

The Impact of Full-cost Insurance on the Consumption of Rural Residents

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Abstract: This paper explores the impact of full-cost insurance, a policy aimed at reducing farmers' income risk and ensuring food security, on rural consumption. Using agricultural economic data from 13 major grain-producing provinces in China, spanning 2011 to 2022, we investigate how the implementation of full-cost insurance—modeled as a quasi-natural experiment—affects rural residents' consumption patterns. The findings reveal a significant positive effect, primarily driven by increased grain production. Additionally, heterogeneity analysis suggests that the effectiveness of the full-cost insurance scheme is contingent on farmers' expectations of the policy. These results provide empirical insights into the role of full-cost insurance in rural economies and offer policy implications for refining its institutional design.

1. Introduction

Since China is a vast agricultural nation and its economy is based on agriculture, it is crucial to consider how to encourage the high-quality development of rural regions and encourage rural inhabitants' consumption [1]. In order to protect the development of agricultural economy, countries have carried out agricultural insurance one after another. It has emerged as a key tool for managing agricultural risks on the global stage [2]. Since the agricultural insurance policy was put into effect, the coverage rate has been steadily rising thanks to national and municipal agriculture insurance subsidies [3]. The overall value of China's agriculture insurance policy, which protects farmers from danger, was 5.46 trillion yuan at the end of 2022, with premium income amounting to 121.9 billion yuan [4].

In response to the issue of insufficient coverage, the Chinese government has been exploring and implementing new forms of agricultural insurance, enhancing protection levels, and refining related policies and regulations [5]. A three-year full-cost insurance trial program was initiated by the central government in 2018 and covered 20 grain-producing counties in six provinces: Henan, Shandong, Inner Mongolia, Anhui, Hubei, and Liaoning. The full-cost insurance pilot will be extended to the major grain-producing counties in 13 major grain-producing provinces, including Hebei, Inner Mongolia, Liaoning, Jilin, and Heilongjiang, in 2021 if the pilot's outcomes are improved. In 2023, the full-cost insurance pilot will be extended to all large grain-producing counties in the country. Full-cost insurance is designed to cover the entirety of production costs, offering enhanced risk protection, effectively functioning as a form of quasi-revenue insurance [11].

Current research on the effects of full-cost insurance primarily addresses three key aspects. First, the environmental impact of full-cost insurance has been examined[6][7]. Yin hao et al. (2023), using micro-survey data, found that wheat full-cost insurance significantly reduces pesticide usage, thereby promoting the green development of agriculture. Second, there has been research on how full-cost insurance affects land usage[8]. Guo Fengru (2023), based on survey data from four provinces in 2022, suggest that full-cost insurance encourages farmers to invest in soil quality protection by improving expected income and enhancing access to credit. Lastly, an analysis of full-cost insurance's impact on food production has been conducted[10]. Zhang Jinhua et al. (2023), through a quasi-natural experiment, demonstrated that full-cost insurance increases food output by incentivizing the expansion of the sown area for food crops.

In summary, while existing literature has explored the effects of full-cost insurance pilots, there is limited research on its impact on rural residents' consumption. This paper makes several key contributions to the field, distinguishing itself from previous studies in the following ways. First, using a multi-temporal difference-in-differences approach, the paper examines the impact of full-cost insurance on rural consumption. Second, the selected period (2011-2022) captures a broader range of pilot areas, thereby providing a more robust assessment of the policy's impact.

2. Theoretical Analysis and Research Hypotheses

Agricultural production is highly uncertain and vulnerable to natural disasters [9]. As a novel form of agricultural insurance, full-cost insurance offers higher coverage limits compared to conventional agricultural insurance policies. On the one hand, full-cost insurance can provide effective protection for agricultural production, reduce farmers' sensitivity to future income, and thus increase farmers' expectation of future income. According to the precautionary savings theory, consumers' uncertainty of future income increases consumers' precautionary savings motivation, which in turn reduces the level of consumption [12]; on the other hand, full-cost insurance can stabilise farmers' income, and in the case of natural disasters, full-cost insurance can provide farmers with a backing to protect farmers' income, thus promoting rural residents' consumption. The following theory is proposed in light of the previous study.:

H1: Full-cost insurance pilot can promote rural residents' consumption.

As a risk transfer tool, full-cost insurance can externalise agricultural risks and alleviate the problem of sunk costs in agricultural production in the face of income uncertainty. When the cost of agricultural production is sufficiently covered, rational farmers may choose to increase the area sown to crops to improve future income levels. And the increase of crop sown area can increase the production of food [13]. Because income is a major factor limiting rural residents' consumption, an increase in food production will, on the one hand, directly increase farmers' ability to carry out consumption. On the other hand, an increase in food production can give farmers positive long-term expectations for the future, which will encourage rural residents to increase consumption, decrease savings, and improve their own standard of living.

Based on this, the hypothesis is proposed:

H2: Full-cost insurance increases rural residents' consumption by increasing food production.

3. Research Design

3.1 Source of Data and Selection of Samples

The data used in this study primarily originate from city-level statistical yearbooks and the China Economic Network Database. Due to significant data gaps in the pilot counties, this analysis adopts the methodology of Jiang (2024) and utilizes data from prefecture-level cities within these provinces, which are included in the scope of the 2021 pilot. This substitution is justified as the counties participating in the full-cost insurance program are large grain-producing regions within the respective cities, making the use of prefecture-level data a reasonable alternative to county-level data for the analysis. The final dataset includes observations from 136 prefecture-level cities over the period from 2011 to 2022.

3.2 The process of choosing and defining variables

Explained Variables : This paper's explanatory variable is the consumption of rural dwellers. The consumption level of rural inhabitants is measured in this study by taking the logarithm (*logc*) of their per capita consumption expenditure in each metropolis.

Core Explanatory Variables : The core explanatory variable of this paper is to carry out the full-cost insurance pilot (*did*), *did* for the pilot to set up a dummy variable.

Control Variables : This study includes the following control variables in an effort to minimize the influence of other factors on the consumption of rural residents: Initially, the degree of

economic progress (X1); second, the level of urbanisation (X2); third, The industrial structure of the area (X3) (the proportion of the added value of the tertiary industry to GDP); Fourth, the level of education development (X4) (the proportion of the local general secondary school students to the total population); fifth, the amount of funding allocated to agriculture (X5) (the proportion of government spending on water, forestry, and agriculture to all government spending).

Mechanism Variables : Food output (yield) is chosen as the mechanism variable in this study, and the total food production of all cities at the prefecture level for the current year is used as the measurement.

3.3 Model Setting

The implementation of full-cost insurance was piloted in different regions during different years. To investigate whether the full-cost insurance pilot has a positive effect on rural residents' consumption, this study employs a difference-in-differences model with multiple time periods to assess the policy's impact.

$$\log c_{it} = \alpha_0 + \alpha_1 did_{it} + \sum_2^n \alpha_n control_{it} + \tau_i + \gamma_t + v_{it}$$

Where i and t represent the region and year in which the full-cost insurance pilot was implemented, respectively, the explanatory variable did represents the implementation of the full-cost insurance pilot, $control$ represents a set of control variables affecting rural residents' consumption, τ_i is an individual fixed effect, γ_t is a fixed effect for a year, and one word for a random disturbance is v_{it} .

4. Empirical Results and Analyses

4.1 Benchmark Regression Analysis

Table 1 displays the outcomes of the benchmark regression. The findings indicate a significantly positive coefficient on the explanatory variable, regardless of the control variables, suggesting that the full-cost insurance pilot has effectively stimulated consumption among farmers in the pilot regions.

Table 1 Benchmark Regression Results

	(1) logc	(2) logc
did	0.031** (0.012)	0.025** (0.011)
X1		0.209*** (0.013)
X2		0.001 (0.001)
X3		0.007*** (0.001)
X4		-0.015*** (0.003)
X5		0.005*** (0.001)
N	1632.000	1632.000
adj. R2	0.958	0.968
id	yes	yes
year	yes	yes

4.2 Robust type test

4.2.1 Parallel Trend Test

The parallel trends assumption between the experimental and control groups must be satisfied before using the multi-temporal difference-in-differences approach to evaluate the effects of full-cost insurance implementation. The study examines the parallel trends assumption using an event study, and subsequently develops the following regression model:

$$Logc = \beta_0 + \sum_{s=1}^{10} \beta_{pre_s} D_{pre_s} + \beta_{current} D_{current} + \sum_{s=1}^4 \beta_{post_s} D_{post_s} + \sum_1^n \beta_n control_{it} + \tau_i + \gamma_t + v_{it}$$

Where D_{pre_s} is the dummy variable before the full-cost insurance pilot, the dummy variable for the full-cost insurance pilot year is $D_{current}$, D_{post_s} is the dummy variable after the full-cost insurance pilot. Before the full-cost insurance pilot is implemented, Figure 1 below shows that there is no discernible change in the consumption of rural inhabitants in the experimental group compared to the control group, meeting the requirements of the parallel trend test. In terms of the dynamic effect of the full-cost insurance pilot, Figure 1 below shows that there is a certain policy time lag in the policy effect, which is not significance in the year the pilot policy is implemented, and its estimated coefficient is significantly positive only with the gradual passage of time. This delay may be attributed to the time required for the full-cost insurance pilot policy to be implemented at the grassroots level across different regions. Two years following the policy's implementation, the full-cost insurance pilot's estimated coefficient turned out to be significantly positive, indicating that there was a notable difference in rural consumption in comparison to the control and experimental groups.

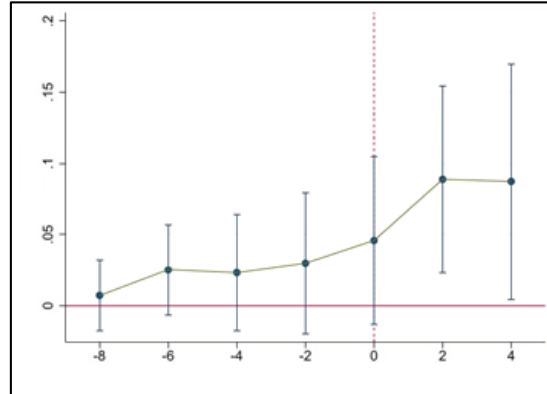


Fig.1 Parallel trend graph

4.2.2 Placebo Test

To further bolster the validity of the regression results and send out the influence of some other unobservable stochastic factors, the study uses the placebo test to determine whether the changes in the policy's rural residents' consumption are due to other stochastic factors. The policy pilot time is assigned at random, and the distribution of 500 simulated estimated coefficients with their corresponding P-values is obtained by repeating the entire experimental procedure 500 times. As shown in Figure 2, the majority of the simulated estimated coefficients are clustered around zero, and most of the corresponding P-values exceed 0.1. These results provide strong evidence that the full-cost insurance pilot program's execution did influence the consumption patterns of rural residents, and further suggest that the findings from the benchmark regression are not attributable to random variation.

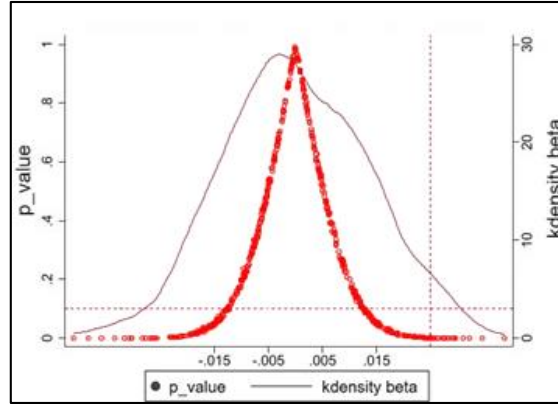


Fig.2 Placebo test chart

4.2.3 PSM-DID Test

This work performs a robust type test using the PSM-DID method to reduce the sample self-selection bias. The results in Table 2 show that the data, after propensity score matching, satisfy the parallel trends assumption. Additionally, the estimated coefficient for the explanatory variable is significantly positive, suggesting that the full-cost insurance pilot program has a substantial effect on promoting rural residents' consumption. The results from the PSM-DID analysis are consistent with those obtained from the baseline regression, confirming the robustness of the findings.

Table 2 PSM-DID Test Results

VARIABLES	(1) logc
did	0.0267** (0.0127)
X1	0.208*** (0.0293)
X2	0.000442 (0.0021)
X3	0.00650*** (0.0010)
X4	-0.0141** (0.0061)
X5	0.00452*** (0.0017)
_cons	6.192*** (0.3130)
N	1586
adj. R2	0.958
id	Yes
year	Yes

4.3 Mechanism analysis

This study examines the food production route in order to learn more about the ways that full-cost insurance affects consumption. Table 3 displays the findings of the mechanism analysis. Column (1) illustrates the impact of the full-cost insurance pilot program on food production. The positive and statistically significant coefficient of the explanatory variable suggests that the program substantially boosts food production, increases rural residents' incomes through enhanced local food output, and, to a certain extent, contributes to higher consumption levels.

Table 3 Results of the Analysis of the Mechanism

VARIABLES	(1) logyield	(2) logc
logyield		0.0508** (0.0236)
did	0.0318*** (0.0118)	
X1	-0.0757*** (0.0139)	0.213*** (0.0127)
X2	-0.00363*** (0.0010)	0.000744 (0.0009)
X3	0.00168** (0.0007)	0.00656*** (0.0007)
X4	-0.00561 (0.0035)	-0.0143*** (0.0032)
X5	0.00658*** (0.0013)	0.00423*** (0.0012)
N	1632	1632
adj. R2	0.989	0.965
id	Yes	Yes
year	Yes	Yes

4.4 Heterogeneity analysis

Starting in 2021, thirteen grain-producing provinces will be included in the pilot program for full-cost insurance, with complete coverage for grain-producing counties in the implementation area expected by 2022. To assess the impact of the program, two regression analyses were conducted using experimental data, with a time window of 2011-2020 for comparison against the benchmark regression. Column (1) of Table 4 shows the benchmark regression results, while column (2) presents the findings from the 2011-2020 time window. The regression analysis reveals that, although the introduction of full-cost insurance has little effect on rural residents' consumption in the second group, it significantly boosts consumption in the benchmark regression. This may be due to the fact that: full-cost insurance was not well accepted by farmers at the beginning of its implementation, while farmers in the pilot areas after 2021 received good feedback from farmers in the pilot areas in 2018, which reduced farmers' risk expectations for the future and weakened their incentives for precautionary savings, thus further increasing rural residents' consumption.

Table 4 Results of Heterogeneity Analysis

VARIABLES	(1) logc	(2) logc
did	0.0251** (0.0107)	0.0227 (0.0147)
X1	0.209*** (0.0126)	0.244*** (0.0164)
X2	0.000610 (0.0009)	0.000246 (0.0010)
X3	0.00661*** (0.0007)	0.00545*** (0.0008)
X4	-0.0146*** (0.0032)	-0.00811** (0.0041)
X5	0.00460*** (0.0012)	0.00508*** (0.0014)
N	1632	1360
adj. R2	0.965	0.958
id	Yes	Yes
year	Yes	Yes

5. Conclusion and Policy Recommendations

This study examines the underlying causes and evaluates the effect of full-cost insurance on the earnings of rural people using a multi-temporal difference-in-differences technique. The findings indicate that the full-cost insurance pilot program significantly enhances rural consumption levels. Mechanism analyses show that the full-cost insurance pilot promotes rural consumption by increasing food production. When the program first begins to be implemented, heterogeneity studies reveal no discernible impact on farmers' consumption; but, when full-cost insurance is expanded in 2021, it has a major impact on the consumption of rural inhabitants.

This study offers the following suggestions in light of the aforementioned findings:

First, to protect vulnerable farmers, it is essential to extend the reach of full-cost insurance and expand its coverage area. The results of this study provide compelling evidence for the beneficial effects of full-cost insurance, showing that its adoption considerably increases rural consumption.

Secondly, it is essential to strengthen the oversight of the full-cost insurance implementation process. As an agricultural risk management tool characterized by "high protection" and "high compensation", full-cost insurance is still in the promotion phase. Therefore, robust supervision is critical not only to safeguard the interests of farmers but also to build their trust in the program's efficacy and reliability.

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