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ARTICLE

The impact of old-age pensions on the happiness level of elderly people – evidence from China

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Abstract

As an important source of income for elderly people, pensions have a great impact on their wellbeing. There are three different pension systems in China (the Old-age Insurance System for Government Agencies and Institutions (OISGAI), the Basic Old-age Insurance System for Urban Employees (BOISUE) and the Social Insurance of the Old-age Pension for Urban and Rural Residents (SIOPURR)). This study empirically analyses the impact of various pension types on the happiness of elderly people in China and further explores the potential impact mechanism using the 2014 China Family Panel Studies data. The study suggests that first, receiving pensions from OISGAI, BOISUE and SIOPURR is positively correlated with the happiness level of elderly people. Second, the sense of happiness of elderly people who receive BOISUE is higher than that of those receiving SIOPURR, which is mainly caused by the difference in the level of pension benefits. When the level of benefits is controlled for, there is no significant difference between these two groups. Third, when they have the same level of pension benefits, the happiness of elderly people who receive OISGAI is significantly higher than that of those who receive pensions from the other two systems, which is possibly related to the hidden 'special' government guarantee and the difference of the growth rate of the benefit level.

Keywords: ageing; pension type; happiness level; elderly people; pension benefits level; government guarantee; China

Introduction

Happiness is not only the ultimate goal of human pursuit but also one of the eternal themes explored by our society. Currently, it is estimated that over 33.1 per cent of the countries around the world have entered a status of ageing society and this proportion will increase further to 42.5 per cent in 2050 (United Nations, 2015). Identifying the influential factors of elderly people's sense of happiness would help researchers understand the social psychology of elderly people and improve their quality of life. In recent years, with the trend that most countries in the

world are facing the threat of ageing societies, many scholars have carried out bountiful research on this topic.

Factors affecting the happiness of elderly people

Since the 1970s, economists have played a crucial role in studying the factors affecting happiness. Income (absolute and relative) (Easterlin, 1974, 1995; Oreopoulos, 2007; Daniel and Angus, 2010; Sun *et al.*, 2016; Hauret and Williams, 2019; Muresan *et al.*, 2019), inflation (Tella *et al.*, 2001, 2003), urbanisation (Hudson, 2006; Knight *et al.*, 2009) and other factors have been identified. Scholars have agreed that inflation and urbanisation have a significant negative correlation with the sense of happiness, while the impact of income on happiness has been debated. The Easterlin study in 1974 found that an increase in per capita income was not reflected in an increase in happiness, which led to the famous 'Easterlin Paradox' (Easterlin, 1974).

Some scholars have used groups of elderly people as the research object and have conducted comprehensive and meticulous research on the factors affecting their sense of happiness. Studies have found that the impact of income on the happiness of elderly people marginally declines. Meanwhile, as the marginal happiness based on income diminishes, the influence of other non-income factors on the happiness of elderly people is gradually enhanced. These factors have been highlighted: demographic characteristics, socio-economic status, self-evaluation health status, religious beliefs, neighbourhood trust, social support, *etc*. Some scholars have found that among these factors, good health (physical and mental health), stable marriage and a high level of education are conducive to enhancing the happiness of elderly people (Graham *et al.*, 2011; Oshio and Urakawa, 2014; Sun *et al.*, 2016; Malone and Wachholtz, 2017; Kislev, 2018). Religious beliefs and trust in the neighbourhood also contribute to the improvement of elderly people's sense of happiness (Helliwell, 2003, 2010; Li *et al.*, 2005; Lu and Gao, 2017; Park, 2018; Devine *et al.*, 2019). Social networks and social support are also important in increasing their happiness level (Chan and Lee, 2006; Borgonovi, 2008; Yiengprugsawan *et al.*, 2012).

In addition to studying the above individual factors, scholars have also paid attention to factors affecting elderly people's happiness from the perspective of external policies. Studies conducted by Tran *et al.* (2017) and Keng and Wu (2014) have shown that external health insurance policies, the coverage of health insurance and the availability of medical services are significantly correlated with the happiness of elderly people.

Impact of old-age pensions on the happiness of elderly people

As an important source of income for elderly people, what kind of impact will old-age pensions have on their happiness has also attracted the attention of scholars, but existing research has provided varied conclusions. Sasaki *et al.* (2018) pointed out that as people's life expectancy continues to increase, elderly people who rely solely on personal savings are facing higher risk of poverty, and pensions, as an important source of income for elderly people, can effectively reduce this risk

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and improve life satisfaction. Gorry *et al.* (2018) found that benefiting from Social Security and Defined Benefit pension plans can improve elderly people's mental health and life satisfaction. Liu and Liu (2017) studied the effect of the new rural social endowment insurance for rural residents on subjective welfare and found that the new rural insurance can significantly improve the life satisfaction of elderly people. Wang *et al.* (2018) used the ordered logit model and found that the new rural social endowment insurance for rural residents can significantly improve the life satisfaction of elderly people. Schatz *et al.* (2012) studied the impact of South Africa's non-contributory pension system on the happiness of rural elderly people. The study found that pensions can generally improve the economic welfare of the elderly population and improve their happiness level in a short period of time. However, in the long run, its role may be limited. Park (2018) explored the impact of South Korea's basic old-age pension on the happiness of elderly people, and the results showed that the basic pension system was negatively correlated with elderly people's wellbeing.

A few scholars further explored the impact of different types of pension systems on older people's sense of happiness. Shin and Ercolano (2018) used the optimal life model to analyse the impact of a public pension system and private pension savings on the longevity and happiness of elderly people. The study found that the public pension system can extend life expectancy but did not increase the happiness level and that under the constraints of the government budget, the public pension system cannot improve the level of happiness compared with private pension savings. Sasaki *et al.* (2018) compared the impacts of the 'national pension plan (lowest level of pension)', 'employee pension and mutual aid pension plan (moderate pension)' and 'enterprise pension plan (highest level of pension)' on elderly people's sense of happiness in Japan. The study found that the higher the level of pension benefits was, the more the pension system could enhance the happiness of elderly people.

Introduction to China's old-age pension policy

China has the largest population of elderly people in the world. The Fifth National Population Census of China, which was carried out at the end of November 2000, showed that the population over 60 years old had reached 130 million people, accounting for 10.2 per cent of the total population. In accordance with the statistical standards of the United Nations, China has entered an ageing society. Since the beginning of the 21st century, the number of elderly people in China has soared. According to the National Bureau of Statistics of China, the number of people over 60 years old reached 249.49 million in 2018, accounting for 17.9 per cent of the total population.

To compensate for the lack of income among the elderly population and ease their stress related to trying to survive, the Chinese government has established three social pension insurance systems: the Old-age Insurance System for Government Agencies and Institutions (OISGAI), the Basic Old-age Insurance System for Urban Employees (BOISUE) and the Social Insurance of the Old-age Pension for Urban and Rural Residents (SIOPURR).

The OISGAI system was established in the 1950s to solve the problem of pension security for civil servants and staff members who are governed by civil servant law.

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Individuals who receive this type of pension do not need to pay any insurance fees, and the pensions issued by the system are directly borne by state financial funds. The insured will receive a monthly pension income upon retirement and the payment standard is the last month's salary before retirement (about 50–90%) determined by his or her participation period, job title, job title level, salary level and age.

The BOISUE system was established in 1997 with the aim of co-operating with the reform of state-owned enterprises at that time and to help state-owned enterprises adapt to the market environment and economic system, and provide endowment insurance for the urban employees of state-owned enterprises. According to the policy, this system is for all employees of urban enterprises and uses a pooling model that combines social pooling and personal accounts, providing insurance at the local, municipal or county level. The insurance costs are co-funded by the enterprises and employees in proportion, which means the enterprises put 16–20 per cent of the employee's salary into the social pooling (the proportion of the contributions varies in each region), and the individual pays 8 per cent of his or her salary into a personal account. Insured persons can receive a monthly pension after 15 years of contributions. The level of pension is determined by the period of participation and the number of years of contributions made by the insured, and is paid monthly based on a certain proportion (about 40%) of the social average salary in the unified area.

To establish basic living standards for elderly rural residents, the Chinese government established the new rural social insurance of the old-age pension in 2009. The system is a combination of individual contributions, collective subsidies and government allowances. The benefits of the new rural social insurance of the old-age pension consist of basic pensions and individual account benefits. In 2011, the government established the social insurance of the old-age pension for urban residents for urban non-employed residents, aiming to solve their problem of old-age care. Moreover, in 2014, the Chinese government decided to merge the new rural social endowment insurance and urban residents' social endowment insurance and establish the national unified SIOPURR. To date, China's social pension insurance system has achieved universal coverage. The SIOPURR system is managed by a combination of social pooling and individual accounts. Pension insurance premiums consist of individual contributions and special government subsidies. The insured who are age 60 or over can receive a monthly pension after paying the insurance premium for 15 years.

China has established a social pension insurance system covering all people through the above-mentioned three types of old-age pension. However, these three systems are very different, mainly in terms of the level of pension benefits. Among the three pensions, OISGAI has the highest level of pension benefits, BOISUE is second and SIOPURR is the lowest. It stands to reason that as one of the important sources of income for elderly people, the level of pensions benefits may affect their sense of happiness. A high level of pension benefits can improve the purchasing power of the elderly population and to a certain extent help them improve their quality of life and thus improve their level of happiness (Sasaki *et al.*, 2018), and *vice versa*.

Second, the level of government guarantees differs among the three systems. Of the three systems, the OISGAI is essentially all paid by the government.

The pension payments are financed by the government, which is a strong guarantee. The financing of the SIOPURR and BOISUE systems is, however, mainly borne by the insured themselves. The government grants subsidies only when the system fails to make ends meet. Relatively speaking, the level of government guarantee is limited, and the pension fund may face the risk of shortfalls. China is a typical society with a strong government. In general, the Chinese people have 'super' trust in their government. Therefore, the higher the level of government protection for the pension system is, the more optimistic the public's expectation of the old-age pension, the fewer the concerns about receiving the pension in full and on time, and thus the greater the level of happiness of elderly people, and *vice versa*.

Third, in addition to the above two aspects, the three systems have significant differences in terms of the growth rate of the pension levels. Such differences will affect the expected income of elderly people and thus may have an impact on their sense of happiness.

Therefore, it is reasonable to say that the differences in the level of pension benefits, growth rates and government guarantees may have various effects on the happiness of older groups. The contracts used for each type of old-age pension in China provide a natural condition for us to study the impacts of the different pension systems on elderly people's sense of happiness.

In our review of the existing research, we find that most scholars pay attention to the impact of a certain pension system on the happiness of elderly people. Although a few scholars have explored the impact of different types of pension systems on the happiness level of older people, they mainly focused on pension benefits. The contribution of this paper is that, using the differences between each type of old-age pension in China, it not only compares the old-age pension's impact on elderly people's happiness in terms of the pension benefit level but also explains how the old-age group's trust in government and their expectations regarding pension income affect their sense of happiness from the perspective of government guarantee and pension growth rate behind the pension system.

Methods

Data

The data in this paper were obtained from the 2014 China Family Panel Studies (CFPS), which aims to reflect the changes of Chinese families by collecting data at three levels: individuals, families and communities. The CFPS survey covers various topics, such as family income, population mobility, marriage, social security and the sense of happiness. The CFPS data are currently representative of large-scale micro-integrated social survey data in China. The CFPS covers the country's 25 provinces/cities/autonomous regions and uses a multi-stage, implicit stratification and population-scale method that integrates urban and rural areas. The population of the sample collection area accounts for 94.5 per cent of the country's population. The data are currently representative of large-scale micro-integrated social survey data in China.

The CFPS database consists of four databases: a family database, an adult database, a children's database and a community database. Due to its research needs, this paper uses data from the adult database and the family database for the

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analysis. First, we matched the data from the adult database with those of the household database and deleted the duplicate sample values to obtain a sample size of 37,147. Based on the current age requirements for the Chinese old-age pension system, we deleted the samples that were younger than 60 years old.[1] To prevent data on commercial endowment insurance, enterprise supplementary pension insurance and other types of old-age insurance from interfering with this study, we retained only samples with social pension insurance or no pension insurance, and the sample size is 7,150. Finally, after deleting samples with missing data, we obtained a sample size of 5,360. This paper uses 5,360 samples to analyse the impact of the type of social pension insurance on elderly people's sense of happiness.

Dependent variable

The dependent variable of this study is elderly people's sense of happiness. This paper adopts the subjective question 'How happy do you feel?' to reflect the happiness of elderly people. The respondents chose their own status using a scale from 0 to 10, meaning that there were 11 levels of happiness from 'very unhappy' to 'very happy'. The measurement of subjective sense of happiness is relatively simple, but the indicator has high reliability and validity, and can accurately express personal feelings (Graham and Pettinato, 2001; Easterlin, 2003). As shown in Table 1, the average subjective sense of happiness of elderly people in China (as indicated by our sample) is 7.634.

Independent variable

The core independent variable of this study is the type of social pension insurance, measured according to answers to the question 'Do you have an old-age pension that you have started to receive?' in the CFPS data. The four types of answers are having no pension insurance or receiving an old-age pension from the OISGAI, BOISUE or SIOPURR. Table 1 shows that most elderly people, accounting for 46.9 per cent, receive a pension from the SIOPURR, followed by elderly people who receive a pension from the OISGAI, accounting for 19.5 per cent, and the proportion of elderly people who receive a pension from the BOISUE is 16.4 per cent. In addition, 17.3 per cent of elderly people do not have any old-age pension.

Control variables

To prevent deviations in the model estimates due to missing variables, three types of variables were controlled for in the empirical analysis: first, the individual characteristic variables, including age, gender, marital status, *hukou* and family size; second, the socio-economic status indicators, including the education level, the family monthly income (log), membership in the Communist Party or Communist Youth League, house asset (log) and total deposits (log); third, other variables that affect happiness, including the frequency of interactions with relatives and people in the neighbourhood, religious beliefs, self-rated health status, medical insurance and leisure activities. Considering the pension programmes are operated

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at the city or county level in China, the differences in the economic and cultural aspects of China's various counties or cities may have an impact on residents' sense of happiness, so in the empirical analysis, we controlled for the counties or cities where the elderly people were located. The definitions and descriptive statistics of the variables are shown in Table 1.

Model

The measured value of happiness in this study is from 0 to 10 and can be regarded as a continuous variable. Therefore, a linear regression model is used to estimate the effect of the type of social pension insurance on the happiness of elderly people. The model is set to:

$$happiness_i = \beta_0 + \beta_1 pensions_i + \beta_2 X_{i2} \ldots \beta_k X_{ik} + \varepsilon_i$$

where $happiness_i$ represents the level of happiness of the ith elderly person, $pensions_i$ represents the type of social pension received by the ith elderly person and $X_2 \ldots X_k$ represents the other control variables, namely the individual characteristic variables, socio-economic status variables and other variables that affect the sense of happiness. β_0 is the intercept term, β_1 is the correlation coefficient of the impact of pension type on the happiness of elderly people, $\beta_2 \ldots \beta_k$ is the correlation coefficient of other control variables on the happiness of elderly people and ε_i is a random error term.

Results

The impact of receiving a pension on the happiness of elderly people

Table 2 reports the ordinary least squares (OLS) estimation results of the impact of receiving social pension insurance on the wellbeing of elderly people. The benchmark variable is that no pension insurance is received. There are no control variables added in column 1, and the individual characteristic variables, socio-economic status indicators and other control variables that may affect the happiness of elderly people are added cumulatively in columns 2–4. The regression results shown in columns 1–4 show that the OISGAI, BOISUE and SIOPURR are positively correlated with the happiness level of elderly people. Specifically, under the same conditions, elderly people who receive a pension from the OISGAI are happier than elderly people with no pension by 0.375, and this result is significant at the 1 per cent statistical level. Receiving a pension from the BOISUE can increase the happiness of elderly people by 0.201, and this result is significant at the 5 per cent statistical level; receiving a pension from the SIOPURR can increase the happiness level of elderly people by 0.142, and this result is significant at the 10 per cent statistical level.

The regression results shown in Table 2 are mostly consistent with those of existing studies. The individual characteristics, socio-economic indicators and other controlled variables have a significant impact on the happiness of older adults (Graham and Pettinato, 2001; Knight *et al.*, 2009; Fang and Sakellariou, 2016; Sun *et al.*, 2016; Malone and Wachholtz, 2017). Specifically, compared with elderly

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Table 1. Variable definition and descriptive statistics

Variable	Definition	Observations	Mean	SE
Happiness	Very unhappy to very happy: 0–10	5,360	7.634	2.157
OISGAI	Dummy variable: OISGAI = 1; otherwise = 0	5,360	0.195	0.396
BOISUE	Dummy variable: BOISUE = 1; otherwise = 0	5,360	0.164	0.369
SIOPURR	Dummy variable: SIOPURR = 1; otherwise = 0	5,360	0.469	0.499
No pension	Dummy variable: no pensions = 1; otherwise = 0	5,360	0.173	0.378
Age:	Dummy variable			
55–65	55–65 = 1; otherwise = 0	5,360	0.424	0.494
65–75	66–75 = 1; otherwise = 0	5,360	0.425	0.494
75–86	76–85 = 1; otherwise = 0	5,360	0.138	0.344
85 and above	86 and above = 1; otherwise = 0	5,360	0.013	0.117
Gender	Dummy variable: male = 1; female = 0	5,360	0.475	0.499
Marital status	Dummy variable			
Married	Married = 1; others = 0	5,360	0.807	0.395
Hukou	Dummy variable: rural *hukou* = 1; urban *hukou* = 0	5,294	0.581	0.494
Family size	Continuous variable	5,360	3.695	1.977
Education level	Categorical variable: unschooled = 1; primary school = 2; middle school = 3; high school/technical school = 4; university and above = 5	5,360	2.014	1.141
Monthly household income	Continuous variable: log	5,360	7.695	1.417
Member of Communist Party or Communist Youth League	Dummy variable: yes = 1; no = 0	5,360	0.1657	0.372
House asset	Continuous variable: log	5,360	10.87	3.789
Total deposits	Continuous variable: log	5,360	4.756	5.226
Mental health	Categorical variable: poor = 1; fair = 2; good = 3; very good = 4; excellent = 5	5,360	4.417	0.810

(*Continued*)

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Table 1. (*Continued.*)

Variable	Definition	Observations	Mean	SE
Frequency of keeping in touch with relatives	Categorical variable: often = 1; sometimes = 2; seldom = 3; never = 4	5,360	1.696	0.912
Relationships with neighbours	Categorical variable: very harmonious = 1; harmonious = 2; neutral = 3; a little tense = 4; very tense = 5	5,360	1.902	0.844
Self-rated health	Categorical variable: excellent = 1; very good = 2; good = 3; fair = 4; poor = 5	5,360	3.512	1.174
Religion	Dummy variable: yes = 1; no = 0	5,360	0.294	0.455
Weekly leisure time	Continuous variable: time of watching television and movies (hours)	5,360	13.71	11.84

Notes: SE: standard error. OISGAI: Old-age Insurance System for Government Agencies and Institutions. BOISUE: Basic Old-age Insurance System for Urban Employees. SIOPURR: Social Insurance of the Old-age Pension for Urban and Rural Residents.

people aged 55–65, the happiness level of elderly people aged 66–75, 76–85 and above 85 are higher; the happiness level of women is significantly higher than that of men; compared with unmarried, divorced and widowed seniors, the married people's levels of happiness are higher. Having Communist Party or Communist Youth League affiliations, a high family monthly income and high deposits corresponds to a high level of happiness in elderly people. Finally, the better the self-assessment of physical health and mental health is, the higher the happiness level of elderly people. In addition, having medical insurance, leisure time, frequent interactions with relatives and a harmonious relationship with neighbours are positively correlated with the level of happiness of elderly people as well.

The impact of different types of pension on the happiness of elderly people

To analyse further the impact of differences in the type of pension received on the happiness of elderly people, Table 3 compares in detail the differences in the impacts of the three types of pension, namely the OISGAI, BOISUE and SIOPURR, on the happiness of elderly people. Columns 1 and 2 in Table 3 report the OLS estimation results with SIOPURR as the benchmark variable and the column 1 regression results show that the level of happiness of elderly people receiving OISGAI and BOISUE is higher than that of elderly people who received a pension from the SIOPURR by 0.229 and 0.162, respectively. When we further control for the benefits level of pensions in column 2, we find that the level of happiness of elderly people receiving a pension from the OISGAI is higher than that of elderly people who received a pension from the SIOPURR by 0.278, but there is no significant difference in happiness level between the BOISUE and SIOPURR.

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Table 2. The ordinary least squares estimation results of the relationship between pensions and the happiness level of elderly people

	(1)	(2)	(3)	(4)
Variables	Happiness	Happiness	Happiness	Happiness
OISGAI	0.823***	0.620***	0.483***	0.375***
	(0.0966)	(0.112)	(0.111)	(0.110)
BOISUE	0.594***	0.430***	0.333***	0.201**
	(0.101)	(0.109)	(0.111)	(0.095)
SIOPURR	0.249***	0.250***	0.208**	0.142*
	(0.0823)	(0.0836)	(0.0909)	(0.0801)
Age 66–75		0.201***	0.225***	0.255***
		(0.0651)	(0.0655)	(0.0627)
Age 76–85		0.336***	0.339***	0.411***
		(0.0947)	(0.0977)	(0.0919)
Age >85		0.676***	0.722**	0.872***
		(0.256)	(0.281)	(0.245)
Gender		−0.138**	−0.151**	−0.243***
		(0.0605)	(0.0621)	(0.0604)
Marriage		0.443***	0.405***	0.368***
		(0.0785)	(0.0847)	(0.0750)
Hukou		−0.276***	−0.135	−0.102
		(0.0800)	(0.0822)	(0.0799)
Family size		0.0344**	−0.00261	0.0079
		(0.0152)	(0.0160)	(0.0158)
Education level			−0.0422	−0.0749**
			(0.0282)	(0.0292)
Household income			0.134***	0.0886***
			(0.0273)	(0.0223)
Member of Communist Party or Communist Youth League			0.275***	0.264***
			(0.0751)	(0.0807)
House asset			0.0133*	0.00887
			(0.00798)	(0.00759)
Total deposits			0.0180***	0.00969*
			(0.00563)	(0.00565)
				−0.243***

(*Continued*)

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Table 2. (*Continued.*)

Variables	(1) Happiness	(2) Happiness	(3) Happiness	(4) Happiness
Self-rated health				(0.0251)
Mental health				0.459***
				(0.0369)
Religions				0.0531
				(0.0621)
Weekly leisure time				0.00606**
				(0.00244)
Frequency of keeping in touch with relatives				−0.0644**
				(0.0315)
Relationships with neighbours				−0.256***
				(0.0336)
Health insurance				0.208*
				(0.1173)
County identification	8.52e-05**	9.59e-05**	0.000107***	9.04e-05**
	(3.99e-05)	(3.98e-05)	(3.65e-05)	(3.81e-05)
Constant	7.246***	6.910***	5.831***	5.730***
	(0.0706)	(0.124)	(0.251)	(0.299)
Observations	5,347	5,347	5,347	5,347
R^2	0.018	0.029	0.041	0.117

Notes: Robust standard errors are in parentheses. The baseline variable of the social pension insurance type and age in the model are 'no social pension insurance' and '55–65', respectively. OISGAI: Old-age Insurance System for Government Agencies and Institutions. BOISUE: Basic Old-age Insurance System for Urban Employees. SIOPURR: Social Insurance of the Old-age Pension for Urban and Rural Residents.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Columns 3 and 4 in Table 3 compare the differences in happiness level between OISGAI and BOSIUE, and the benchmark variable is BOISUE. The column 3 regression results show that, under the same conditions, the happiness of elderly people who receive a pension from the OISGAI is higher than that of elderly people who receive a pension from the BOISUE by 0.170. When we further control for the level of pension insurance benefits shown in column 4, we find that the level of happiness of elderly people who receive a pension from the OISGAI was higher than that of elderly people who receive a pension from the BOISUE by 0.192. Column 5 further reports the regression results of the interaction terms between pension income and pension insurance, and the results show that the correlation between pension income and happiness level is not affected by different pension programmes.

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Table 3. The ordinary least squares estimation results on the impact of the different types of pension on the happiness level of elderly people

	(1)	(2)	(3)	(4)	(5)
Variables	Happiness	Happiness	Happiness	Happiness	Happiness
OISGAI	0.229**	0.278**	0.170*	0.192**	1.447*
	(0.0983)	(0.1118)	(0.0951)	(0.0962)	(0.858)
BOISUE	0.162*	0.178			
	(0.0934)	(0.1121)			
SIOPURR			−0.162*	−0.178	0.718
			(0.0934)	(0.1121)	(0.451)
Pensions		−0.0409		−0.0502	−0.119
		(0.0329)		(0.0331)	(0.124)
Pensions × OISGAI					0.171
					(0.1327)
Pensions × SIOPURR					0.038
					(0.1277)
Other variables	Control	Control	Control	Control	Control
County identification	Control	Control	Control	Control	Control
Constant	5.897***	6.145***	5.966***	6.278***	5.571***
	(0.3004)	(0.3419)	(0.3064)	(0.3691)	(0.4888)
R^2	0.1132	0.1134	0.1132	0.1134	0.1139
Observations	4,444	4,444	4,444	4,444	4,444

Notes: Robust standard errors are in parentheses. The control variables are the same as those in Table 2; because of space limits, the regression results are not reported for the other control variables. Individuals without any social pension insurance were deleted from the sample. OISGAI: Old-age Insurance System for Government Agencies and Institutions. BOISUE: Basic Old-age Insurance System for Urban Employees. SIOPURR: Social Insurance of the Old-age Pension for Urban and Rural Residents.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

From the results shown in columns 1–4 in Table 3, we can conclude that, first, the difference in the impact of the BOISUE and SIOPURR on the happiness of elderly people is mainly due to the difference in the level of pension insurance benefits. After controlling for the pension insurance benefits level, there is no significant difference in the happiness of elderly people who receive the BOISUE and SIOPURR. Second, when the level of pension insurance benefits is controlled for, elderly people who received a pension from the OISGAI are happier than elderly people who received a pension from the BOISUE or SIOPURR.

Robustness test

To demonstrate further the robustness of the above results, we follow related research (Ferrer-i-Carbonell and Frijters, 2004; Knight and Gunatilaka, 2010; Mukuria and Brazier, 2013) and standardise the original results of the measure of happiness using a five-point Likert scale. When the score of happiness is $\leqslant 2$, we set the variable to the value of 1; when $3 \leqslant$ happiness $\leqslant 4$, we set the value to 2; when $5 \leqslant$ happiness $\leqslant 6$, we set the value to 3; and when $7 \leqslant$ happiness $\leqslant 8$, set the value to 4; When happiness $\geqslant 9$, we set the value to 5 (1–5 means 'very unhappy', 'unhappy', 'neutral', 'happy' and 'very happy'). We use the ordered probit regression model to perform a regression again. Table 4 reports the results of the ordered probit regressions on the impact of the different pension types on the happiness level of older people, and we find that the regression results are consistent with the results of Tables 2 and 3, which further confirms the robustness of the above results.

Discussion

Receiving pensions significantly improves the happiness level of elderly people

The regression results in Table 2 show that under the same conditions, regardless of which type of pension is received, the happiness level of Chinese elderly people is greater than that of elderly people in China who do not receive a pension. A possible explanation for this conclusion is that pensions, as an income source, can improve the economic situation of elderly people to a certain extent, increase their sense of financial security, alleviate their economic anxiety and, thus, improve their happiness level. The method used by the three basic types of old-age insurance to distribute pensions is the same: as long as the insured reaches the statutory retirement age, he or she can receive a pension on a monthly basis for life. This means that in contrast to those who have no old-age pension, elderly people who receive a pension, regardless of which type, can obtain a stable monthly income when they grow old. The pension income increases the income security of elderly people and allows them to improve their quality of life. Therefore, the old-age pension helps elderly people form more optimistic psychological expectations for their future life and improves their happiness level.

The regression results in Table 2 also show that the different types of pension have different effects on the happiness of elderly people. Receiving a pension from the OISGAI can increase the happiness of elderly people by 0.375; the

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Table 4. The ordered probit estimation results on the impact of the different types of pension on the happiness level of elderly people

	(1)	(2)	(3)	(4)	(5)
Variables	Happiness	Happiness	Happiness	Happiness	Happiness
OISGAI	0.216***	0.176***	0.178***	0.143***	0.113***
	(0.0612)	(0.0536)	(0.0613)	(0.0489)	(0.0502)
BOISUE	0.116**	0.085*	0.089		
	(0.0583)	(0.0501)	(0.0575)		
SIOPURR	0.060			−0.085*	−0.089
	(0.0437)			(0.0501)	(0.0575)
Pensions			−0.0067		−0.0067
			(0.0196)		(0.0196)
Other control variables	Control	Control	Control	Control	Control
County identification	Control	Control	Control	Control	Control
Pseudo R^2	0.0439	0.0425	0.0427	0.0425	0.0427
Observations	5,347	4,444	4,444	4,444	4,444

Notes: Robust standard errors are in parentheses. The other control variables are the same as those in Table 2; because of space limits, the regression results of the other control variables are not reported. OISGAI: Old-age Insurance System for Government Agencies and Institutions. BOISUE: Basic Old-age Insurance System for Urban Employees. SIOPURR: Social Insurance of the Old-age Pension for Urban and Rural Residents.
Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

BOISUE can increase the happiness of elderly people by 0.201; and the SIOPURR can increase the happiness of elderly people by 0.142. We believe that the possible cause of these results is the difference in the benefit level of the three pension systems. According to the law of economy, the higher the level of the pension benefit is, the better the economic security of elderly people and the more elderly people's negative psychological emotions caused by economic pressure can be alleviated, thus enhancing the happiness of elderly people (Darity and Myers, 1987; Dutta, 2008; Frey and Stutzer, 2010). There are significant differences in the benefit level of the three pension systems currently implemented in China. According to the data released by the National Bureau of Statistics of China, the basic benefit level of the OISGAI in 2016 was 4,623.05 yuan per capita per month, and the basic benefit level of the BOISUE was 2,388.57 yuan per capita per month, while the basic benefit level of SIOPURR was only 117.36 yuan per capita per month. That is, the OISGAI has the highest benefit level, BOISUE is in the middle and SIOPURR is the lowest. This is consistent with our measurement results, and the happiness of elderly people insured is directly proportional to the level of pension benefits. The OISGAI pension with the highest benefit level enhanced the happiness of elderly people to the highest degree, while the SIOPURR pension with the lowest benefit level enhanced the happiness of elderly people to the lowest degree.

Benefits level: a comparison of the impact of the BOISUE and SIOPURR on elderly people's happiness

The regression results in Tables 3 and 4 show that under the same conditions, elderly people who receive a pension from the BOISUE have a higher level of happiness than elderly people who receive a pension from the SIOPURR. When other conditions remain unchanged and the pension benefit level is controlled for, the impact of receiving a pension from the BOISUE on happiness is no longer significant. Therefore, it can be inferred that the difference between the impacts of the BOISUE and SIOPURR on the happiness of elderly people is mainly the difference in the level of pension benefits.

In China, both the BOISUE and SIOPURR are composed of a co-ordinated account pension and a personal account pension, but there is a considerable difference between the benefit levels of these two systems. The main source of the BOISUE is the joint payment of both the insured and the employer during the period of employment, and the payment standard is 24–28 per cent of the in-service wage (proportion of contribution varies in different areas), and the insured can receive a monthly pension after 15 years of making continuous contributions.

SIOPURR, however, is mainly composed of government subsidies and individual contributions. The amount of the government subsidies is very small, with an average of 60–80 yuan per person per month (the amounts of subsidies in each area is different according to the local ability to pay subsidies). The personal contribution standard is also low, ranging from 100 to 2,000 yuan per person per year. Specifically, the insured can freely choose the payment level. The current situation is that the insured often chooses the lowest level of payment for reasons such as 'economic short-sightedness' and 'insufficient expectations for the future of the system'. These factors together lead to lower levels of pension benefits for the insured.

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There is no significant difference between the financing and receiving processes used by the SIOPURR and BOISUE, and the main difference between them is reflected in their benefit level. Therefore, the impacts of these two types of pension on elderly people's sense of happiness are mainly reflected in the pension benefits. Statistics obtained from the National Bureau of Statistics show that in 2016, the benefit level of the BOISUE is on average 2,385.57 yuan per month, while the benefit level of the SIOPURR is only 117.36 yuan per month. The benefit of the BOISUE is 20 times that of the SIOPURR. Therefore, the income of elderly people who receive a pension from the BOISUE is higher than that of elderly people who receive a pension from the SIOPURR. The life after retirement for elderly people who receive a pension from the BOISUE is more secure and their economic anxiety can be alleviated to a greater extent than that of elderly people who receive a pension from the SIOPURR. The BOISUE can alleviate the economic anxiety of elderly people to a greater extent than the SIOPURR, especially in terms of the psychological expectations of elderly people regarding their financial security. Thus, the BOISUE can promote their level of happiness.

Government guarantee and expected income: an analysis on the influence of the OISGAI on the happiness of elderly people

The regression results in Tables 3 and 4 show that under the same conditions, the happiness level of elderly people who receive a pension from the OISGAI is significantly greater than that of those who receive a pension from the SIOPURR and BOISUE. After keeping other conditions unchanged and further controlling for the benefit level of the pensions, the results still show that receiving a pension from the OISGAI increases the level of happiness of elderly people. That is, when the level of pension benefits is the same, elderly people who receive a pension from the OISGAI are happier than those who receive a pension from the other two types of old-age pension.

Previous studies have shown that government support and trust have a significant impact on residents' happiness (Zhang, 2016). Pu and Zhao (2020) found that basic pensions had a significant positive effect on residents' happiness, and further found that government support and trust played a partial mediating role between basic pensions and residents' happiness, and Ni and Zhang (2020) reached a similar conclusion from the perspective of public transfer payment. In China, participants in the OISGAI are public officials of the state or government institutions. During their employment, the contributions to the pension insurance system are fully paid by the government. These individuals are not required to pay the participation fees for the pension insurance. The pension insurance received after the participants' retirement is also entirely borne by the state. This means that the payment of the OISGAI insurance is covered by the government's fiscal revenues, and the pension benefit is guaranteed by the government. The participants do not have to worry about whether their future pensions will be punctually paid in full.

The other two pension systems, the BOISUE and SIOPURR, however, are social endowment insurance systems for urban and rural residents and urban enterprise employees. These funds are raised by both society and individuals. The level of pension benefits depends on the funds remaining in the participants' personal

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accounts, as well as the amount in the local pooling account. According to the 'Social Insurance Law of the People's Republic of China', only when these two systems have insufficient funds will the government provide financial subsidies, which means the government's responsibility is 'limited'. In recent years, as China's population ageing problem has become increasingly serious, the media has continuously reported that China's BOISUE and SIOPURR pension funds have become unable to pay pensions to participants and that government insurance funds for the BOISUE have already suffered a deficit in a few provinces (Zheng *et al.*, 2018). This negative news may affect the insured seniors' confidence in their pension insurance system to a certain extent, the government support and trust could be weakened, causing them to be concerned about their future financial security, thus reducing their sense of happiness.

The government has funded all the 'bills' of the OISGAI system, ensuring that it will be paid on time and in full. However, the government will bear only the last 'bottom' responsibility when the BOISUE and SIOPURR systems are unable to make ends meet. Whether the participants' future pensions can be paid on time or in full is unknown. A different 'special' government guarantee and support may cause older people receiving pensions from the OISGAI to have a higher level of happiness than those receiving the other two types of pension.

At the same time, existing studies have shown that expected income can also affect residents' happiness level (Lei and Bin, 2012; Zhao *et al.*, 2013). Different pension income and income expectations for different pension insurance programmes may also have different effects on people's happiness. Figure 1 shows a comparison of the benefit levels of different types of pension. We find that although the benefit levels of the three pension systems increase on a regular basis, the OISGAI system itself has the highest amount of pension treatment, and the average annual growth rate of its benefit level is as high as 14.59 per cent, which is significantly higher than that of the other two pension systems. The variation in the proportion and growth rate of the pension benefit may affect the happiness of elderly people receiving different types of pension. The faster the pension welfare growth rate is, the more the pension can guarantee the pension income of the insured after retirement. At the same time, this higher growth rate can improve elderly people's expectations and confidence in the system and thus improve their happiness level. Therefore, the government's 'special guarantee' embodied in the speed of the OISGAI system's benefit adjustment has further caused the difference between the OISGAI and the other two systems in terms of improving the happiness of elderly people.

Conclusions

This paper analysed the impact of different Chinese pension types on elderly people's sense of happiness and further discussed the potential impact mechanisms in terms of three aspects: the pension benefits level, government guarantee and expected income. We find that, first, regardless of which type of pension they receive, elderly people who receive a pension have a significantly higher happiness level than that of elderly people without any pension. The conclusion of this study verifies the conclusions of most previous studies. As one of the income sources of

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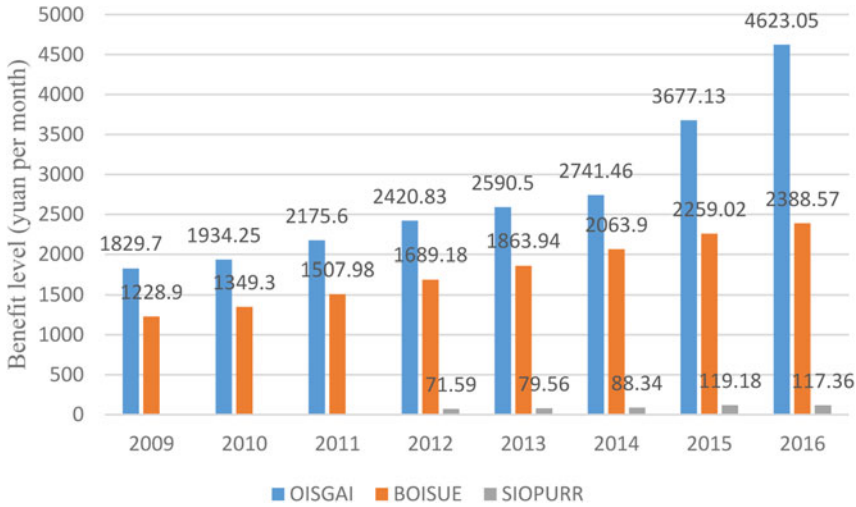

Figure 1. Comparison of the benefit levels of different types of pension.
Notes: OISGAI: Old-age Insurance System for Government Agencies and Institutions. BOISUE: Basic Old-age Insurance System for Urban Employees. SIOPURR: Social Insurance of the Old-age Pension for Urban and Rural Residents.

elderly people after they retire, pensions can improve the financial status of elderly people to a certain extent, increasing their sense of economic security, easing their economic anxiety and thus improving their happiness.

Second, elderly people who receive the BOISUE pension have a higher happiness level than elderly people who receive the SIOPURR pension, but after controlling for the pension benefits, the impact of receiving the BOISUE pension on happiness is no longer significant. Through a detailed comparison of the SIOPURR pension and the BOISUE pension, we find that there is no significant difference between the two pension systems except the gap in the benefit level. Therefore, we believe that the varied influence on the happiness level caused by these two systems may come from the gap in their pension benefits. Sasaki *et al.* (2018) used the Japanese pension system as an example and found similar conclusions.

Third, older people who receive the OISGAI pension have a higher happiness level than those receiving the SIOPURR pension and the BOISUE pension. When we further control for the pension benefit level, we find that the difference in happiness is still statistically significant. That is, when the income level of the pensions is the same, the happiness level of elderly people receiving the OISGAI pension is significantly higher than that of those receiving the SIOPURR and the BOISUE pensions, which we believe is due to the strong government protection and a higher benefit growth rate of the OISGAI pension. This conclusion provides a reference for scholars who seek to explore further the relationship between government guarantees and elderly people's sense of happiness, as well as the relationship between expected income and elderly people's happiness.

The limitations of this article are mainly reflected in two points. First, this paper explains the impact of different pension types on elderly people's sense of happiness

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by considering the government guarantee and benefit growth. However, due to data limitations, there is no way to measure accurately the impact of government guarantees and benefit growth on the happiness of older people. Second, in terms of the happiness measurement, although the method of measuring the subjective sense of happiness has been used by most scholars and has been proven to have high reliability and validity, objective measurement indicators should also be considered. However, due to data limitations, we were not able to identify objective indicators for measuring happiness. We will further consider the factors that influence the sense of happiness by using a combination of subjective measurement and objective indicators in future studies.

Data

The datasets generated for this study are available from the corresponding author on request.

Author contributions. All authors contributed to the study conception and design. The literary and survey sections were primarily written by YM, the material preparation, data collection and analysis were performed by JH, XZ was responsible for data curation, methodology and formal analysis, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Conflict of interest. The authors declare no conflicts of interest.

Ethical standards. Ethical approval for the study and written informed consent from the participants of the study were not required as per national legislation and institutional requirements.

Note

1 The Chinese government stipulates that male participants in OISGAI and BOISUE can receive a monthly pension at the age of 60 and female participants at the age of 55. The male and female participants in the SIOPURR can receive an old-age pension at the age of 60, so the female participants in the OISGAI and BOISUE can start receiving a pension between 55 and 60, but the female participants in SIOPURR cannot receive a pension at the age of 55–60, which will cause a deviation in our analysis results. Therefore, we keep only samples over 60 years old in the analysis.

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