The Impact of Fiscal Subsidies on the Sustainability of China's Rural Pension Program

Benxi Lin[1,*], Yu Yvette Zhang[2]

1. School of Economics, Fujian Agriculture and Forestry University, Fuzhou, Fujian 350002, P. R. China; bxlin@126.com

2. Department of Agricultural Economics, Texas A&M University, College Station, TX 77843, USA; yzhang@tamu.edu

*Correspondence: bxlin@126.com

Abstract: This paper studies the impact of fiscal subsidies on the sustainability of China's rural pension system. We first provides an overview of China's rural pension system and explains the formulas used to calculate the pension payments. We then examines how fiscal subsidies, in forms of basic pension, incentive pension, and matching subsidy, affect participation rates and individual contributions. Our study shows that the rural residents' participation rates can be improved significantly by increasing basic pension or by providing incentive pension, but not by matching subsidy. However, none of these fiscal subsidies has significant effects on the amount of individual contributions. Overall, our results imply that incentive pension is an effective mechanism in encouraging rural residents to participate in the pension programs, but current level of matching subsidies are not sufficient enough to improve participation or increase contributions. Our study suggests the needs to increase the fiscal subsides in China's rural pension system, and can provide useful implications in designing the effective pension system for rural residents.

Key words: Chinese Pension System; New Rural Pension Scheme (NPRS); Fiscal Subsidies; Incentive Pension; Matching Subsidy.

 doi:10.20944/preprints201911.0161.v1

The Impact of Fiscal Subsidies on the Sustainability of China's Rural Pension Program

I. Introduction

China's population is aging faster than almost any other country in the world. In 2030, China will become the worlds' most aged society [1], and the proportion of the elderly population aged 65 or older in China will double from 10% to 20% in 20 years (2017 – 2037) [2]. The elderly proportion of the rural population in China is higher than that of the urban population, with the rural area also aging faster than the urban areas [3]. Moreover, rural elderly have higher rates of poverty than the urban elderly [4]. Historically, the Chinese rural elderly have relied heavily on their adult children as the main source of financial support. This traditional informal system of old-age provision has been weakening with the increased rural-to-urban migration flows as well as the higher life expectancy and lower fertility rate since the economic reforms in 1980s. [5, 6,7]. China needs a sustainable pension system with broad coverage and adequate benefits to provide a social safety net in addressing the needs of the rural aging population. In this paper we study the effects of fiscal subsidies on the sustainability of the rural pension system in terms of participation rates and contribution amounts.

The nationwide rural pension system in China was not established until 2009, when China launched the New Rural Pension Scheme (NRPS) aiming to provide income support for rural elderly. The NRPS was preceded by several county-level pilot schemes starting in 1986 when Chinese State Council issued its 7th Five Year Plan, which noted that "efforts should be made to study how to establish a rural pension system, launch and gradually expand pilot schemes in line with economic development" [8]. The NRPS has rapidly expanded since its implementation in 2009 and covered all regions of rural China in 2012. Meanwhile, the Urban Resident Social Pension (URSP) program was implemented in 2011 to cover the urban nonwage residents who were not covered by the employee-based pension programs. According to Doc. 8 by the State Council of China in 2014, The NRPS and URSP were merged into one unified pension system, the Urban and Rural Residents Basic Pension System (URBP), for all nonwage rural and urban residents. By the end of 2018, 532.91

 doi:10.20944/preprints201911.0161.v1

million of rural and urban residents have enrolled in URBP with the coverage rate higher than 85%, making URBP the pension program with the largest number of participants in the world [9]. Despite the rapid development of this program, many studies have found that rural residents, especially younger residents, do not have sufficient incentive to participate, and most people who do participate choose the lowest level of contribution [10].

The data used in our study is from an NRPS subsidy program in Fujian Province of China. Fujian Province, located on the southeast coast of China, is one of the richest provinces in China but with significant intraprovincial disparities largely due to income gap between rural and urban areas [11, 12]. According to China National Bureau of Statistics, Fujian's GDP per capita in 2018 ranks the sixth in the nation, in fact, the third highest province only after Jiangsu and Zhejiang if excluding the three municipalities of Beijing, Shanghai, and Tianjin. Fujian province is one of the earliest provinces to introduce the Incentive Pension in the NRPS program, which will be explained in detail in the next section. Our data is from 2011 to 2013, when the NRPS and URSP were still operating in parallel before they merged into URBP in 2014. The URBP adopted the basic schemes, approaches, and pension benefit formulas from the NRPS, and currently serves as the major rural pension program in China. Therefore, our study with this unique data set of NRPS can provide very useful implications in designing an effective pension system for rural residents.

The rest of this paper is organized as follows. Section 2 explains the calculation of the pension payment in Chinese pension system. Section 3 describes the data used in our study and presents the data analysis. Section 4 discusses the results and provides policy implications.

II. Pension Formulas

In this section we will explain the NRPS pension formulas, which still apply to the current URBP program. According to Doc. 32 by the State Council of China in 2009, all rural residents aged 16 or above (excluding students) who are not enrolled in the urban pension programs can participate in the NRPS voluntarily. The NRPS allows participants to receive a pension, starting age 60 after 15 years of contributions. Participants aged 45 or over when enrolling in NRPS will be required to make a

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 14 November 2019 doi:10.20944/preprints201911.0161.v1

lump-sum payment to cover the shortfall years. The pension consists of two components - a basic pension component and an individual account with individual contribution and matching subsidy. The pension (monthly) formula is as follows,

$$(1) Pension\_Payment = Basic\_Pension + [\sum_{t=1}^{T}(Contribution_t + Match_t) \times (1+r)^{T-t}]/139,$$

where the second part represents the amounts accumulated in individual account of the beneficiary including accrued interests, with r being the One-Year Term Deposits interest rate and T being the total years of contribution. Note that the individual account is calculated in a yearly base but the beneficiary will receive the pension monthly. Therefore, in formula (1), Pension Payment and Basic Pension are monthly values, while Contribution and Match (matching subsidy) are annual values. The actuarial factor 139 is the expected months of living after retirement at age 60 based on the life expectancy of 71.5 years in 2009, and this actuarial factor is still used in the current URBP program.

The basic pension varies across different regions/counties according to local government policies with a minimum of 55 CNY per month set by the central government (China Statistical Yearbook 2015, http://www.stats.gov.cn/tjsj/ndsj/2015/indexeh.htm). Matching and management of the individual accounts are determined by local governments with the minimum contribution of 100 CNY required by the central government. The matching subsidy starts at 30 CNY for the minimum contribution of 100 CNY with an increment of 5 CNY for every additional 100 CNY of the contribution, and is capped at a maximum level (maximum matching subsidy) set by local governments. This type of matching defined contribution (MDC) approach has been shown to increase pension coverage and saving rates in many countries [17]. However its effect in China is either insignificant or unclear as most contributors have weak incentives to contribute above the minimum level [4, 18].

Fujian Province has taken several measures to ensure sustained participation of rural residents, including providing an incentive pension and increasing matching subsidy. It is one of the earliest provinces to include an incentive pension in the program starting 2011, aiming to encourage the participation especially that of the younger

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 14 November 2019 doi:10.20944/preprints201911.0161.v1

residents under the age of 45. Under this scheme, if a person has contributed to the program for more than 15 years, he/she will receive an extra pension payment in the amount of 1% of basic pension for each additional year of contribution beyond 15 years. The pension formula then takes the form,

(2) $Pension\_Payment =$

$$\begin{cases} Basic\_Pension + [\sum_{t=1}^{T}(Contribution_t + Match_t) \times (1+r)^{T-t}]/139, \ if\ T < 15, \\ Basic\_Pension + Incentive\_Pension \times (T-15) + [\sum_{t=1}^{T}(Contribution_t + Match_t) \times (1+r)^{T-t}]/139, \ if\ T \geq 15. \end{cases}$$

III. Data

This paper uses regional statistical data of NRPS program during 2011-2013 from 64 counties of Fujian Province provided by Fujian Urban and Rural Residents Social Insurance Administration Center and data from Fujian Statistical Year Books (2011-2013). The incentive pension scheme was implemented in 4 out of these 64 counties in 2011, 27 counties in 2012, and 33 counties in 2013. We have obtained county-level information including the participation rates (for different age groups), basic pension, average contribution, if the county implemented the incentive pension scheme, and other basic statistics for each county in each year. The descriptions of county-level summary statistics and variables used in our analysis are presented in Table 1.

Table 1. Definition of Variables and Descriptive Statistic.

Variable	Definition	Value/Mean	SD
ParticipationRate	Percentage of eligible people enrolled	83.10%	13.70%
Contribution	Average individual contribution per year (CNY)	130.42	31.96
BasicP	Basic Pension per month (CNY)	59.48	9.85
IncentiveP	If implemented incentive pension (=1)	33.33%	
MaxMatch	Maximum matching subsidy per year (CNY)	57.87	17.64
Income	Annual per capita income (CNY)	8954.49	1951.94
MaleRatio	Proportion of male participants	50.62%	1.90%
Proportion of participants age <30 and > 16		17.58%	5.36%

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 14 November 2019 doi:10.20944/preprints201911.0161.v1

Proportion of participants age⩾30 and < 45		40.54%	3.34%
Proportion of participants age⩾45		41.88%	6.38%
Urbanization	Urbanization rate	49.86%	15.86%

Data Source: Fujian Provincial Department of Finance, China

IV. Analytical Methods and Results

We first estimate the effect of fiscal subsides, including bon the participation rates of the rural residents. In our data, we have participation rates for three age groups, people younger than 30 but older than 16 (Age1), older than 30 but younger than 45 (Age 2), and older than 45 (used as the base for age group). The regression model takes the following form,

(3) $ParicipiationRate_{ait} = \alpha_0 + \alpha_1 IncentiveP_{it} + \alpha_2 BasicP_{it} + \alpha_3 MaxMatch_{it} + Age_{1_{it}} + Age_{2_{it}} + Age_{1_{it}} \times IncentiveP_{it} + Age_{2_{it}} \times IncentiveP_{it} + MaleRatio_{it} + \alpha_3 Income_{it} + Urbanization_{it} + \epsilon_{ait}$,

where the subscripts a is the age group, i is the county, t is the year, and $Age_1 = 1$ if the age group is between 16 and 30, and $Age_2 = 1$ if the age group is between 30 and 45, with the age group of older than 45 being the base group. The definitions of other variables in this regression are described in Table 1. We use the interaction terms of age groups (Age_1, Age_2) and the incentive pension provision to investigate whether the incentive pension had different effects for different age groups. We also examine the effects of some basic regional information such as gender ratio, average income per capita, and urbanization rates. Since participation rate is a value from 0 to 1, we assume it follows a Beta distribution and perform a beta regression [19]. The results are presented in Table 2.

Table 2. The Effects of Incentive Pension on Participation Rates

	OLS (n=576)		Beta Regression (n=576)	
	Coef.	P Value	Coef.	P Value
Intercept	0.7359	0.000	0.5912	0.405
IncentiveP	0.0435**	0.023	0.2120*	0.067

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 14 November 2019 doi:10.20944/preprints201911.0161.v1

Age_1	-0.0457**	0.048	-0.3281**	0.010
Age_2	-0.0055	0.756	-0.0427	0.672
Age_1 x IncentiveP	-0.0300	0.258	-0.2067	0.177
Age_2 x IncentiveP	-0.0137	0.604	-0.1248	0.432
BasicP	0.0016***	0.009	-0.0135***	0.001
MaxMatch	-0.0007**	0.066	-0.0040**	0.055
MaleRatio	-0.3408	0.160	-1.8550	0.174
Income	2.04e-05***	0.000	0.0001***	0.000
Urbanization	0.0008**	0.039	0.0066***	0.003

Notes: *significant at 10%; ** significant at 5%; *** significant at 1%.

Our analysis shows that the participation rates significantly increases with the provision of incentive pension. The participation rates of young people (age <30) are significant lower than people older than 45, but the effects of incentive pension on participations do differ among different age groups. People in counties with higher per-capita income and urbanization level are more willing to participate in the pension programs. Not surprisingly, higher basic pension increases the participation rates. What is puzzling in the results is that, the participation rates decrease with the maximum matching subsidy possibly due to the endogeneity problem.

We now explore the effects of fiscal subsidies especially matching subsidies on individual contributions controlling for the county-specific effects. In our data, we have average individual contributions in each county, which is used as the dependent variable in the analysis. Since we don't have contribution amounts in each age group, we use the proportion of participants older than 45 (EldRate) instead of age group dummies in the analysis. The regression model takes the following form,

$$(4)\ Contribution_{it} = \alpha_0 + \alpha_1 IncentiveP_{it} + \alpha_2 BasicP_{it} + \alpha_3 MaxMatch_{it} + EldRate_{it} + MaleRatio_{it} + \alpha_3 Income_{it} + Urbanization_{it} + \epsilon_{it},$$

where the subscripts *i* is the county, *t* is the year. We first performed Hausman test to differentiate between the fixed-effects model and the random-effects model, and the null hypothesis is rejected (P<0.000) implying the fixed-effects model is more

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 14 November 2019 doi:10.20944/preprints201911.0161.v1

preferred. While the fixed-effects model can answer the questions about the effects of fiscal subsidies when the policies change over time for the same county, the between-effects model can provide the effects of matching subsidy when it differs between counties. The results of both fixed-effects and between-effect regressions are presented in Table 2.

Table 2. The Effects of fiscal subsidies on Individual Contributions

	Fixed-Effects (n=192)		Between-Effects (n=192)	
	Coef.	P Value	Coef.	P Value
Intercept	492.8737	0.001	427.0291	0.000
MaxMatch	0.0247	0.773	0.1100	0.597
IncentiveP	-1.4561	0.208	26.3398***	0.003
BasicP	-0.0878	0.409	-0.8162**	-0.026
Income	0.0002	0.667	0.0011	0.650
Urbanization	0.0008**	0.039	0.9680***	0.000
MaleRatio	-7.4300**	0.014	-6.8526*	0.001
EldRate	0.2599	0.312	0.6103	0.229
R^2: within	0.1009		0.0011	
R^2: between	0.3655		0.6140	
R^2: overall	0.3623		0.5207	

Notes: *significant at 10%; ** significant at 5%; *** significant at 1%.

The between-effects regression results imply that average individual contributions in the counties with incentive pension are significantly higher than that of the counties without incentive pension. However, this effect is not significant in the fixed-effects regression when controlling for county-specific effects, meaning that the provision of incentive pension cannot increase the individual contributions significantly. Increasing the amounts of maximum matching subsidy cannot increase the contributions significantly either. Higher degree of urbanization can increase individual contributions but the magnitude is small. The overall contribution will be lower when the proportion of male residents increases. Average individual

 doi:10.20944/preprints201911.0161.v1

contributions in the counties with higher basic pension are higher than that in the counties with lower basic pension.

V. Discussion and Concluding Remarks

In this paper we study the effectiveness of fiscal subsides in improving the sustainability of rural pension system in China in terms of participation rates and individual contribution amounts. Our data shows that participation rates of rural residents younger than 30 are significantly lower than that of older people. The results suggest that rural residents' participation rates in the pension system can be significantly improved either by providing a higher amount of basic pension, or by providing an incentive pension that increases the pension payment as the number of years enrolled in the program increases. The significant effects of incentive pension do not differ among different age groups, although it is designed aiming to increase the participation rates of people younger than 45. Neither of these two fiscal policies have any significant effects in improving the amount of contributions. Moreover, increasing the maximum amount of matching subsidy have no effect on participation rates and individual contributions.

Overall, our results imply that incentive pension is an effective mechanism in encouraging rural residents to participate in the pension programs, but current level of matching subsidies are not sufficient enough to improve participation or increase contributions. China's rural pension payments in general are less than 10% of per capital rural income, which is significantly lower than the social pension in other countries [lin et al.]. Our study suggests the needs to increase the fiscal subsides in China's rural pension system, and can provide useful implications in designing the effective pension system for rural residents.

Acknowledgments: Benxi Lin was supported by National Natural Science Foundation of China (Project No. 71303049) and Fujian Agriculture and Forestry University Science and Technology Innovation Special Fund (Project No. KFA17508A).

Reference

1. People's Daily, Beijing, China. China's percentage of elderly highest in

 doi:10.20944/preprints201911.0161.v1

2030. September 12, 2010. http://en.people.cn/90001/90776/90882/7137446.html

2. United Nation. World population ageing. 2017. https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Highlights.pdf
3. World Health Organization. China country assessment report on ageing and health. 2015.
4. Dorfman, M. C., Wang, D., O'Keefe, P., & Cheng, J. (2013). China's pension schemes for rural and urban residents. Matching Contributions for Pensions, 217.
5. Scheffel, J., & Zhang, Y. (2019). How does internal migration affect the emotional health of elderly parents left-behind? Journal of Population Economics, 32(3), 953-980.
6. Lin, B., Lin, Z., Zhang, Y., & Liu, W. (2018). The impact of the new rural pension scheme on retirement sustainability in China: Evidence of regional differences in formal and informal labor supply. Sustainability, 10(12), 4366.
7. Cai, F., Giles, J., O'Keefe, P., & Wang, D. (2012). The elderly and old age support in rural China. The World Bank.
8. Dorfman, M. C., Holzmann, R., O'keefe, P., Wang, D., Sin, Y., & Hinz, R. (2013). China's pension system: A vision. The World Bank.
9. Ministry of Human Resources and Social Security of the People's Republic of China. Urban and rural residents' pension insurance has entered a new era. April 02, 2018.
10. Lei, X., Zhang, C., & Zhao, Y. (2013). Incentive problems in China's new rural pension program. In Labor Market Issues in China (pp. 181-201). Emerald Group Publishing Limited.
11. Chen, H., Tang, L., Qiu, Q., Wu, T., Wang, Z., Xu, S., & Xiao, L. (2018). Coupling between rural development and ecosystem services, the case of Fujian Province, China. Sustainability, 10(2), 524.
12. Lyons, T. P. (1998). Intraprovincial disparities in China: Fujian province, 1978–1995. Economic Geography, 74(4), 405-432.
13. Palacios, R., & Robalino, D. A. (2009). Matching Defined Contributions:

 doi:10.20944/preprints201911.0161.v1

A way to increase pension coverage. Closing the Coverage Gap: The Role of Social Pensions and Other Retirement Income Transfers, 187-202.

14. Hinz, R., Holzmann, R., Tuesta, D., & Takayama, N. (Eds.). (2012). Matching contributions for pensions: A review of international experience. The World Bank.
15. Ferrari, S., & Cribari-Neto, F. (2004). Beta regression for modelling rates and proportions. Journal of applied statistics, 31(7), 799-815.