Does a Public Pension Improve Rural Livelihoods?

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Abstract. This paper evaluates the impact of the New Rural Social Pension Insurance (NRSP) pilot on rural income and consumption in China. Using provincial panel data for 2000 to 2021, we estimate a difference-in-differences model with province and year fixed effects as well as province-specific linear trends. In the analysis, any province with a raw pilot start before 2009 is recoded to 2009 in order to align treatment timing with the official launch of the NRSP. Under this policy-consistent timing rule, the preferred specification shows that the NRSP pilot is associated with increases of approximately 39 per cent in rural per capita disposable income and 32 per cent in rural per capita consumption expenditure. Richer fiscal and rural-development controls leave the positive association intact, and short-run coefficients are also statistically significant.Supplementary province-year financial regressions based on county-aggregated deposit and loan balances do not provide statistically precise evidence on the savings or debt-repayment channel. The study therefore offers policy-relevant macro evidence while clarifying the identification limits that remain under a more historically consistent treatment coding.

Keywords: New Rural Social Pension Insurance; rural income; rural consumption; difference in differences; provincial panel data

1 Introduction

Population aging in China has accelerated rapidly in recent years, while the erosion of traditional family-based support systems has increased the vulnerability of elderly residents in rural areas [1]. Strengthening basic livelihood security for the rural elderly and improving households' long-term income expectations and consumption capacity have become central issues in China's social policy agenda [2]. To address these challenges, the NRSP scheme was launched [3]. Existing studies show that public pension transfers affect not only elderly income and poverty but also household consumption [4][5][6]. The pension income significantly increases elderly income and food consumption, reduces agricultural labour supply, and improves health outcomes[7][8]. Classical consumption theories, such as the Life-Cycle Hypothesis [9] and the Permanent In-

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come Hypothesis [10], suggest that a stable income streamcan alter households' permanent income expectations.The NRSP was introduced on a pilot basis in selected regions from 2009 and gradually extended to full national coverage by 2012 [11]. Following the standard policy-evaluation framework [12], staggered implementation enables the use of a multi-period DID design and an event-study specification to examine both contemporaneous effects and dynamic trajectories around policy implementation. Recent work on staggered-adoption DID and event-study estimation further supports this empirical design [13][14].

2 Data and Methodology

The empirical analysis is based on the National Provincial Panel Database, which contains more than 2,900 variables for the period 2000 to 2021. The dependent variables are rural per capita disposable income (rural_inc), for which we use the natural logarithm ln_inc, and rural per capita consumption expenditure (rural_cons), for which we use the natural logarithm ln_cons. In the extended analysis, we use the elderly dependency ratio (old_dep) as an additional outcome variable.We first estimate a two-way fixed-effects DID model without province-specific time trends:

$$y_{it} = \beta\, pilot_{it} + \gamma X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where y_{it} denotes the natural logarithm of rural per capita disposable income or rural per capita consumption expenditure. $pilot_{it}$ is the NRSP pilot indicator, X_{it} is a vector of controls, μ_i denotes province fixed effects, λ_t denotes year fixed effects, and ε_{it} is the error term. Standard errors are clustered at the province level. Therefore, the main specification incorporates province-specific linear time trends:

$$y_{it} = \beta\, pilot_{it} + \gamma X_{it} + \mu_i + \lambda_t + \delta_i \cdot t + \varepsilon_{it}$$

To test the validity of the parallel-trends assumption and trace the dynamic effects of the policy, we construct a relative-time variable:

$$relyear_{it} = t - pilotstart_i$$

The variable is truncated to the interval [-5, 5], and a set of relative-year dummies $D_{k,it}$ is generated for $k = -5, -4, -3, -2, 0, 1, 2, 3, 4, 5$. The year prior to the pilot implementation ($k = -1$) is omitted as the reference category. The event-study specification is:

$$y_{it} = \sum_{k \neq -1} \theta_k\, D_{k,it} + \gamma X_{it} + \mu_i + \lambda_t + \delta_i \cdot t + \varepsilon_{it}$$

3 Empirical Results

Table 1 reports the descriptive statistics for the main variables.

Table 1. Descriptive statistics of main variables (income and consumption sample)

Variable	Mean	SD	Min	Max
ln(rural disposable income per capita)	8.726	0.746	7.316	10.470
ln(rural consumption per capita)	8.505	0.755	6.999	10.143
NRSP pilot (2009-constrained start and after = 1)	0.577	0.495	0.000	1.000
Short-run NRSP pilot (0-2 years after constrained start)	0.203	0.403	0.000	1.000
ln(GDP per capita)	10.564	0.567	8.959	12.011
Share of secondary industry	0.421	0.083	0.160	0.620
Share of tertiary industry	0.475	0.091	0.298	0.837
Social security expenditure / total fiscal expenditure	0.130	0.035	0.055	0.276
Urbanization rate	0.549	0.142	0.215	0.942
Observations	433			

Table 2 and Table 3 report the estimated effects of the NRSP pilot on rural per capita disposable income and rural per capita consumption expenditure under the 2009-constrained treatment definition.

Table 2. Impact of NRSP pilot on rural disposable income (dependent variable: ln_inc)

	FE only	FE + trends	Short-run + trends
NRSP pilot (2009-constrained start and after = 1)	0.677***	0.326***	
	(0.115)	(0.106)	
Short-run NRSP pilot (0-2 years after constrained start)			0.212***
			(0.081)
Observations	433.000	433.000	433.000
Adjusted R-squared	0.486	0.640	0.633
Province FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province linear trends	No	Yes	Yes

Table 3. Impact of NRSP pilot on rural consumption (dependent variable: ln_cons)

	FE only	FE + trends	Short-run + trends
NRSP pilot (2009-constrained start and after = 1)	0.647***	0.281**	
	(0.117)	(0. 114)	
Short-run NRSP pilot (0-2 years after constrained start)			0.188**
			(0.083)
Observations	433.000	433.000	433.000
Adjusted R-squared	0.454	0.617	0.613
Province FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province linear trends	No	Yes	Yes

These estimates do not eliminate all policy-confounding concerns, but they show that the main positive association is not driven only by the parsimonious baseline control set. Table 4 reports the estimates after adding concurrent province-level policy and fiscal-composition controls.

Table 4. Additional controls for concurrent province-level policy environmen

	Income: richer controls	Consumption: richer controls	Income: fiscal composition controls	Consumption: fiscal composition controls
NRSP pilot	0.339***	0.293**	0.303***	0.258**
	(0.108)	(0.115)	(0.095)	(0.103)
Observations	433	433	433	433
Province FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province linear trends	Yes	Yes	Yes	Yes

Fig. 1 and Fig. 2 present the dynamic effects of the NRSP on rural income and consumption. The horizontal axis represents the relative year with respect to the pilot starting year, and the year prior to implementation serves as the reference category.

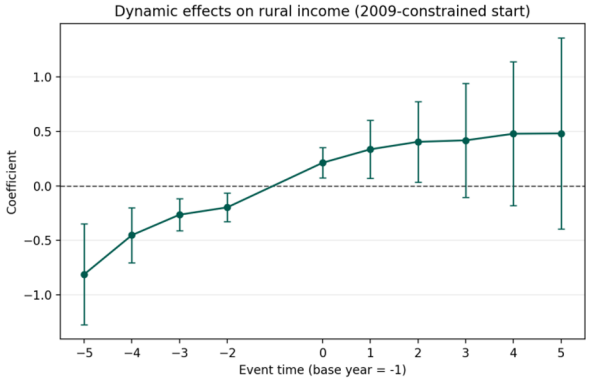

Fig. 1. Dynamic effects of the NRSP pilot on rural income.

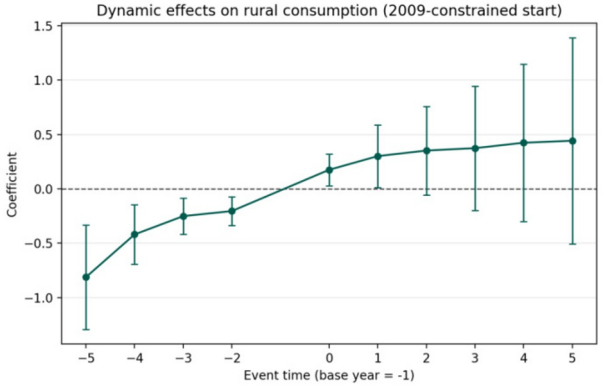

Fig. 2. Dynamic effects of the NRSP pilot on rural consumption

4 Robustness Checks and Further Analysis

Table 5 reports additional robustness checks.

Table 5. Robustness checks and extended analysis

	Placebo ln_inc	Placebo ln_cons	Drop municipalities ln_inc	Drop municipalities ln_cons	Old-age dependency
Placebo pilot (5-year lead)	0.214	0.302*			
	(0.178)	(0.175)			
NRSP pilot (actual)			0.328***	0.287**	
			(0.124)	(0.136)	
Short-run pilot effect (0-2 years)					0.331
					(0.225)
Observations	433.000	433.000	378.000	378.000	372.000
Adjusted R-squared	0.635	0.618	0.596	0.574	0.922

5 Conclusion and Policy Implications

The fact that the consumption response remains smaller than the income response is still consistent with a consumption-smoothing channel, but the supplementary regressions on province-level deposit and loan balances do not yield statistically precise evidence on saving or debt adjustment. From a policy perspective, the results still suggest that pension expansion is closely associated with higher rural income and consumption, and that this association survives a richer set of fiscal and rural-development controls. Future reforms would benefit from more coordinated administrative data collection on pension generosity, rural expenditures, savings, debt, and other concurrent rural policies so that the welfare effects of pension expansion can be identified more sharply and with more credible treatment timing.

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Disclosure of Interests

The authors declare no conflicts of interest.

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