

Article

Impact of Farmer Cooperatives on Labor Employment: Evidence from Rural China

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Abstract: Farmer cooperatives are one of the types of important entities for agricultural production and rural community development in China. This study aims to examine the effects of farmer cooperatives on rural labor employment and explores the mechanisms from the perspective of institutional advantage, factor redistribution, and value chain. Leveraging two-waved panel data from the China Rural Development Survey, a multinomial Logit model and Tobit model with panel data are adopted. The results show that farmer cooperatives significantly boost rural labor employment, with a more pronounced effect on fully farming and part-time farming. These effects are primarily seen through three mechanisms: income augmentation stemming from institutional advantages, factor redistribution by land transferring and technology service/adoption, as well as industrial clusters. The limited value chain extension of farmer cooperatives hinders its role in improving fully non-agricultural employment. The findings suggest that the government should support the high-quality development of farmer cooperatives to facilitate rural labor employment.

Keywords: farmer cooperative; labor; employment; rural China



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1. Introduction

Despite various initiatives, the issues of unemployment and underemployment persist in rural China. The rising proportion of secondary and tertiary industries, coupled with technological advancements, has heightened skill standards for the workforce, resulting in negative short- and medium-run employment disruptions, facilitating workforce adaptation and redistribution, as well as presenting both opportunities and challenges for rural employment [1–3]. The economic downturn, global uncertainties, and unexpected shocks have exacerbated employment pressure [4,5]. Rural labor often lacks access to employment opportunities compared to those in the formal sector, resulting in significant unemployment and underemployment issues among them [6].

As an enterprise form and economic organization, farmer cooperatives possess the capability to create employment from two perspectives. First, farmer cooperatives are embedded within the rural economy. They offer unique advantages in assisting rural labor to engage in employment by renting farmland, providing an agricultural socialization service [7–11], and accessing broader markets [12,13]. This not only empowers farmers to diversify their production and management activities but also increases the demand for hired labor in the agricultural sector, thereby improving employment prospects for rural labor [14]. Second, farmer cooperatives may create jobs related to agricultural technology research and development, production management, sales and marketing, agricultural product processing, logistics, and distribution when driving the development of surrounding industries, which widens employment prospects for rural residents [15–17].

However, limited research has delved into the relationship between farmer cooperatives and rural labor employment. A review of the pertinent literature reveals that the research on cooperatives has concentrated on production, markets, and the generation of income. Among the scarce studies that have touched on this topic, most of them have concurred on the positive influence of farmer cooperatives on rural labor employment. The studies have affirmed the role of cooperatives in absorbing rural labor [18,19]; some found that cooperatives exert a buffering effect during periods of non-agricultural employment decline [10], while others focused on the function of cooperatives in promoting non-agricultural employment opportunities in rural areas [7,14,20,21]. Whereas, these studies only focused on a single indicator of rural labor's employment, such as whether the labor is employed or engaged in non-agricultural jobs. Given the diverse forms of rural labor's employment, purely studying the impact of farmer cooperatives on a specific form of employment may lack universality, and there are gaps in exploring the diversity of employment promotion roles of cooperatives.

Furthermore, the question of how farmer cooperatives influence rural labor employment remains unsupported by comprehensive research. While the literature acknowledges the roles of farmer cooperatives in rural development, it fails to establish a clear link between these roles and specific types of employment among rural labor, so there are gaps in exploring the underlying mechanism [22–24]. In terms of study approach, most studies examining the employment impacts of farmer cooperatives rely primarily on descriptive analysis and structural equation models to disentangle various impact pathways based on specific cases [25,26]. However, there is a scarcity of empirical studies to rigorously test the underlying mechanisms by using a national representative sample. While Li et al. [14] found that new agricultural entities can promote non-agricultural employment through local labor hiring and land transfer, their analysis remains incomplete, overlooking potential influence pathways such as the peer effect of technology adoption and industrial chain development. There remains a necessity to conduct a more thorough analysis of the cooperative employment mechanism and establish a more comprehensive influence framework from various perspectives.

The research questions identified in this study are as follows: what is the impact of farmer cooperatives on the employment behavior of rural labor, and why does it have this effect? This study seeks to discern the influence of farmer cooperatives on the various types of rural labor employment and explores the mechanisms based on a national representative sample covering 2000 rural households at 100 villages in five provinces of China. Compared to previous studies, the contributions of this paper are evident in three aspects: Firstly, the evaluation framework of rural cooperatives emphasizes their economic value, with comparatively limited research examining their impact on employment. This study aims to enhance understanding of the value created by farmer cooperatives in rural employment and expand the scope of analysis concerning the utility of cooperatives. Secondly, we undertake a segmentation of rural employment, examining the specific effects of farmer cooperatives on various employment types. Lastly, this study not only explores the mechanisms from the perspectives of land renting and technology service/adoption, but also from economies of scale, profit-oriented productivity, as well as value chains extension. Clarifying the influence pathway of farmers' cooperatives on labor employment is beneficial to theoretically refine the mechanism.

The rest of this study is as follows. Section 2 shows the conceptual framework. Section 3 introduces the methodology. Section 4 presents the results. Section 5 concludes with implications.

2. Conceptual Framework

The mechanisms underpinning farmer cooperatives' impact on rural labor employment can be examined into three aspects: institutional advantages, factor distribution, and value chain extension.

The farmer cooperatives hold two institutional advantages over smallholders: the scale of operations and the income-oriented productivity [27]. The accelerated consolidation of land and the proliferation of agricultural custom services are the key drivers behind the returns to scale within farmer cooperatives [28]. An enlarged operational scale allows for a more refined division of labor, leading to a reduction in average costs. By achieving an optimal scale of operations, farmer cooperatives can minimize the labor required per unit of land, leading to a ‘displacement’ of labor and a shift in its utilization [29]. In terms of market, cooperatives expand stable market channels, can promote agricultural specialization, avoid a monopoly, and reduce uncertainty and transaction costs [30–35]. Furthermore, these cooperatives strengthen farmers’ ‘bargaining’ prowess, thereby reducing transaction risks and costs while ensuring a just outcome and a relatively stable return for farmers [36–39]. From the standpoint of institutional advantages, farmer cooperatives reduce transaction costs through economies of scale and profit-oriented production methods. On one hand, they enable farmers to “liberate” their labor input from the land, allowing them to pursue other economic activities. On the other hand, they augment farmers’ agricultural income. This income increase may incentivize farmers to expand agricultural production, thereby attracting additional labor.

Regarding factor distribution, farmer cooperatives offer two pivotal tools: land transfer and agricultural custom services. Land, machinery, and labor constitute the essential factors in agricultural production. Cooperatives serve as a platform that facilitates the circulation of these factors and enables the reallocation of resources during this process. Farmer cooperatives rent in lots of land from smallholder farmers [40], which can unlock farming labor. Cooperatives are catalysts for advanced agricultural technology [8,41]. These technological advancements are provided to smallholder farmers through agricultural custom services or have a peer effect on them, and thus unlock labor in farming. Through land transfer services, farmers have the opportunity to lease or transfer their land to others, thereby securing a steady rental income. This enables them to reallocate their labor resources towards non-agricultural sectors. Meanwhile, agricultural custom services leverage agricultural machinery and equipment to replace manual labor. Consequently, farmers can dedicate more time and energy to diverse production and life activities, fostering a shift towards non-agricultural employment opportunities.

From a lens of value chain, farmer cooperatives offer enhanced employment prospects by two ways. The first is value chain extension from sowing, ploughing, and harvesting to post-agricultural production, such as selling, drying, storing, and processing. Extending the value chain is helpful to increase the income of farmers by adding value of agricultural products which attract farmers in land and generate more non-agricultural jobs [42–44]. In addition, cooperatives’ impact on reducing marketing costs for agricultural products and enhancing farmers’ income is not merely confined to their members; it extends to the broader regional economy, exhibiting a significant regional radiation effect [45]. The existence of farmer cooperatives can promote the development of other industries due to the industry cluster effect. Cooperatives can create a more attractive labor market and employment opportunities, which draw rural laborers to engage in wage-based work.

The extended value chain of cooperatives mitigates cyclical market risks in upstream planting and breeding industries, safeguarding the asset-based returns of participating farmers. By highlighting their strategic position in the value chain, cooperatives empower their members to forge stronger market connections and influence, securing relatively higher product prices and incomes. Furthermore, the jobs created by the development of the cooperatives’ chain effectively address unemployment issues resulting from the mismatch between job supply and demand. The conceptual framework is shown in Figure 1.

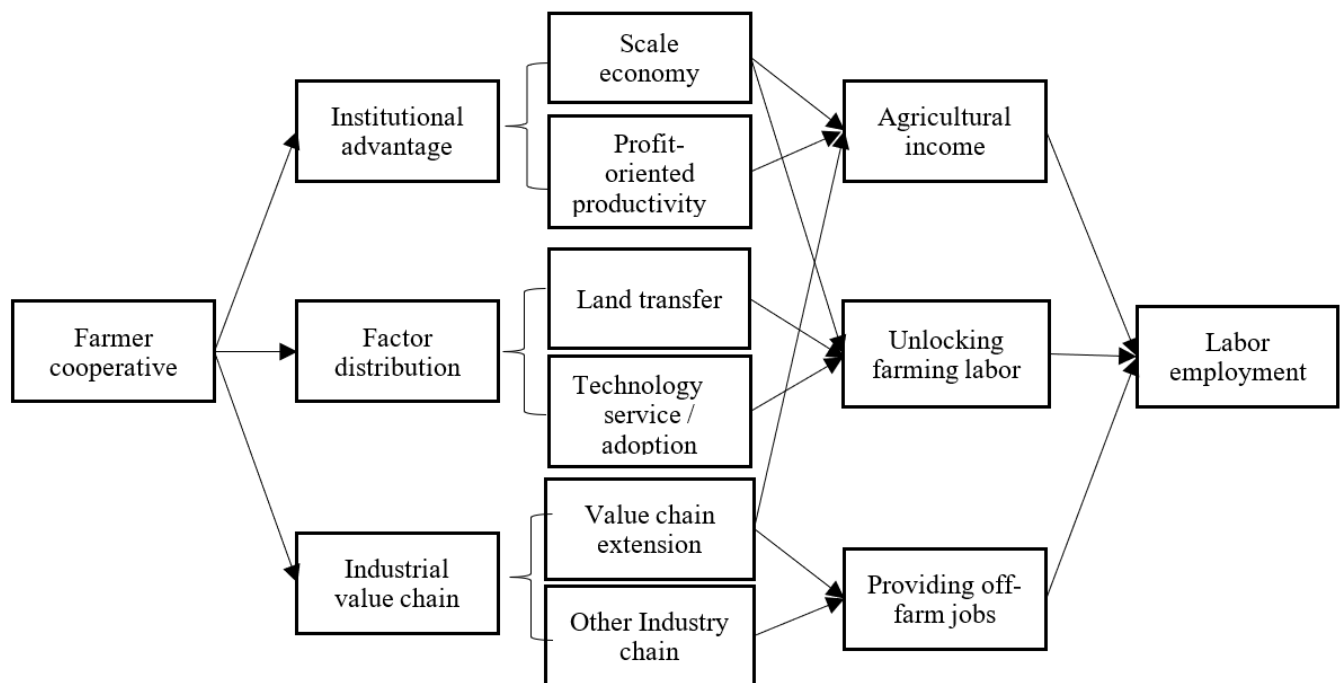


Figure 1. The conceptual framework of this study.

3. Materials and Methods

3.1. Sampling and Data Collection

The data used in this study are from two recent waves of the China Rural Development Survey. The initial survey in 2005 employed a stratified random sampling approach, targeting 2000 rural households across 100 villages in five provinces. The sampling process is as the following steps: Initially, provinces were randomly selected from major agroecological zones in China, with Jiangsu, Sichuan, Shaanxi, Jilin, and Hebei being selected. Then, a two-step method was employed to select five sample counties from each province. First, all counties within each province were ranked in descending order based on their per capita gross value of industrial output. Second, five counties were chosen from this list using an isometric random sampling technique. Within each selected county, sample townships and villages were selected in the two groups. For each county, the two sample townships were randomly selected from each of the ‘more well-off’ and ‘poorer’ categories. Adhering to the same methodology, two villages were then selected from each of these sampled townships. Lastly, the survey team randomly identified 20 households from each village. For these 20 households, 8 were interviewed using questionnaires, while the remaining 12 underwent group interviews. Since then, follow-up surveys have been conducted on the entire sample of households in 2008, 2012, 2016, 2019, and 2023. The data of the preceding year were gathered in each wave of survey.

This study uses the data at village, household, and individual levels collected in 2019 and 2023 as only these two waves of survey gathered the information on farmer cooperatives. At the village level, the information of population, distance to the township, per capita income, cultivated land, enterprise, industries, and other farming entities are used. At the household level, this study uses the information of grass-root political capital, dependency ratio, and land size. At the individual level, the information of gender, age, years of schooling, health status, and employment status are used.

The sample undergoes the following processing: Firstly, we only include the rural labor which is defined as those aged between 16 and 64 years old, finished formal schooling, not retired or exit labor market due to health problems, not military personnel, or serving prison sentences. Secondly, we eliminate the individuals with missing data for the variables. As a result, a total of 9199 observations spanning both waves remain.

3.2. Empirical Strategy

3.2.1. Benchmark Model

This study has multinomial logistic regressions with panel data as the benchmark model since there are four distinct employment statuses among rural labor. Specifically, the employment status is categorized into four types including unemployed, fully farming, part-time farming, and fully non-agricultural employment. The model is specified as follows:

$$Employ_{it} = \alpha_j + \beta_1 cooperative_{jt} + \beta_2 I_{it} + \beta_3 F_{it} + \beta_4 V_{jt} + \beta_5 year_t + \beta_6 county_i + \varepsilon_{it} \quad (1)$$

$Employ_{it}$ represent the employment status of the it th labor in t year to choose unemployed (equal to 0), fully farming (equal to 1), part-time farming (equal to 2), or fully non-agricultural employment (equal to 3). $cooperative_{jt}$ is the key independent variable. It equals to one if there is at least one farmer cooperative in the j th village, and zero otherwise. Labor's participation in farmer cooperatives is not random, and it involves a self-selection process [46,47]. However, the benefits offered by farmer cooperatives are not limited to their members alone. Their services, such as machinery access, land transfer, and market facilities, are available to all villagers, including those who are not cooperative members. Therefore, this study uses the presence of farmer cooperatives within a village as the primary explanatory variable rather than membership status. This approach addresses the potential endogeneity from sample selective bias introduced by unobservable factors that might affect both membership and employment status.

This study controls for some variables at individual, household, and village characteristics on labor employment to mitigate the risk of biased estimation from omitted variables. I_{it} are individual characteristics of the it th labor in the t year, including age, square of age, gender, years of education, marital, and health status. Household characteristics F_{it} pertaining to the it th labor in the t year encompass the presence of a village leader, the dependency ratio, and the land area of the household. Meanwhile, V_{jt} refers to village characteristics of the j th village in the t year, which contains the population size, the number of enterprises, the per capita income, the distance to counties, and the presence of other agricultural entities. These control variables' definitions and statistical analysis are presented in Table 1. The study incorporates time and county dummy variables in the model to control the time trends and location impacts. The p -value of the Hausman test is 0.1206, greater than 0.1, so the random effects model is selected to estimate the coefficient.

Table 1. Description of control variables.

Variables	Definition	2018 (N = 4782)		2022 (N = 4417)	
		Mean	St. D.	Mean	St. D.
Age	Years	43.88	12.82	44.56	12.10
Male	1 = yes, 0 = no	0.52	0.50	0.53	0.50
Education	Years of schooling	8.63	4.51	9.28	4.48
Married	1 = yes, 0 = no	0.86	0.35	0.84	0.37
Health	Self-report physical health (1 = General health status or better, 0 = Poor health)	0.75	0.44	0.73	0.44
Village leader	Any family member serves as village leader? (1 = yes, 0 = no)	0.12	0.32	0.12	0.33
Dependency ratio	Ratio of younger aged less than 16 years old and elders aged above 64 years old in the household	0.51	0.50	0.58	0.56
Land	Size of contract farmland in the household (thousand mu)	0.01	0.01	0.01	0.09
Population	Population in village (ten thousand)	0.22	0.14	0.20	0.13
Firm	Number of enterprises in village	8.55	20.51	6.19	14.10

Table 1. Cont.

Variables	Definition	2018 (N = 4782)		2022 (N = 4417)	
		Mean	St. D.	Mean	St. D.
Per capita income *	Per capita income per year in village (ten thousand CNY)	1.61	0.99	1.22	0.68
Town Distance	Distance from village and township (kilometer)	5.48	5.23	5.75	5.40
Other entity	Other new agricultural operation entities in village (1 = yes, 0 = no)	0.52	0.50	0.53	0.50

* Per capita income is deflated by the CPI index.

3.2.2. Models for Mechanism Analysis

This study firstly explores the mechanism of institutional advantage from two dimensions: scale economy and profit-oriented productivity. Then, this study investigates the mechanism of factor redistribution from land transfer and agricultural technology service/adoption perspectives. The model is specified as Equation (2).

$$X_{mt} = \eta_0 + \eta_1 cooperatives_{jt} + \eta_2 F_{mt} + \eta_3 V_{jt} + \eta_4 year_t + \eta_5 county_m + \psi_{mt} \quad (2)$$

m and t denote household and year, respectively. X_{mt} encompasses the following dependent variables for each mechanism analysis.

For the mechanism of institutional advantage, X_{mt} includes (a) farm income defined as the natural logarithm of the household's annual agricultural income; (b) farm income percentage, the proportion of annual agricultural income within the household's total income; (c) farm time, which is defined as the natural logarithm of the farming hours in the household; (d) ratio of farm income to labor, the natural logarithm of the ratio between the household's agricultural income and the farming hours. Both farm income and farm income percentage are used to measure the income-oriented productivity of farmer cooperatives. Farm time and ratio of farm income to labor are used to measure the scale economy of farmer cooperatives.

For the mechanism of factor distribution, X_{mt} includes the following: (a) Land transfer, a categorical variable containing no transfer, only renting out, only renting in, and both renting out and in, which is used to indicate the land redistribution effect of farmer cooperatives. (b) Extent of agricultural custom service measured by the degree of the agricultural machinery socialization service used in sowing, ploughing, and harvesting, which is used to capture the agricultural technology service effect of farmer cooperatives. (c) Agricultural machinery use, a categorical variable, including used for the partial production process, and used for all production process, which is used to obtain the peer effect of agricultural technology adoption of farmer cooperatives.

Given that 30% of sample households did not earn money from agricultural activities and more than half of sample households did not use an agricultural custom service, this study employs Tobit models with panel data to delve into the influence of farmer cooperatives on farm income, income percentage, farm time and their ratio, and extent of agricultural custom service. The multinomial logit model is used when the explained variables are categorical. To mitigate concerns of omitted variables, we have incorporated the control variable of the current value of agricultural machinery owned by a household.

Lastly, this study examines whether farmer cooperatives affect employment among rural labor through the industry value chain, including value chain extension and industry cluster. Value chain extension is defined as extending value chain from providing the service of sowing, ploughing, and harvesting to post-agricultural production, such as selling, drying, storing, and processing. The model is specified as follows:

$$Employ_{it} = \vartheta_j + \pi_1 chain_{jt} + \pi_2 I_{it} + \pi_3 F_{it} + \pi_4 V_{jt} + \pi_5 year_t + \pi_4 county_i + v_{it} \quad (3)$$

where $chain_{jt}$ is a categorical variable, including no extended value chain (equal to 0, reference group), value chain extended by other entities rather than farmer cooperatives

(equal to 1), value chain extended by the farmer cooperatives outside of the village (equal to 2), and value chain extended by the farmer cooperatives in the village (equal to 4).

Industry cluster is measured by two variables. The first is the probability of having a major industry in a village, which is a dummy variable. The second is the amount of industrial investment in a village, censored data. The presence of a leading industry in a village is a factor in assessing the vitality of a rural industry. Industrial investment serves as a reliable measure of an industry's growth potential and is also instrumental in addressing development disparities and fostering diversity [48–50]. By examining the impact of cooperatives on the two variables, we can gauge the formation of industrial cluster effects. The model is specified as follows:

$$Industry_{jt} = \alpha_0 + \alpha_1 cooperatives_{jt} + \alpha_2 V_{jt} + \alpha_3 year_t + \alpha_4 county_j + \tau_{jt} \quad (4)$$

4. Results

4.1. Descriptive Results

There is a decrease trend in the proportion of unemployed, fully agricultural employment, and part-time employment labor, but increase trends for fully non-agricultural employment labor from 2018 to 2022 (Table 2, Columns 1 and 2). The trend in labor employment in villages lacking cooperatives and those with cooperatives aligns with the overall trend, and the rate of employment change in villages with cooperatives is generally less than that in villages without cooperatives (Table 2, Columns 3–6). For the village with farmer cooperatives, there is a decline in unemployed labor and fully non-agricultural employment, and an increase in the proportion of part-time and fully farming, compared to the village without farmer cooperatives (Table 2, Columns 3–6). Overall, the rural labor in the villages with farmer cooperatives exhibits a higher employment proportion and a greater preference for fully farming and part-time farming among the various employment options.

Table 2. Employment of rural labor.

Year	All Sample		No Cooperatives		Cooperatives	
	2018	2022	2018	2022	2018	2022
Unemployment (%)	9.37	8.69	11.05	10.16	8.59	7.74
Fully farming (%)	26.43	22.82	23.43	19.86	27.82	24.75
Part-time farming (%)	20.91	18.88	20.58	17.74	21.06	19.63
Fully non-agricultural employment (%)	43.29	49.60	44.84	52.24	42.53	47.89
Observations	4782	4417	1511	1742	3271	2675

There are 68 villages with farmer cooperatives in 2018 and the number of villages with cooperatives witnessed a slight decline in 2022, settling at 62. Among the villages with cooperatives, the average number of cooperatives underwent a marginal increase, rising from 3.65 in 2018 to 3.75 in 2022 (Table 3, Row 1). However, this growth in cooperatives was not paralleled by an expansion in the number and size of hired laborers (Table 3, Row 2). This suggests that while the villages with farmer cooperatives experienced an increment in their number of cooperative entities, the hiring of workers did not scale up accordingly, indicating a lack of synchronization in the development and growth of hired labor. Farmer cooperatives indeed provide some agriculture custom services, encompassing cultivating, harvesting, pesticide control, technique extension, agricultural product selling, and land transfer agent (Table 3, Row 4–9). Cooperatives play a pivotal role in agricultural product sales and other aspects, primarily due to the diversification of their business content within villages, transcending the traditional role of single-purpose farming cooperatives.

Table 3. Status of farmer cooperatives.

	2018	2022
Number of farmer cooperatives (pcs)	3.65	3.75
Number of workers employed by farmer cooperatives (pcs)	39.87	22.38
Number of villages where farmer cooperatives provide agricultural custom services (pcs)		
<i>Sowing and ploughing</i>	10	10
<i>Harvesting</i>	10	8
<i>Pest control</i>	7	6
<i>Technology extension</i>	4	10
<i>Products selling</i>	7	3
<i>Intermediary agent of land rent</i>	5	3

4.2. Results from Benchmark Model

Farmer cooperatives play a significant role in promoting employment opportunities for rural labor. Table 4 reports the odds ratios, representing the likelihood of choosing a specific employment type compared to the reference group of unemployment. Specifically, the odds of labor in villages with farmer cooperatives engaged in fully farming are 1.526 times those in villages without farmer cooperatives. Similarly, the odds of part-time farming are 1.577 times, and the odds of fully non-agricultural employment are 1.226 times, when compared to the group without farmer cooperatives (Row 1). These findings align with previous studies [10,14], indicating that the presence of farmer cooperatives increases the probability of employment among rural labor over unemployment in all scenarios.

Table 4. Results from benchmark model: Effects of cooperative on employment type.

	(1) Fully Agricultural Employment	(2) Part Time Employment	(3) Fully Non-Agricultural Employment
Reference group: Unemployment			
Cooperative	1.526 *** (0.198)	1.577 *** (0.186)	1.226 * (0.148)
Education	0.895 *** (0.015)	0.974 * (0.014)	1.092 *** (0.016)
Male	3.520 *** (0.508)	14.592 *** (1.917)	16.432 *** (2.303)
Age	1.407 *** (0.062)	1.768 *** (0.072)	1.576 *** (0.061)
Square of age	0.997 *** (0.000)	0.994 *** (0.000)	0.994 *** (0.000)
Married	0.556 ** (0.145)	0.654 * (0.165)	0.215 *** (0.047)
Health	0.794 * (0.100)	1.287 ** (0.155)	1.292 ** (0.163)
Village Leader	0.614 ** (0.119)	1.576 *** (0.267)	1.075 (0.188)
Dependency ratio	0.663 *** (0.075)	0.647 *** (0.068)	0.781 ** (0.082)
Land	0.749 (0.424)	0.801 (0.460)	1.558 (1.316)
Population	1.423 (0.991)	1.300 (0.794)	4.809 ** (2.948)
Firm	0.980 *** (0.006)	0.994 (0.004)	1.004 (0.004)
Per capita income	1.116 (0.126)	1.137 (0.109)	1.068 (0.104)

Table 4. Cont.

	(1)	(2)	(3)
	Fully Agricultural Employment	Part Time Employment	Fully Non-Agricultural Employment
Town Distance	1.026 *	1.003	0.987
	(0.014)	(0.013)	(0.013)
Other entity	1.044	0.974	1.022
	(0.138)	(0.120)	(0.128)
Year_dummy	YES	YES	YES
County_dummy	YES	YES	YES
Constant	0.000 ***	0.000 ***	0.002 ***
	(0.000)	(0.000)	(0.002)
Observations	9199	9199	9199

*, **, *** denotes $p < 0.1$; $p < 0.05$; $p < 0.01$; Coefficients and standard errors are odds ratios.

The Wald tests reveal that the effects of farmer cooperatives on fully farming and part-time farming groups are comparable, while its impact on non-agricultural employment is comparatively smaller. The p -value of 0.761 for the difference between fully farming and part-time farming confirms that the positive effect of farmer cooperatives on both of them is not significant. The p -values of 0.06 and 0.01 for the comparison among fully farming, part-time farming, and non-agricultural employment groups suggest that the positive effect of farmer cooperatives on non-agricultural employment is significantly smaller than the other two groups. The study concludes that farmer cooperatives contribute less to non-agricultural employment compared to other employment options.

In the benchmark model, this study initially posits that the labor samples are mutually independent. In reality, employment behaviors among individuals within the same household laborers are likely to be interdependent, and such household-level interactions have the potential to undermine the robustness of the benchmark model. This paper adopts a household-level clustered standard error approach in lieu of the conventional robust standard error setting for maximum likelihood estimation. Table 5 presents the odds ratios derived from the clustered standard errors, revealing that the proportions of laborers in villages with cooperatives opting for agricultural, part-time, and non-agricultural employment, compared to unemployment, are all significantly higher than 1. The coefficients remain unchanged in both direction and significance, thus affirming the robustness of the benchmark model's findings.

Table 5. Robustness test.

	(1)	(2)	(3)
	Fully Agricultural Employment	Part-Time Employment	Fully Non-Agricultural Employment
Reference group: Unemployment			
Cooperative	1.526 ***	1.577 ***	1.226 *
	(0.224)	(0.215)	(0.151)
Control variables	YES	YES	YES
Year_dummy	YES	YES	YES
County_dummy	YES	YES	YES
Constant	0.000 ***	0.000 ***	0.002 ***
	(0.000)	(0.000)	(0.002)
Observations	9199	9199	9199

*, **, *** denotes $p < 0.1$; $p < 0.01$; Coefficients and standard errors are odds ratios.

4.3. Results from Mechanism Analysis

4.3.1. Institutional Advantages: Scale Economy and Income-Orientation Productivity

The results presented in Table 6 verify that the mechanism of farmer cooperatives improve the employment of rural labor by scale economy and improve income-orientation productivity. The farm income of households in villages with farmer cooperatives is about 44.5 percent higher than that of households in villages without farmer cooperatives, marking a significant surge (Row 1, Column 1). The results reveal that farm cooperatives not only boost agricultural income, but they drive an increase in the farm income proportion. However, the modest 0.8 percent rise in the agriculture income share in households located in villages with farmer cooperatives compared to those without indicates that farmer cooperatives do not lead to significant alterations in household income structure. Households with higher agricultural incomes may tend to augment their incomes through alternative avenues, so that they maintain a balanced income structure.

Table 6. Impact of farmer cooperative on farm income and farm labor input.

	(1)	(2)	(3)	(4)
	Farm Income	Farm Income Percentage	Farm Time	Farm Income/ Farm Time
Cooperative	0.445 *** (0.110)	0.008 * (0.005)	0.428 *** (0.089)	0.064 * (0.038)
Village Leader	−0.010 (0.157)	0.006 (0.007)	−0.163 (0.131)	0.182 *** (0.051)
Dependency ratio	−0.057 (0.078)	−0.006 * (0.004)	−0.035 (0.065)	−0.020 (0.026)
Land	0.027 (0.931)	0.011 (0.043)	−0.445 (0.784)	5.172 *** (1.493)
Population	−0.988 * (0.596)	−0.055 ** (0.027)	−1.787 *** (0.501)	−0.209 (0.196)
Firm	−0.016 *** (0.003)	−0.000 *** (0.000)	−0.015 *** (0.003)	−0.007 *** (0.001)
Per capita income	0.144 * (0.079)	0.000 (0.004)	−0.048 (0.064)	0.007 (0.027)
Town Distance	0.054 *** (0.013)	0.001 ** (0.001)	0.042 *** (0.011)	0.001 (0.004)
Other entity	0.063 (0.112)	−0.004 (0.005)	0.076 (0.092)	0.009 (0.037)
Year_dummy	YES	YES	YES	YES
County_dummy	YES	YES	YES	YES
Observations	3507	3507	3507	2784

*, **, *** denotes $p < 0.1$; $p < 0.05$; $p < 0.01$.

Table 6 highlights the positive influence of farmer cooperatives on agricultural labor inputs of households. This aligns with the results of the benchmark model, underscoring the contribution of farmer cooperatives to farming labor. It is noteworthy to discuss the contrasting performance of farmer cooperatives and large-scale agricultural investments (LSAIs). As Nolte and Ostermeier [51] observed, LSAIs tend to displace small farmers during their development, failing to generate the anticipated direct employment effects. This paper argues that the disparity between farmer cooperatives and other large-scale productive investments lies primarily in their distinct organizational structure, business model, and distribution mechanisms. Farmer cooperatives' services are not inwardly exclusive, enabling other small farmers in rural areas to reap the benefits of the cooperative's institutional advantage, enhancing their own production efficiency. Farmer cooperatives facilitate the establishment of incentive-compatible development models that benefit farmers while maintaining the competitiveness of firms, thus mitigating the potential displacement effect on smallholder farmers. Furthermore, farmers remain integral to China's agricultural production paradigm. In the efficiency competition between large-scale operations and

smallholders, smallholders often possess unique productivity advantages in cultivating certain agricultural crops [52]. The income-generating impact of cooperatives in agricultural production lead more labor to prefer small-scale agricultural production and operations rather than being displaced by capital-intensive farms.

The findings of column (4) in Table 6 exhibit the impact of farmer cooperatives on enhancing the ratio of farm income to time. When the amount of time devoted to farm inputs remains unchanged, the presence of farmer cooperatives boosts the agricultural earnings per unit of labor time. At constant farm income, households in villages with cooperatives invest less hours to agricultural activities. This observation is consistent with the previous analysis that at a fixed farm income, farmer cooperatives contribute to a crowding-out of agricultural labor to some extent. Households' innate drive for higher farm income overshadows the potential scale economies derived from labor substitution, leading them to increase their agricultural labor inputs.

4.3.2. Factor Redistribution: Land Transfer and Technology Service/Adoption

Table 7 indicates that the existence of farmer cooperatives encourages rural households to engage in land renting out but fails to exert a substantial impact on land renting in or simultaneously renting in and out. The results underscore that the farmer cooperatives rent in land from smallholder households, thereby potentially influencing the allocation of labor in rural communities. The result of affecting only renting out but not renting in is consistent with the study of Li et al. [14].

Table 7. Impact of farmer cooperative on land transfer and mechanization.

	(1)	(2)	(3)	(4)	(5)	(6)
	Land Transfer			Technology Service/Adoption		
	Renting Out Only	Renting In Only	Renting Out and Renting In	Extent of Custom Service	Part Process Use	All Process Use
	Reference group: No transfer				Reference group: No machine use	
Cooperative	1.517 *** (0.245)	1.234 (0.205)	1.729 (0.601)	0.012 * (0.007)	1.069 (0.142)	1.408 ** (0.241)
Machinery expenses				−0.002 *** (0.001)	1.010 (0.017)	0.947 *** (0.020)
Village Leader	1.012 (0.230)	1.493 ** (0.287)	0.966 (0.407)	0.005 (0.009)	0.971 (0.183)	1.894 ** (0.485)
Dependency ratio	1.093 (0.121)	0.700 *** (0.0829)	0.870 (0.194)	0.001 (0.005)	0.923 (0.088)	1.037 (0.115)
Land	2.207 (1.644)	0.0125 (0.0831)	692.5 (3.667)	−0.031 (0.052)	0.804 (0.409)	0.607 (0.300)
Population	0.218 * (0.183)	0.525 (0.476)	0.0455 * (0.0819)	0.096 *** (0.035)	4.722 ** (3.191)	0.548 (0.667)
Firm	0.998 (0.005)	0.990 (0.007)	0.999 (0.019)	−0.001 ** (0.000)	0.978 *** (0.005)	0.990 (0.007)
Per capita income	1.190 (0.132)	1.046 (0.114)	0.898 (0.174)	0.014 *** (0.005)	1.087 (0.146)	1.478 ** (0.291)
Town Distance	0.993 (0.019)	1.051 *** (0.017)	1.026 (0.042)	0.001 (0.001)	1.013 (0.014)	0.993 (0.016)
Other entity	0.887 (0.144)	1.043 (0.163)	1.572 (0.488)	−0.016 ** (0.007)	1.545 *** (0.207)	0.523 *** (0.090)
Year_dummy	YES	YES	YES	YES	YES	YES
County_dummy	YES	YES	YES	YES	YES	YES
Observations	3507	3507	3507	3131	3131	3131

*, **, *** $p < 0.1$; $p < 0.05$; $p < 0.01$; coefficients and standard errors in column (1)–(3) and (5)–(6) are odds ratios; machinery expenses have been deflated by CPI; models in column (4)–(6) eliminated the samples without farmland which affect the reliability of the results.

The results presented in Table 7 reinforce the notion that cooperatives play a pivotal role in enhancing the extent of agricultural mechanization and fostering the adoption of agricultural custom services within farming households. The findings align with the positive role that farmer cooperatives play in facilitating the dissemination of agricultural technology, as outlined in theoretical and literature analyses. The literature suggests that the influence of technological progress on labor employment is multifaceted, with some technological changes not necessarily leading to a shift of labor towards the industrial or service sectors, but rather an increase in agricultural labor inputs [51,53].

However, this study argues that the relationship between technological advancements and labor employment choices is contingent upon the specific category of technology. Some technological advances can significantly influence the variety, yield, or production cycle of agricultural products, leading to higher profits and potentially increased labor demand due to scale expansion. By focusing on the technology provided by cooperatives in agricultural custom services, this study limits the scope of technology's content and role. Consequently, it is plausible to affirm the significance of cooperative custom services in farming households and their potential to liberate labor for optimal allocation.

4.3.3. Value Chain: Value Chain Extension and Industrial Cluster

The results reveal that the value chain extension of local farmer cooperatives improve the probability of engaging in fully farming and part-time farming among rural labor, while it fails to promote fully non-agricultural employment. In comparison to the areas without value chains extension, rural labor in villages with local-based farmer cooperatives providing such value chains are 1.979 times more likely to be fully farming and 1.644 times more likely to opt for part-time farming than unemployment (Table 8, Row 1). There is no significant disparity in the likelihood between fully non-agricultural employment and unemployment. This suggests that local cooperatives offering value chain extension favors farming and part-time farming. Similarly, rural labor in villages with other entities providing value chain extension tend to farm. Among these options, the labor in villages with local-based farmer cooperatives extending value chains exhibit the highest probability of farming and part-time farming. Hence, when comparing the impact of local cooperative value chain extensions, it is evident that their positive influence on labor employment exceeds that of other entities or cooperatives from outside the village.

This study posits that the distinguishing characteristics of local cooperatives within the value chain framework determine their impact on employment. Notably, the value chain extension of these farmer cooperatives does not significantly influence fully non-agricultural employment. As evident in the descriptive analysis, the sampled farmer cooperatives exhibit notable shortcomings in their incomplete industrial chains. While some farmer cooperatives possess value chain links beyond production, these links remain weakly integrated. This impediment hinders industry value enhancement and impedes farmer cooperatives' ability to generate the anticipated high demand for hired labor.

The number of farmer cooperatives exhibits a clustering effect by increasing the probability of having a major industry in a village and the amount of industry investment in the village (Table 9, Row 1). These farmer cooperatives attract increased industrial investments, which foster a more comprehensive rural entrepreneurial ecosystem, encompassing technical support, market channels, and financial assistance. Such an environment provides an optimal backdrop for employment and entrepreneurship opportunities for the rural workforce. Encouraged by the favorable conditions created by farmer cooperatives, villages facilitate the upgrading of rural industrial structures, gradually diversifying the types of leading industries and establishing multiple interconnected industrial chains. Consequently, the cooperatives contribute significantly to the development of local industries, creating an appealing labor market that generates job positions and aids agricultural surplus labors in finding suitable employment.

Table 8. Impact of industry chains on employment.

	(1)	(2)	(3)
	Fully Farming	Part-Time Farming	Fully Non-Agricultural Employment
Reference group: Unemployment			
Baseline group: No extended value chain			
Chain by others	1.452 ** (0.245)	1.219 (0.192)	0.879 (0.137)
Chain by other cooperatives	3.366 (2.560)	2.152 (1.553)	0.961 (0.838)
Chain by local cooperatives	1.979 *** (0.418)	1.644 *** (0.316)	0.833 (0.159)
Education	0.892 *** (0.015)	0.971 ** (0.014)	1.090 *** (0.016)
Male	3.513 *** (0.505)	14.592 *** (1.914)	16.370 *** (2.288)
Age	1.407 *** (0.061)	1.768 *** (0.072)	1.574 *** (0.061)
Square of age	0.997 *** (0.000)	0.994 *** (0.000)	0.994 *** (0.000)
Married	0.554 ** (0.144)	0.644 * (0.162)	0.211 *** (0.046)
Health	0.787 * (0.100)	1.278 ** (0.155)	1.287 ** (0.162)
Village Leader	0.626 ** (0.122)	1.590 *** (0.270)	1.074 (0.187)
Dependency ratio	0.672 *** (0.077)	0.654 *** (0.068)	0.784 ** (0.082)
Land	0.749 (0.420)	0.778 (0.450)	1.489 (1.248)
Population	1.648 (1.148)	1.476 (0.910)	5.430 *** (3.406)
Firm	0.978 *** (0.006)	0.992 ** (0.004)	1.003 (0.004)
Per capita income	1.160 (0.128)	1.178 * (0.109)	1.076 (0.102)
Town Distance	1.023 (0.014)	1.000 (0.013)	0.990 (0.013)
Other entity	1.033 (0.137)	0.974 (0.121)	1.059 (0.132)
Year_dummy	YES	YES	YES
County_dummy	YES	YES	YES
Observations	9199	9199	9199

*, **, *** $p < 0.1$; $p < 0.05$; $p < 0.01$; coefficients and standard errors are odds ratios.

Table 9. Impact of farmer cooperative on value chain in village.

	(1)	(2)
	Major Industry (1 = Yes, 0 = No)	Ln (Amount of Industrial Investment)
Cooperative	0.299 *** (0.085)	0.369 *** (0.131)
Population	−0.641 * (0.372)	−0.196 (0.657)
Village farmland	0.008 (0.011)	0.016 (0.024)
Firm	0.010 *** (0.003)	0.017 *** (0.004)

Table 9. Cont.

	(1)	(2)
	Major Industry (1 = Yes, 0 = No)	Ln (Amount of Industrial Investment)
Per capita income	−0.004 (0.037)	0.078 (0.095)
Town Distance	0.003 (0.007)	0.032 ** (0.014)
Other entity	0.001 (0.062)	0.136 (0.130)
Year_dummy	YES	YES
County_dummy	YES	YES
Observations	177	199

*, **, *** $p < 0.1$; $p < 0.05$; $p < 0.01$; Column (1) removed observations with no variation in the dependent variable within the same county for both periods.

5. Conclusions and Implications

This paper examines the effects of farmer cooperatives on rural labor employment, exploring the underlying mechanisms that they influence through the lens of institutional advantages, factor redistribution, and industrial value chains. Leveraging two-waved panel data from the China Rural Development Survey, empirical analysis was conducted using multiple regressions related to panel data. The findings reveal that farmer cooperatives foster fully farming, part-time farming, and fully non-farm employment for rural labor, with a more pronounced impact on fully farming and part-time farming.

Analysis of the mechanisms show that farmer cooperatives have bolstered agricultural income and its share in household income. The comparative regression divulges that the income-attracting effect of famer cooperatives transcends the substitution effect on rural labor stemming from land capital consolidation and large-scale operations. Therefore, farmer cooperatives increase agricultural employment engagement. Concurrently, they expedite land renting out and foster mechanization. The technology service or adoption offering from farmer cooperatives facilitate the redistribution of household labor resources, enabling them to diversify into alternative employment avenues. Furthermore, farmer cooperatives catalyze rural industrial clusters and propel the evolution of value chains. This consolidation and progression within the industrial value chain sparks the creation of local job opportunities, propelling the rural labor force towards employment. The elongation of the value chain renders the agricultural sector more lucrative, thereby enhancing its allure as a viable employment option for rural labor.

This study is instrumental in comprehending the employment role of farmer cooperatives during the development process and enriching the analytical scope of cooperative effectiveness research. It offers deeper insights into the value that farmer cooperatives create in rural labor employment. As China undergoes economic transformation, rural employment has diversified, bolstering the flexibility and resilience of the labor market. The cooperatives' promotional effect on various forms of employment underscores emerging employment trends. Farmer cooperatives have a stronger promotional impact on agricultural and part-time employment compared to fully non-agricultural employment, suggesting that non-agricultural employment opportunities and cooperatives' crowding-out effects cannot fully transition the rural workforce into non-agricultural roles. Instead, part-time employment emerges as a crucial flexible employment mode in rural areas. In the future evolution of farmers' cooperatives, efforts should be directed towards attracting more labor transfer employment and fostering integration and synergy between urban and rural labor markets. A comprehensive analysis of farmer cooperatives' impact on rural labor employment can ascertain whether they serve as an effective solution to the challenges of inadequate internal development momentum and limited external impetus in rural areas. This analysis holds policy and practical implications for governmental bodies in devising guidelines for the nurturing and advancement of farmers' cooperatives.

We acknowledge the limitations of this study. First, the study uses two-waved unbalanced panel data, limiting inferences about the long-term employment effects of farmer cooperatives. Future research could construct multi-period panel data to analyze the enduring impact of cooperatives on employment. Second, we do not touch the complexities of farmer cooperatives, such as types, business mode, and operational performance. Further studies could incorporate the business modes and efficiency of cooperatives into the analytical framework to provide targeted evidence.

This study has the following policy implications despite the above limitations. Firstly, it is imperative to dismantle institutional hurdles that hinder farmer cooperatives' operational efficiency, thereby unleashing their full potential in fostering employment. Secondly, the institutional strengths of farmer cooperatives, particularly their agricultural income-enhancing effects, ought to be harnessed to empower disadvantaged rural residents and facilitate their employment prospects. Thirdly, there is a need to bolster farmer cooperatives' role in factor circulation and to standardize circulation mechanisms to minimize institutional barriers that cooperatives face in optimizing resource distribution and cater to the demand for labor's free flow. Lastly, constructing a complete agricultural value chain can help expand fully non-agricultural employment in terminal services, stabilize the connection formed by the upstream breeding industry relying on land elements, promote the integration of the industry chain from downstream to upstream, and enhance the employment effect of cooperatives.

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