

Concerns over inflation also affect the annuitization decision for the reason that installment payments lose purchase power. According to Beshears et al. (2014), 50% of the interviewees prefer an increasing payout stream (2% each year) to match inflation, and inflation concerns have a significant effect in regression result.

Very often participants are allowed to select a pension portfolio during the accumulation phase, and individual attitudes towards inflation and investment are critical factors. We consider three main concerns of participants in the survey: how one views the inflation (inflation concern), and the importance of pension portfolio's return features including guarantee and profitability (investment profitability concern & investment guarantee concern).

(1) Inflation concern. Most interviewees show concern about inflation. In the questionnaire, the question “what extent of importance do you think that inflation will affect your pension” is asked. Answers are also set in the form of scale, with scale 1 being the least influenced, scale 5 the most. 89.6% of the interviewees believe that inflation's effect on purchasing power is important (scale 3, 4 and 5), 21.4% extremely important (scale 5). Comparatively, 8.9% of interviewees regard it as little important (scale 2) and 1.5% not important (scale 1).

(2) Investment profitability concern and investment guarantee concern. The importance of how one view about profitability and guarantee feature, are asked with scales. In general, the interviewees attach more importance to the profitability feature than guarantee feature of pension investment. The results show that, though 89% of the interviewees regard it as important matter (scale 3, 4 and 5), only 19.7% view the return as extremely important (scale 5). Comparatively, guarantee feature of investment are relatively more emphasized: 96.4% of the interviewees consider it as important (scale 3,4 and 5) with 50% of the interviewees regard it as extremely important (scale 5).

Health-related concerns

Unexpected medical expense, including long-term care risk, still remains as a major uncovered risk for most retirees. Studies show that health risk and long-term care are considerable risks for retirees. 60% of elders reaching 65 need long-term care service (Warshawsky et al., 2000), while 40% of them need to stay in a nursing home with an average time of 2.4 years (Murtaugh et al., 1997). Moreover, long-term care is an expensive cost and uncovered risk for most elders, which greatly threatens their welfare. In the US only 4% of long-term expenditures are paid by private insurance, while one-third are paid from out of pocket (Congressional Budget Office, 2004; Brown et al., 2007). The updated number in Francesca et al. (2011) shows private long-term care insurance accounts for less than 8% of total LTC expenditures.

Several researchers observe that such concerns over uncertain health expenses have effects on participants' preferences about both investment and annuitization. Pang and Warshawsky (2010) show that the risk of uncertain uninsured health expenses affects the optimal portfolio strategy for retirees, by driving investment portfolios to shift from risky equities to safer assets. Ameriks et al. (2011) indicate that potential need of retirees for long-term care is an important cause for explaining the annuity puzzle.

Similar to the US, retirees in China are also facing uncovered medical expense risk, like the expenditure of long-term care. Three variables measuring different aspects are considered, including attitudes towards medical expense and long-term care, are considered and also asked with choice with scale in the questionnaire, whose summary is as follows.

(1) Health risk concern. This variable measure concern towards health risk in general, which can be influenced by many factors like individual health condition, etc. Most interviewees pay well-rounded attention to the health risk after retirement. 50.8% of interviewees' attach great importance to health risk (scale 5), with a decreasing trend 27%, 12.3%, 8.2%, 1.7% for scale 4 to 1, respectively.

(2) Medical expense sufficiency. As for the sufficiency to cover medical expense after retirement, most participants believe their retirement income cannot cover medical cost fairly. Answers for the question whether retirement income can cover the cost of medical expense after retirement, are also in the form of scale. Scale 1 means extremely deficient, while scale 5 means fairly enough. 73.3% of the interviewees believe that retirement income cannot cover the cost of long-term care (scale 1 and 2), 45.6% extremely deficient (scale 1), 27.7% not enough (scale 2). Comparatively, 18.9% believe that their retirement income is enough (scale 3), 4.8% quite enough (scale 4) and 3% fairly enough (scale 5).

(3) Long-term care need. Variable long-term care need, measures employees' concern for inability after retirement and desire for long-term care coverage. In regard to the needs and purchase intention of long-term care insurance, employees show stronger acceptance than rejection. The survey shows that, 4.6% of the interviewees have the most purchase intention (scale 5), 34.4% the second most (scale 4), 33.2% do not care (scale 3), 24.7% unnecessary (scale 2), and 24.7% have the least purchase intention (24.7%).

Gender

There is evidence showing gender's effect on some financial decisions including pension investment. Sunden and Surette (1998) find women tend to be more risk-averse in pension investment and invest less in the risky portfolio (mostly stocks) than men. Charness and Gneezy (2012) analyze the results of 15 different studies on risk-taking in investment and conclude that women are more risk averse than men. However, Schubert and Brown (1999) show a different result that women do not generally make less risky financial choices than men under controlled economic conditions.

The gender is also considered as the potential explanatory variable in the survey, its summary is listed in Table 4. There are slightly more male than female: male participants account for 54.36%, and female account for 45.64%.

Default option

With data of Swiss employers' pension, Bütler and Teppa (2006) observe that default option is highly influential in withdrawal decision-making in most cases. Madrian and Shea (2000) show that when annuitization is set as the default option, the portion of choosing annuitization increases by 25%.

As shown in Table 4, the default option of the preferences about annuitization and installment payment account for a considerable proportion. The statistics have shown the effect of the default option already. Also, to take account of the influence of the default option, we consider the indifference state as the middle state with value 1 of the ordered categorical variables, annuity preference, and installment payment preference.

Others

There are also some other explanations. Mitchell et al. (1999) observe adverse selection in the annuity insurance market. Finkelstein and Poterba (2004) also discover the existence of an obvious adverse selection problem by studying the relationship between individual posterior mortality and features of chosen pension using UK's data. Also, Finkelstein and Poterba (2004) argue that bequest motives contribute to a deficient need of annuity theoretically. Inkmann et al. (2011) find that the bequest motive harms elders' pension annuity participation using the UK's data. However, a dispute on the effect of bequest motive still exists. Hurd (1987) compares fortune accumulation and consumption between elders with and without children, finding that bequest motive has little effect on annuity decision. Bernheim (1991), Dushi and Webb (2004) and Beshears et al. (2011) find that compulsory annuitization of some other pensions could explain low annuity purchase of DB and DC plans.

These additional explanations are not considered in the questionnaire for some reasons. The reasons for waiving the adverse selection and bequest motive, are that during the trial interview we found that most interviewees are sensitive in mentioning expected life, death-related issues and tend to avoid privacy including marriage status, children, and salary as well. Besides, the number of children are used as an indicator of bequest motive like Hurd (1987), while it does not apply in China because of the 'one-child' policy.

It is a limitation of our sample that not all possible determinants could be taken into account in the survey, our survey still covers the main factors. Hence, researches on understanding pension participants' behavior are expected with further evidence, especially in countries with the immature pension system.

Empirical analysis

5.1 Dependent and explanatory variables summary

The explanation and source of dependent and explanatory variables are given in Section 4.2, except the gender dummy variable. The gender dummy variable, take a value of 1 for male, and 0 for female. Table 4 summarizes all variables, including dependent and explanatory variables, which are applied in the regression. Given all the variables are in the form of scales and ordinal categorical variables, whose value ranges, the min and max, are as shown in Table 5.

Table 5 Summary statistics of dependent and explanatory variables.

Source: Authors' calculations.

Variables	Mean	Median	Standard Error	Min	Max
investment preference	1.5293	1	0.696	1	4
annuity preference	0.5837	0	0.7773	0	2
installment payment preference	1.1201	1	0.891	0	2
payment term	2.3827	3	1.0043	1	4
increasing payout stream preference	0.7947	1	0.4042	0	1
liquidity need	3.7891	4	0.6293	3	5
emergent withdrawal proportion	3.6313	3	1.2191	1	5
inflation concern	3.7416	4	0.9411	1	5
investment profitability concern	3.6843	4	0.9771	1	5
investment guarantee concern	4.2818	5	0.849	1	5
health risk concern	2.6047	3	0.8732	1	5
medical expense sufficiency	1.8478	1	1.0079	1	5

long-term care need	3.2458	3	0.9318	1	5
gender	0.5436	1	0.4981	0	1

5.2 Regression and result analysis

This section presents the results of an ordered logistic analysis applied to the sample. Given that both dependents and explanatory variables are ordinal categorical, ordered logistic regression is a suitable regression model for ordinal dependent variables. Therefore, we analyze influencing factors of enterprise pension investment and withdrawal preferences using ordered logistic regression.

Table 6 reports the regression results of potential factors on employees’ investment and withdrawal preferences for enterprise pension. There are totally five different dependent variables including annuity preference, installment payment preference, payment term, increasing payout stream preference, and investment preference.

Table 6 Results from ordered logistic regression for the full sample

Source: Authors' calculations.

		Dependent Variable				
		Investment	Withdrawal			
Concerns	Variables	investment preference	annuity preference	installment payment preference	payment term	increasing payout stream preference
	liquidity need	0.053	0.052	-0.241**	0.240**	0.170
		(0.126)	(0.127)	(0.119)	(0.117)	(0.161)
Liquidity concerns	emergent withdrawal proportion	-0.044	-0.119*	-0.243***	0.245***	0.017

		(0.066)	(0.065)	(0.062)	(0.060)	(0.081)
	inflation concern	0.053	0.015	0.014	0.194**	0.150
		(0.092)	(0.091)	(0.087)	(0.082)	(0.112)
	investment profitability concern	0.207**	0.052	-0.283***	-0.102	-0.144
Investment attitudes		(0.088)	(0.086)	(0.086)	(0.077)	(0.116)
	investment guarantee concern	-0.404***	0.245**	0.157	0.123	0.137
		(0.105)	(0.110)	(0.100)	(0.095)	(0.130)
	health risk concern	-0.325***	0.128	-0.061	-0.109	-0.312***
		(0.092)	(0.092)	(0.089)	(0.083)	(0.114)
Health -related concerns	medical expense sufficiency	-0.111	0.113	-0.028	0.056	-0.212**
		(0.080)	(0.075)	(0.072)	(0.071)	(0.092)
	long-term care need	-0.015	0.059	0.091	0.074	0.219**
		(0.085)	(0.085)	(0.081)	(0.076)	(0.109)
Gender	gender	-0.196	-0.226	-0.363**	-0.040	-0.156
		(0.153)	(0.151)	(0.147)	(0.139)	(0.193)
	Observations	716				

This table reports the coefficient estimates from ordered logistic regressions of different preferences on a set of potential explanatory variables. Standard errors are in parentheses. Significant level: *** p<0.01, ** p<0.05, * p<0.1.

5.2.1 Investment preference

The result shows that investment strategy choices are affected by both investment attitudes and health risk concern as in Table 6.

Unsurprisingly, individual concerns towards investment profitability and guarantee affect riskiness of preferred investment strategy positively and negatively (significant at the 5% and 1% level), respectively. Employees who attach greater importance to pension investment profitability are more likely to prefer risky investment, while those who attach greater importance to the investment guarantee concern are more likely to be conservative investors. This result is consistent with the decision of rational investors.

Second, health risk concern contributes to one's less risky investment decision. The coefficient of health risk concern is -0.325 (significant at the 1% level), indicating that retirees with higher concern for health risk are less likely to choose a risky investment strategy. This is understandable in the sense that medical risk concern makes employees more risk-averse in financial decisions. This finding shows that China's retirees' behavior is consistent with Pang and Warshawsky's study (2010).

However, Chinese data shows that gender difference doesn't have a significant effect on investment decision: women do not make less risky financial choices than men in the pension investment. This result is contrary to the conclusion of Sunden and Surette (1998) and consistent with Schubert and Brown (1999).

5.2.2 Annuity preference

Table 6 shows two significant factors affecting employees' preference for annuitization: emergent withdrawal proportion and investment guarantee concern. First, increasing emergent withdrawal proportion decreases annuitization preference (significant at the 10% level). The emergent withdrawal proportion measures the individual extent of potential liquidity needs, the larger emergent withdrawal proportion one expects, the worse financial impact an emergent liquidity might bring. This finding coincides with Beshears et al. (2014) that liquidity needs influences withdrawal behavior. Second, concern towards guarantee feature of investment significantly increases employees' annuitization preference (significant at the 5% level). This finding supports the framing hypothesis of Brown et al. (2007) in the sense that the more important one views investment guarantee feature of a pension fund, or the less one expects high investment return, then the more likely he considers annuity under consumption mode and prefer annuity.

Therefore, employees who have less unexpected financial needs and are more conservative in pension investment by avoiding potential loss, show higher annuity preference.

5.2.3 Installment payment preference

Emergent withdrawal proportion and liquidity need measure different perspectives of liquidity concerns. With regard to installment payment preference, these two variables lower installment payment preference (significant at the 1% and 5% level, respectively). It's shown that emergent liquidity concern decreases employees' installment payment preference, which might indirectly lower employees' acceptance of annuity. Moreover, emergent withdrawal proportion also significantly affects employees' annuity preference. Therefore, liquidity concern remains a critical factor influencing employees' pension withdrawal behavior in China.

Second, employees with a higher request for investment return tend to avoid installment payment and favor lump sum withdrawal. The regression result shows that coefficient of investment profitability concern is -0.283 (significant at the 1% level), indicating that higher individual expectation of pension investment return leads to less patience and less acceptance of installment payment. A possible explanation is that employees, whose expectation of return cannot be fulfilled by the pension fund, prefer a lump sum withdrawal in order to arrange investment themselves. This result works as further evidence confirming the framing hypothesis (Brown et al., 2007), and influences of investment preference (Beshears et al., 2014) in the literature.

Interestingly, the regression shows that gender difference affects individual preference for installment payment (-0.363 significant at the 5% level). This finding indicates that women seem to be less time-patient than men in pension withdrawal and tend to prefer a lump sum withdrawal. Given women are believed to live longer, this observation is quite puzzling. Hence, Chinese data found no gender effect in annuity preference and investment, but women are found less in favor of installment payment than men.

5.2.4 Payment term preference

As for the expected payment term, concerns towards liquidity and inflation are revealed to influence employees' payment term preference (significant at the 1% and 5% level, respectively). The effect of liquidity concerns, as expected, is the same as that of installment payment preference: the higher concern for emergent liquidity, the shorter payment term employees expect. Summarizing the effect of liquidity concerns, a reasonable explanation is that higher liquidity concern results in lower time patience, which explains why employees prefer lump sum withdrawal and shorter payment term.

Second, it is notable that in Table 6, the coefficient of inflation concerns is 0.194 (significant at the 1% level), suggesting that inflation concern contributes to a longer expected payment term. This is puzzling from intuition, for in most cases inflation concern drives people to shorter duration payment streams, e.g. shorter payment term, to avoid losing purchase power. China's "inflation puzzle" might be explained by that: it's widely believed by interviewees that the guaranteed return of pension fund is above the inflation rate, because the interviewee cohorts experienced a fast-growing period of China, with a high asset return. Hence, this belief brings interviewees an illusion that that inflation is always lower than the guaranteed return. This might be a possible reason for that a longer payment is favored by employees with more inflation concern.

5.2.5 Increasing payout stream preference

Table 5 shows the effects of uncertain medical expenditure concerns, including health risk concern, medical expense sufficiency, and long-term care need. Beshears et al. (2014) conclude that increasing payout stream is preferred due to that it deals better with inflation risk. However, China's case shows this preference results from medically related concerns.

First, health risk concern reduces increasing payout stream preference (significant at the 1% level), showing that employees who attach more importance to health risk are less in favor of increasing payout stream. Second, individual sufficiency for medical expense also has a negative influence on the acceptance of increasing payout stream (significant at the 5% level). That's, increasing payout stream is more favored by those who are less sufficient in medical expense. Third, the long-term care need increases employees' intention to accept increasing payout stream arrangements.

To explain, increasing payout stream preference is revealed to be resulted from medical expense risk, with the tradeoff between short-run and long-run influence. Health risk concern reduces participants' preference for increasing payout stream, which can be explained by similar reason with liquidity concern: the unexpected feature of medical risk drives the employees into a myopic mood and encourages them to make withdrawal decision in a short run. This explanation also fits for the health risk concern's effect on investment decision. However, the other two concerns drive employees to make decisions for the long run. To the employees, increasing the payout stream arrangement helps them relieved of financial stress in the later stage of their retirement. This increasing payment arrangement is more for those facing long-run risk, like long-term care risk. Therefore, employees with more long-term care need and less medical expense sufficiency, tend to favor increasing payout stream.

Conclusion

To the best of our knowledge, our paper is the first to provide empirical analysis on pension investment and withdrawal behavior with Chinese data. This paper has several novelties and contributions to the literature. Though annuity puzzle has been in the academic scope for a long time, there is little literature focusing on annuity puzzle or pension withdrawal behavior of immature pension system or developing country like China. We first show the existence of the annuity puzzle in China and reexamine proposed factors in literature with Chinese data. Apart from the annuitization decision, our survey is also interested in analyzing participants' investment and other withdrawal behaviors. Such preferences are important for understanding retirees' behaviors comprehensively. We analyze the influencing factors of employees' behaviors, which provide critical and practical insights for occupational pension design.

China's findings show some consistencies with the literature, with respect to annuitization behavior. Liquidity concern remains as the main concern weakening individual intention to annuitize pension. Also, the effects of participants' investment attitudes, that pension investment guarantee concern increases acceptance of annuity while investment profitability concern has the opposite effect, support framing hypothesis of Brown et al. (2007). As for gender effect, we found no gender effect in annuity preference and investment preference, and women are found less in favor of installment payment than men. The result that women do not generally make less risky financial choices than men, is consistent with Schubert and Brown (1999).

The results also show how liquidity concerns and health-related concerns are affecting participants' preferences. In addition to weakening individual intention to annuitize pension, liquidity concern also affects other withdrawal arrangement preferences: installment payment preference and payment term. It's revealed that individuals with higher liquidity concerns prefer shorter withdrawal duration by avoiding installment payment and longer term. One possible explanation for this phenomenon is that liquidity concern reduces participants' time patience.

Comparably, the effect of health-related concerns is more complicated, proved to affect both preferences for investment strategy and payout streams. Different aspects of medical expense concern affect participants' decision making in different ways. In general, the unexpected feature of health-related concerns, the health risk concern, drives the participant to be more risk-averse in investment and less in favor of increasing payment streams. Also, aspects of health-related concerns which result in long-term financial effect like the long-term care need, make participants think in the long run, like favoring increasing payout streams. The findings indicate that uncertain medical cost risk and financial sufficiency remain important factors of employees' considerations in the financial arrangement of their pension. Moreover, different from literature's findings, Chinese data shows health-related concerns, instead of inflation concern, are shown to determine the preference for increasing payout streams.

These findings are practical for pension regulators and enterprises like those in China, who are self-responsible for designing occupational pensions for employees. Our results provide several scientific guidance and implications for occupational pension design. First, to promote the acceptance of annuity, installment payment, and longer payment term, employers need to reduce employees' liquidity concern. One suggested design is that during the payout phase of installment or annuitization, pension plans allow retirees to advance an early withdrawal from remaining account, capped by proportion or amount, in case of emergent liquidity demands. Similar options, like a loan from the pension account, can also be considered in pension design to fulfill liquidity demand. Second, many factors like individual health concern also affect one's preferred investment strategy. It's suggested that enterprises take considerations of employees' diversity, like different individual health concerns, into account, and provide suitable choices for their employees. Third, payout arrangements like increasing payout streams should be provided to the retirees, especially those facing risks with long-run financial effects.

This paper aims to understand pension participants' investment and withdrawal behaviors and provide guidance and implications for pension plan design, with Chinese data. We analyze the influencing effects of several proposed behavioral factors on different preferences. We hope to supplement existing literature with China's evidence and contribute to enterprises' better tailoring occupational pension plan. Also, further researches on understanding retirees' behaviors, especially countries with the immature pension system, are expected.

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About The Society of Actuaries

The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world dedicated to serving more than 30,000 actuarial members and the public in the United States, Canada and worldwide. In line with the SOA Vision Statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and nonactuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues, and thereby provides value to stakeholders and decision makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

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