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The Impact of Off-Farm Employment Recession and Land on Farmers' Mental Health: Empirical Evidence from Rural China

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Abstract: The agricultural land management under the household responsibility system (HRS) in rural China empowers farmers with land tenure rights, meeting the basic needs for their livelihoods and employment by cultivating the land. This paper investigates the pivotal role of agricultural cultivated land as a social safety net, ensuring livelihood security for farmers confronting a recession in off-farm employment. Our analysis is based on data collected from six provinces (Heilongjiang, Henan, Zhejiang, Yunnan, Shandong, and Anhui) in the rural areas of China from 2019 to 2020. We investigated the impact of the off-farm employment recession on the mental health of farmers and the moderating effect of land as a social safety net on the relationship between the off-farm employment recession and mental health. The analysis points to the following results: (1) The majority of farmers have significantly reduced off-farm working time during employment recession. (2) The off-farm employment recession has worsened farmers' mental health. (3) Farmers' land assets through tenure rights provide both income and employment security functions, which can mitigate the adverse effects of the off-farm employment recession on their mental health. The findings of this study highlight the crucial role of land assets to reduce the negative impact of unemployment in the context of economic recession, emphasizing the significance of the policies supporting the land rights among vulnerable rural groups.

Keywords: rural farmers' livelihood; land tenure rights; mental health; economic recession; employment and unemployment

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1. Introduction

As an additional source of income, families rely on nonfarm employment to meet their needs. Traditionally, the rural households in developing countries have been viewed as exclusively engaged in agriculture. However, more and more farmers are migrating from the agricultural sector to the nonfarm sector. Mounting evidence confirms that nonfarm wages and salaries are becoming the major sources of total family income [1–3], and the diversification of household activities can reduce the vulnerability to risks. However, many rural workers are temporary migrants with "dual occupations" [4,5], by working in the fields during the farming seasons and in the nonfarm sector during the slack agricultural seasons. Furthermore, these workers are employed in small enterprises and low-status labor occupations, such as construction work [6,7]. They are susceptible to market fluctuations and more exposed to the economic recession as their jobs are inherently informal without the protection of formal contracts [8–13]. For instance, the COVID-19 pandemic and associated containment policies have resulted in an unprecedented economic crisis and shocks to the labor market. Nearly all countries have faced widespread job losses, especially in low-wage occupations such as healthcare support, food preparation and serving, and personal care

and service [14,15]. Furthermore, household quarantine and transportation restrictions exacerbated the difficulty for migrant workers to promptly return to employment in urban areas. This not only led to a decrease in their income and working time but also affected their mental health [16,17].

Unemployment has some negative impacts on the mood, anxiety, and spirit of the unemployed. For example, during the global financial crisis in 2007, the Spanish construction industry was severely affected, leading to a prolonged decline in the mental health of unemployed workers that persisted severely for up to five years, diminishing their chances of securing re-employment [17]. In Italy, a country with high and sustained levels of unemployment, studies have shown that permanent employees have better psychological health than individuals with temporary or non-standard working arrangements, or those experiencing unemployment [18]. These effects are even more pronounced in regions or countries with less developed economies, an inequitable income distribution, and weak unemployment protection schemes [19]. For example, most Chinese migrant workers do not participate in social insurance and protection schemes such as unemployment insurance and medical service, and their mental health significantly deteriorated during the financial crisis in 2007 [20]. Some studies have also demonstrated that unemployment increases one's psychological, physical, and emotional vulnerability [21], causing mental health problems such as suicide and self-harm during the pandemic [22]. Social policies and formal support resources, such as health and unemployment insurance, have been identified as effective mechanisms in mitigating the impact of unemployment on mental health [23–25].

In China, the land system serves as a social safety net providing a basic income and employment opportunities. As an agricultural country with a large population and limited land, China has implemented a series of land system reforms over the past half-century to alleviate the conflict between the people and land. In the late 1970s, China shifted from being collective-based (commune, brigade, team) to household-based by implementing the household responsibility system (HRS), separating land ownership and contractual rights. The rural collective economic organization [1] owns the land ownership rights and contracts the distribution land (contracted land) to farmers on a household unit based on their household size, labor supply, or both. Farmers can cultivate crops on their land for personal consumption or sell the products for subsistence. Alternatively, they can transfer out the land and earn rental income to fulfill their basic needs [26–28]. In 2022, farmers possessed contracted land with about 0.1 hectares of arable land per capita and 0.52 hectares per household. Initially, farmers were granted a 15-year land use period, which was extended to 30 years upon expiration. To safeguard farmers' land contractual rights, the government has proposed extending the land contract period by an additional 30 years following the expiration of the second round. With the progression of urbanization and technological advances in agriculture, a growing number of rural laborers are moving from the villages to the nonfarm employment sector in cities, leading to increased part-time and nonfarm employment among farmers. In response, the government has begun to support large-scale farming and has carried out land property rights reforms. While rural land ownership remains with village collectives, farmers' rights have been divided into tenure rights and use rights. The government supports the transfer of land use rights from small farmers to large-scale professional farmers and also protects farmers' land tenure rights. When off-farm employment opportunities diminish, land can also emerge as a "labor reservoir", offering re-employment options for migrant workers to return to farming in the agricultural sector [10,29,30].

Some studies confirmed that traditional agriculture in low-income economies was relegated to the "subsistence sector", functioning as a reservoir for "surplus labor" [31] and providing financial support during shocks [32]. Some studies have also demonstrated the role of land as a "labor reservoir" to provide employment for laborers. A study discovered that among the rural laborers in China who lost their off-farm employment during the pandemic, 61.2 percent of them returned to the agricultural sector, either through cultivating their own cropland or working for large-scale farms [33]. Furthermore, the study revealed that household-contracted cropland or cultivated acreage heighten the likelihood of the labor returning to the agricultural sector [33]. In India, some migrant workers chose to return to their village after losing their jobs [12,13].

The existing literature has overlooked the role of land moderating the relationship between the off-farm employment recessions [2] and mental health. To address this gap, this study examined the mental health of rural workers with off-farm jobs in the context of the off-farm employment recession during the COVID-19 pandemic, utilizing the data from six provinces (Heilongjiang, Henan, Zhejiang, Yunnan, Shandong, and Anhui) in China. The study aimed to answer three key research questions:

1. What is the impact of the pandemic on the off-farm employment among farmers in China?
2. How do the reduced working hours or layoffs affect the mental health of farmers?
3. How does the land moderate the relationship between the off-farm employment recession and the mental health of farmers?

We analyzed the impact of the off-farm employment recession on the mental health among the rural workers who had part-time jobs or full-time jobs in the off-farm sector before the pandemic. Furthermore, we explored how these impacts differ based on individual characteristics. Finally, we evaluated the moderating role of land as a social safety net providing income or employment on the relationship between the off-farm employment recession and mental health.

This study contributes to the existing literature in two ways. First, this study expands upon the understanding of the relationship between employment recession and the mental health of farmers by providing empirical evidence of the adverse effects of the off-farm employment recession on mental health. Second, this study empirically demonstrates that land can reduce the adverse effects of the off-farm employment recession on mental health. The conclusions drawn from this study offer valuable insights for policymakers and researchers in other developing countries with similar challenges.

2. Literature Review and Theoretical Analysis

2.1. Literature Review

2.1.1. The Impact of Unemployment on Workers' Mental Health

Nonfarm income is an important source of revenue for farm households, especially in developing countries. Some studies suggest that nonfarm sources account for 40–45% of the average rural household income in sub-Saharan Africa and Latin America and 30–40% in South Asia [3,34,35]. Such patterns of diversification promise to transform the structure of rural economies and societies. Many studies have examined the role of nonfarm employment on farmers' livelihoods, focusing on its effects in reducing rural poverty and vulnerability, and increasing their per capita consumption or expenditure in countries like Vietnam and India [36,37]. Using long-term survey data in Palanpur, a village in western Uttar Pradesh, a study has shown that the nonfarm diversification not only increased the household income but also reduced poverty [38]. In Bangladesh, a study found that nonfarm income has a significant positive effect on household asset ownership [39].

During an economic crisis, labor markets have been always jolted by financial market turmoil. For instance, during the financial crisis in 2008, the monthly job losses spiked to among the highest on record in America [40]. Similarly, during the COVID-19 pandemic, both small and large businesses nearly faced declines [15]. Informal wage workers were significantly more vulnerable to job losses than the formal workers [12,41]. Unemployment is associated with financial strain, loss of social identity, work-related devaluation, reduced life satisfaction [42], and the emergence of unhealthy behaviors such as tobacco consumption, suicide, and alcohol abuse [43,44], as well as depression and anxiety [45,46].

Most evidence supports the generally assumed negative effects of unemployment on mental health. In the existing studies, mental health was measured by reference to depression feelings [47], anxiety disorders, and other psychological symptoms [16]. Some studies examined the relationship between unemployment and mental health using longitudinal samples of those who were unemployed at the beginning of the study [48]. Other studies used samples from pre-crisis periods and during the crisis [47]. In general, most studies have verified that the unemployed suffer from great anxiety. Some studies found that the recession had differential effects on depression depending on the gender, age, employment conditions (working hours), and certain subcategories of the unemployed and the non-employed [49,50]. Furthermore, the negative effect of unemployment on mental health is stronger in countries with relatively low economic development, an unequal distribution of income, or a weak unemployment protection system [18].

2.1.2. Off-Farm Employment Recession and the Re-Employment in the Agricultural Sector

During economic crises, social protection schemes can significantly improve people's situations. Most developed countries have some form of safety net, such as unemployment insurance and access to healthcare. For instance, a study demonstrated that a pre-existing, near-universal pension program in the Nordic countries had a positive impact during the COVID-19 pandemic, as participating households increased their weekly food stocked by 25 percent and reduced the probability of going hungry by 40 percent [51]. Similar to some social protection programs, agriculture is the main livelihood source for rural people in many developing countries. Access to land has long been advocated as one of the potentially most effective approaches to rural poverty reduction [52–54]. In Mexico, access to even a small plot of land can significantly raise a household's welfare [55]. In Ethiopia, the government justifies state land ownership and the prohibition of land sales based on protecting peasants from market forces, which allow farmers to rent part of their land to obtain money or sharecrop their land, so the land policy guarantees a small part of household subsistence [27].

China's evenly distributed land system has constructed a social safety net for rural China, providing substantial employment opportunities for rural workers in the agricultural sector and safeguarding their livelihoods [56]. However, the security function of land in China is gradually weakening due to the declining of comparative returns in agriculture and the general migration of rural workers to the off-farm sector. A study calculated the value of arable land assets as a means of production, old-age security, and financial collateral using Chinese rural data from 1986 to 2015, and found that all the values declined to varying degrees over the specified period [57]. Other countries have also experienced landlessness and farm exits due to the massive outmigration of youth from the rural areas and the development of the off-farm sector [58–60].

Despite the downward trend, returning to one's hometown has become a viable option for migrant workers who face crises in off-farm employment. In the absence of sound social security, such as rural pension schemes, farmers frequently choose to return to farming and refrain from transferring out their land when confronted with the unemployment in the off-farm sector [32]. Following the global financial crisis in 2008, 6.8 percent of China's rural workers experienced layoffs, with 56 percent of the long-term laid-off workers opting to farm on their own cropland [10]. In the early 1990s, as layoffs surged and hiring slowed in China, a study highlighted an increased demand for labor

on family farms, prompting unemployed migrant workers to re-enter the agricultural sector for employment [32]. During the recession in Cyprus, a study demonstrated that the probability of unemployed farmers re-entering the off-farm employment decreases as the size of their farm increases [31]. Some studies found that the agricultural sector acted as a sponge, absorbing surplus labor during the pandemic, and there were general increases in the financial well-being of employed agricultural workers, with increasing bonus pay and weekly hours [12,61].

2.2. Theoretical Analysis

Unemployment significantly affects workers' mental health, both through direct economic and non-economic factors associated with joblessness. On the one hand, the loss of off-farm employment for farmers diminishes their income streams, resulting in livelihood challenges and financial strain. Insufficient relief and compensation exacerbate the deterioration of living standards, which affects farmers' ability to access necessities such as food and medical care. On the other hand, unemployment reduces their social interactions and heightens their negative emotions like depression and loneliness. Some individuals might turn to harmful coping behaviors such as smoking and alcohol abuse, which only serve to intensify psychological stress. Moreover, unemployment can undermine workers' self-esteem and sense of identity, leading to increased self-doubt. Based on the above analysis, we propose the first hypothesis (H1):

H1. *The off-farm employment recession has a negative impact on farmers' mental health.*

The impact of unemployment on farmers' mental health is related to their characteristics. Human capital is a crucial factor in determining a laborer's value. Typically, individuals with higher levels of education have greater access to formal employment opportunities and higher earnings. Farmers with higher levels of education are more likely to access off-farm employment [62] and can find re-employment in the short term even after experiencing job loss. Additionally, farmers who have difficulty finding formal employment are more likely to be affected by an economic recession. Based on the above analysis, we propose the second hypothesis (H2):

H2. *The off-farm employment recession has a more pronounced negative impact on the mental health of disadvantaged farmers.*

Unemployment benefits can significantly mitigate the negative effects of unemployment [63]. China's equally distributed land system serves as a social safety net intended to support the livelihoods of rural residents. Farmers possess the land contractual rights for farming or transferring, which can increase their income and sustain their livelihoods. Furthermore, the land acts as a "labor reservoir", providing them with employment opportunities. Studies have shown that farmers who lose off-farm employment often return to agriculture for employment [32]. Based on the above analysis, we propose the third hypothesis (H3):

H3. *Land can mitigate the negative effects of the off-farm employment recession on farmers' mental health by providing income and employment opportunities.*

Based on the literature review and analysis above, a theoretical framework for the off-farm employment recession, land, and farmers' mental health can be presented (Figure 1).

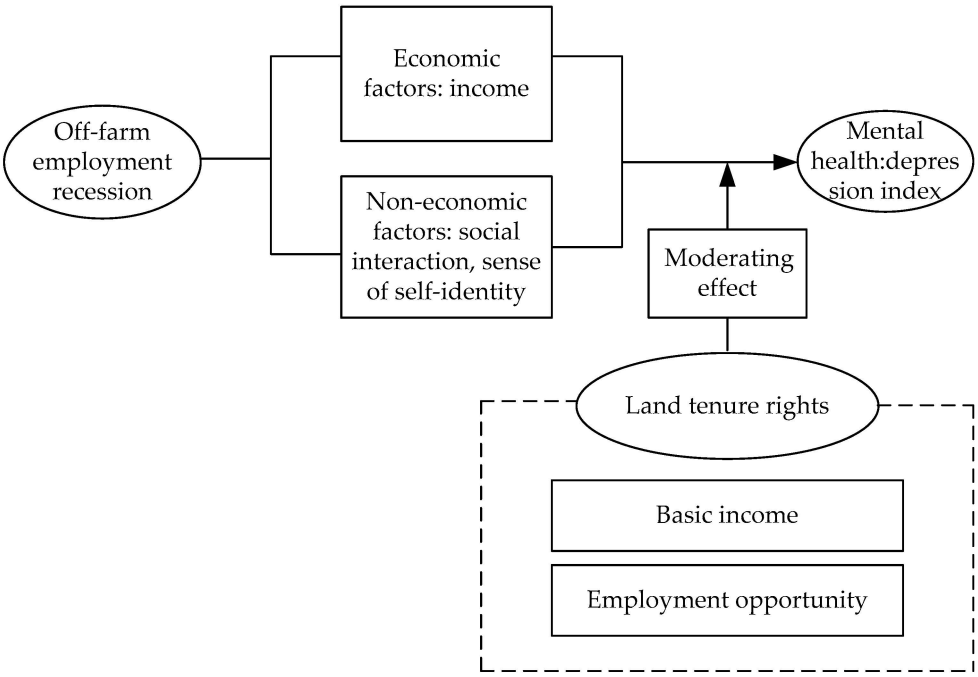

Figure 1. Theoretical framework for the off-farm employment recession, land, and farmers' mental health.

3. Data, Variables, and Research Design

3.1. Sample and Data Collection

According to the industrial structure and economic development level of each region, China is divided into Northeast, East, Central, and West regions. In our study, six provinces were randomly selected from each region: Heilongjiang, Shandong, Zhejiang, Anhui, Henan, and Yunnan. Heilongjiang is located in the northeastern region of China and is a major agricultural producing province. Shandong and Zhejiang are located in the eastern region of China, with high levels of economic development and well-developed non-agricultural industries. Shandong is a major agricultural producing province, while Zhejiang is a province with a net population inflow, attracting many people from other provinces in search of work. Anhui and Henan are located in the central region of China and are also known as major agricultural producing provinces, with a high percentage of rural migrant workers. Yunnan is located in the western region of China, with a lower level of economic development, and migrant workers commonly leave the province for work. Due to its hilly and mountainous terrain, Yunnan primarily produces cash crops such as flowers and sugar cane.

We used a combination of stratified random sampling and probability proportional size sampling to select the sample, comprising 44 counties, 281 villages, and 2810 households. The respondents were usually the head of the household. The dataset consisted of respondents' individual and household characteristics such as personal employment, age and health, household land, and social capital. After the baseline survey in 2019, two follow-up telephone callback surveys were conducted on a randomly selected sample during the COVID-19 pandemic. The first call-back was conducted in July 2020 to collect information on the status of COVID-19 infection, such as the number of infections in the village. The second callback was conducted in December 2020 to collect information on the respondents' land farming and transfer, personal employment, and mental health. Additionally, in the second callback, we collected information on the respondents' land farming and transfer in 2019 using a retrospective approach. Ultimately, 605 respondents participated in all three surveys, forming a two-period panel dataset before and after the COVID-19 pandemic. Due to the substitution of other household members for the respondents in the callback surveys, we excluded certain samples to ensure that the respondents were the same person across

the three surveys. As a result, the final dataset consisted of 326 samples. The respondents worked in the off-farm sector in 2019; some of them may work in the fields during the farming seasons and others would not, but they all had contracted land from the collectives.

3.2. Measurements

3.2.1. Off-Farm Employment during the Pandemic

We conducted a statistical analysis of the respondents' off-farm employment in 2019 and 2020. Table 1 presents the changes in the working time between 2019 and 2020. For the farmers who were not engaged in off-farm employment in 2019, most of them (98.09 percent) maintained the same level in 2020. For the farmers who were engaged in off-farm employment in 2019, 53.53 percent of them maintained the same level, while 34.71 percent witnessed a reduction, and 5.88 percent of them lost their off-farm jobs. As we observed, most of the respondents experienced a decline in the number of months of off-farm employment.

Table 1. Respondents' off-farm employment time between 2019 and 2020.

2019	2020	Overall
Not engaged in off-farm employment in 2019	Not engaged in off-farm work in 2020	359 (98.09%)
	Engaged in off-farm working time in 2020	7 (1.91%)
Engaged in off-farm employment in 2019	Off-farm working time was maintained the same in 2020	91 (53.53%)
	Increase in off-farm working time in 2020	10 (5.88%)
	Decrease in off-farm working time in 2020	59 (34.71%)
	Lost off-farm work in 2020	10 (5.88%)

Notes: Percentage of workers with off-farm jobs (no off-farm jobs) in 2019 in different employment situations in 2020 in parentheses.

3.2.2. Mental Health

The mental health of the respondents was measured by applying the ten most common items of the Center for Epidemiologic Studies Depression Scale (CES-D) indicating psychological distress. The CES-D scale is designed to measure the depressive symptomatology among the general population [64]. The respondents were asked the following ten questions to record the frequency of the respondents' feelings or behaviors over the preceding week: (a) I was bothered by things that usually don't bother me ; (b) I had trouble keeping my mind on what I was doing; (c) I felt depressed; (d) I felt that everything I did was an effort; (e) I felt hopeful about the future; (f) I felt fearful; (g) My sleep was restless; (h) I was happy; (i) I felt lonely; (j) I could not get "going".

The rating options for the above items are as follows: 1 = rarely or none of the time (<1 day); 2 = some or a little of the time (1–2 days); 3 = occasionally or a moderate amount of time (3–4 days); 4 = most or all of the time (5–7 days). For positive emotions like "I felt hopeful about the future" and "I was happy", the response options were reversed: 4 = rarely or none of the time (<1 day); 3 = some or a little of the time (1–2 days); 2 = occasionally or a moderate amount of time (3–4 days); 1 = most or all of the time (5–7 days). The total score ranged from 10 to 40, with higher scores indicating a higher depression index and poorer mental health among farmers. The details of the depression index for an example of one respondent's survey are presented in Table 2. We evaluated the validity and reliability of the mental health scale. (1) Factor analysis is ideal for assessing validity, which not only evaluates the structural validity of the scale, but also simplifies it. Firstly, we examined the suitability of the data for factor analysis. The results indicated that the Kaiser–Meyer–Olkin (KMO) value was 0.8 and the Bartlett's test of sphericity was significant (χ^2 = 544.05, $p < 0.001$), suggesting that the mental health scale was suitable for factor analysis. Secondly, we applied principal component analysis to extract the three factors based on eigenvalues exceeding 1, with a cumulative contribution of 53.67%. All the item factor loadings exceeded 0.5, so we retained all the items. These findings demon-

strated that the mental health scale possesses good structural validity. (2) We calculated the Cronbach's alpha coefficient of the mental health scale, which was 0.739, indicating good reliability.

Table 2. The measurement of the depression index.

	Item	Rarely or None of the Time (<1 Day)	Some or a Little of the Time (1–2 Days)	Occasionally or a Moderate Amount of Time (3–4 Days)	Most or All of the Time (5–7 Days)
How many days do you have the feelings or behaviors	I was bothered by things that usually don't bother me	√ (score 1)			
	I had trouble keeping my mind on what I was doing		√ (score 2)		
	I felt depressed			√ (score 3)	
	I felt that everything I did was an effort				√ (score 4)
	I felt hopeful about the future	√ (score 4)			
	I felt fearful		√ (score 2)		
	My sleep was restles			√ (score 3)	
	I was happy				√ (score 1)
	I felt lonely	√ (score 1)			
	I could not get "going"		√ (score 2)		
Depression index			score 23		

Notes: √ denotes the respondent's selection concerning the item. The score for each answer is in parentheses. This is an example of a respondent's answers provided.

Table 3 presents farmers' mental health between 2019 and 2020. There was an overall increase in the depression index among the respondents during the pandemic compared to that in 2019.

Table 3. Farmers' depression index between 2019 and 2020.

	2019	2020	Inter-Group Mean Differences
Depression index	14.455	15.713	−1.257 ***

Notes: *** represents the statistical significance at 1%.

This study further analyzed the impact of the off-farm employment recession on the respondents' mental health. Table 4 presents the change in the respondents' depression index during the pandemic. The respondents who did not engage in off-farm employment in 2019 showed an increase in the depression index in 2020. Furthermore, for those engaged in off-farm employment in 2019, the depression index showed an even more significant increase. Specifically, among the respondents engaged in off-farm employment, the depression index decreased only when the off-farm employment time remained the same. It increased significantly with a slight reduction in the off-farm employment time. This underscores the substantial deterioration in mental health during the pandemic, which was particularly pronounced among migrant workers facing reduced off-farm working hours or unemployment.

Table 4. Off-farm employment and farmers' depression index.

Off-Farm Work in 2019	Off-Farm Work in 2020	Depression Index in 2019	Depression Index in 2020	Inter-Group Mean Differences
Not engaged in off-farm employment	Increase in off-farm work time	14.429	16.571	−2.143
	Off-farm work time remained the same	14.643	15.914	−1.270 ***
Engaged in off-farm employment	Increase in off-farm work time	15.100	15.300	−0.200
	Off-farm work time remained the same	13.736	13.648	0.088
	Decrease in off-farm work time: ≤20%	13.692	18.231	−4.538 **
	Decrease in off-farm work time: 20–50%	14.342	16.816	−2.474 ***
	Decrease in off-farm work time: 50–100%	15.500	19.125	−3.625
	Not engaged in off-farm employment	14.200	16.900	−2.700

Notes: *** and ** represent the statistical significance at 1% and 5%, respectively.

3.2.3. Control Variables

The control variables included household characteristics and individual characteristics. The household characteristics included the number of members engaging in off-farm employment, the number of members living outside the home all year round, the size of housing, and the household pension income. The individual characteristics included gender, age, education, physical health status, economic status, and mode of residence. The selection and statistical description of the variables are shown in Table 5.

Table 5. Descriptive statistics of the variables.

Variable	Definition	Mean	Standard Deviation	Min	Max
Depression index	1 = Rarely or none of the time (<1 day); 2 = Some or a little of the time (1–2 days); 3 = Occasionally or a moderate amount of time (3–4 days); 4 = Most or all of the time (5–7 days);	14.70	4.058	10	32
Off-farm working time	Farmers' nonfarm working time: Months	7.275	3.961	0	12
Contracted land area	Mu	9.226	15.73	0.300	175
Transferred-in land area	Transferred-in land area in 2019: Mu	9.123	43.56	0	445
Transferred-out land area	Transferred-out land area in 2019: Mu	2.146	3.863	0	30
Physical health	The respondents' self-assessment of their current physical health: 1 = Very good; 2 = Good; 3 = Fair; 4 = Poor; 5 = Very poor	1.972	0.939	1	5
Age	Age of the respondents	49.19	9.780	28	72

Table 5. *Cont.*

Variable	Definition	Mean	Standard Deviation	Min	Max
Education	0 = Illiterate; 1 = Grade 1 of primary school; 2 = Grade 2 of primary school; 3 = Grade 3 of primary school; 4 = Grade 4 of primary school; 5 = Grade 5 of primary school; 6 = Grade 6 of primary school; 7 = Grade 1 of junior high school; 8 = Grade 2 of junior high school; 9 = Grade 3 of junior high school; 10 = Grade 1 of high school; 11 = Grade 2 of high school; 12 = Grade 3 of high school; 13 = Vocational school; 14 = College; 15 = University; 16 = Master's degree; 17 = Doctoral degree	9.411	3.238	0	15
Sex	1 = Male; 0 = Female	0.828	0.378	0	1
Economic status	Economic status: 1 = Very low; 2 = Relatively low; 3 = Average; 4 = Relatively high; 5 = Very high	3.037	0.646	1	5
Number of off-farm workers	Number of family members engaging in off-farm work	1.850	1.181	0	7
Family pension income	Family pension income: Ten thousand yuan	0.277	0.774	0	4.800
Number of members living outside	Number of members who reside outside the home for more than 6 months	0.951	1.170	0	5
Housing area	The household's housing area (m^2)	110.7	38.09	30	300
Number of relatives	Number of relatives with regular contact	15.02	15.31	2	100
Residential arrangement	0 = Living with children;	57.06%	-	-	-
	1 = Only the couple lives together;	32.52%	-	-	-
	2 = Living alone;	2.45%	-	-	-
	3 = Other	7.98%	-	-	-

3.3. Model Specifications

We focused on the respondents engaged in off-farm employment in 2019, utilizing two-period individual-level data from rural areas to examine the impact of the off-farm employment recession on farmers' mental health. Fixed effects estimators are widely applied to eliminate unobserved fixed error components in econometric estimations. Equation (1) calculates the effect of the off-farm employment recession on farmers' mental health, and Equation (2) calculates the moderating effects of land between the off-farm employment recession and farmers' mental health. The equations are as follows:

$$y_{it} = \alpha + \rho shock_{it} + \beta_1 area_{it} + \beta_2 transinarea_{it} + \beta_3 transoutratio_{it} + \gamma X_{it} + \varepsilon_{it} \quad (1)$$

$$y_{it} = \alpha + \rho shock_{it} + \beta_1 area_{it} + \beta_2 transinarea_{it} + \beta_3 transoutratio_{it} + \beta_4 shock_{it} \times area_{it} + \beta_5 shock_{it} \times transoutratio_{it} + \gamma X_{it} + \varepsilon_{it} \quad (2)$$

where i indicates the respondent and t indicates the time. y_{it} indicates the mental health of the respondents. $shock_{it}$ indicates the off-farm employment recession among the respondents. The respondents were classified into two groups based on the reduction in their off-farm working time during the pandemic: those without reduction in off-farm working time (group 0) and those with reduction (group 1). $area_{it}$ indicates the household contracted land area. $transinarea_{it}$ indicates the land area transferred from others. $transoutratio_{it}$ indicates the proportion of land area transferred out to the contracted land area. $shock_{it} \times area_{it}$ indicates the interaction term of the off-farm employment recession and contracted land area. $shock_{it} \times transoutratio_{it}$ indicates the interaction term of the off-farm employment recession and percentage of transferred out land area. $X_{it} = (x_{1t}, x_{2t}, ..., x_{nt})^T$ is a vector of control variables affecting the farmers' mental health, such as the number of household

members engaging in off-farm employment, living outside the household and the respondents' individual characteristics. ρ, β_1, β_2, β_3, β_4, β_5, γ are the coefficients to be estimated. α is the constant term. ε_{it} is the random error term.

4. Empirical Results

4.1. Impact of the Off-Farm Employment Recession on Farmers' Mental Health

Table 6 presents the impact of the off-farm employment recession on the farmers' mental health with county fixed effects and time fixed effects. The results indicate that the coefficient of shock is positive and statistically significant at the 1 percent level. This suggests that the depression index of farmers rises significantly with the reduction in off-farm working time. Consequently, the off-farm employment recession had a negative impact on the farmers' mental health compared to the respondents whose off-farm employment was not reduced. These findings suggest that major public health events and the associated containment policies disrupted the normal economic activities, leading to a reduction in the employment opportunities and income for people. This exacerbates negative emotions and leads to psychological depression. Additionally, the coefficient of transinarea was negative and statistically significant at the 5 percent level. This suggests that the mental health of farmers significantly improves when they acquire land from others. By expanding their farm size through land transfer, farmers can increase their income from agriculture. This will help them cope with the shock of reduced nonfarm employment opportunities.

Table 6. Impact of the off-farm employment recession on farmers' mental health.

Variables	Coefficient	Standard Errors
Shock	3.018 ***	(0.532)
Area	−0.038	(0.042)
Transinarea	−0.011 **	(0.004)
Transoutratio	−0.373	(0.748)
Control variables	Yes	Yes
Province FE	Yes	Yes
Year FE	Yes	Yes
Constant	17.040 ***	(2.251)
N	326	
R-squared	0.334	

Notes: *** and ** represent the statistical significance at 1% and 5%, respectively. Robust standard errors are in parentheses.

4.2. The Heterogeneous Impact

Previous research has highlighted the heterogeneous effects of the off-farm employment recession on the mental health of the general population [65]. This study explored the heterogeneous effects of the off-farm employment recession on farmers with different levels of education, age, and gender by incorporating interactive factors. The results are shown in Table 7. Heterogeneity analysis revealed that the off-farm employment recession had a negative impact on the mental health of farmers, particularly those with lower levels of education, and those who were older and female. Specifically, for farmers with lower levels of education, the coefficient of shock was positive and statistically significant at the 1 percent level, and its value was larger than for farmers with high levels of education. This suggests that the nonfarm recession had a greater negative impact on less educated farmers. For older farmers, the coefficient of shock was positive and statistically significant at the 10 percent level, and its value was larger than for farmers under 60 years old. This suggests that the nonfarm recession had a greater negative impact on older farmers. For female farmers, the coefficient of shock was positive and statistically significant at the 10 percent level, and its value was larger than for male farmers. This suggests that the nonfarm recession had a greater negative impact on female farmers.

Table 7. Heterogeneity analysis of the impact of the off-farm employment recession on farmers' mental health.

Variables	**Education**		
	Junior High School and Below	High School and Above	Inter-group Mean Differences
Shock	3.345 (0.883) ***	2.419 (1.190) *	−0.927 (0.001) ***
Control variables	Yes	Yes	——
Province FE	Yes	Yes	——
Year FE	Yes	Yes	——
N	204	122	——
R-squared	0.344	0.533	——
	Age		
	45–60	60-	Inter-group Mean Differences
Shock	2.321 (0.804) ***	5.251 (2.718) *	2.930 (1.033) ***
Control variables	Yes	Yes	——
Province FE	Yes	Yes	——
Year FE	Yes	Yes	——
N	180	42	——
R-squared	0.454	0.924	——
	Sex		
	Female	Male	Inter-group Mean Differences
Shock	4.686 (2.177) *	2.348 (0.671) ***	−2.338 (0.766) ***
Control variables	Yes	Yes	——
Province FE	Yes	Yes	——
Year FE	Yes	Yes	——
N	56	270	——
R-squared	0.736	0.336	——

Notes. *** and * represent the statistical significance at 1% and 10%, respectively. Robust standard errors are in parentheses.

4.3. The Role of Land in Mitigating the Decline of Farmers' Mental Health

We examined whether land as a social safety net providing income or employment moderated the relationship between the off-farm employment recession and mental health. We examined this by investigating the interaction of the off-farm employment recession with the area of contracted land and the percentage of transferred-out land area. The greater the amount of land that a farmer contracts from the collective economic organization, the higher their potential income. We used the contracted land area to examine the role of land providing income. When farmers transfer out all their contracted land, they lose the opportunity to engage in the agricultural sector within the household. We used the percentage of transferred-out land area to examine the role of land as a "labor reservoir". The results are presented in Table 8. The results indicate that the coefficient of the interaction term between the contracted land area and shock is negative and statistically significant at the 5 percent level. This suggests that the larger the contracted land area, the lower the depression index when subjected to the off-farm employment recession, signifying an improvement in the mental health of farmers compared to those whose off-farm working time was not reduced. In essence, the contracted land area can effectively mitigate farmers' depression due to unemployment and improve their mental health. The coefficient of the interaction term between the percentage of transferred-out land area and shock was positive and statistically significant at the 5 percent level. This suggests that the higher the percentage of land area transferred out, the higher the depression index when subjected to the off-farm employment recession, signifying a decline in the mental health of farmers compared to those whose off-farm working time was not reduced. In summary, the dual role of land of providing a basic income and employment opportunities can mitigate the negative impact of the off-farm employment recession on farmers' mental health.

Table 8. The role of land in mitigating the decline of farmers' mental health under the off-farm employment recession.

Variables	Coefficient	Standard Errors
Shock	2.738 **	(1.015)
Area	−0.028	(0.044)
Transinarea	−0.011 ***	(0.003)
Transoutratio	−1.082	(0.708)
Shock × Area	−0.154 **	(0.066)
Shock × Transoutratio	2.974 **	(1.210)
Control variable	Yes	Yes
Province FE	Yes	Yes
Year FE	Yes	Yes
Constant	17.238 ***	(2.202)
N	326	
R-squared	0.355	

Notes: *** and ** represent the statistical significance at 1% and 5%, respectively. Robust standard errors are in parentheses.

5. Discussion

With economic development and agricultural modernization, an increasing number of farmers are transitioning from the agricultural sector to non-agricultural sector, distancing themselves from their reliance on land for sustenance. This study investigated the role of land as a social safety net for farmers confronting the off-farm employment recession. The findings of this paper are an important reference for countries with a large number of smallholders.

Statistical analysis suggests the negative impact of the COVID-19 pandemic on the off-farm employment of farmers. Among those engaged in off-farm employment, 40.6 percent experienced a reduction in their working time and nearly 6 percent faced layoffs. Numerous examples have also demonstrated that pandemics can pose a direct threat to people's lives, and the containment policies also reduced workers' income and working hours. For example, the impact of the pandemic on the employment in the United States surpassed that of the Great Depression, with the labor participation rate declining by an unprecedented 7 percent [66,67]. A study demonstrated that such lockdowns resulted in an economic recession, resulting in a 57 percent reduction in income and a 73 percent reduction in working time among the residents [68].

We also found a more significant increase in the depression index among farmers during the off-farm employment recession. For farmers engaged in off-farm employment, the decline in off-farm working time was associated with a significant increase in the depression index. Utilizing a fixed effects econometric model, we investigated the impact of the off-farm employment recession on the mental health of farmers. The findings suggest that the off-farm employment recession resulted in a significant increase in their depression index, signifying a decline in their mental health. The main reason for this is that the decline in off-farm work and wage may make workers lose their worth. At the same time, the reduced diversification of household income sources was not conductive to coping with the crisis.

Moreover, we classified them based on individual characteristics to identify the most affected groups. Notably, our results suggest that the adverse impacts are more severe for those who are less educated, older, and female. Compared to people with higher levels of education, those with lower levels not only face higher risks of job loss but also encounter greater challenges in re-employment due to poor social and financial resources [49,50]. Additionally, highly educated individuals may suffer from "status inconsistency", which may be associated with increased depression [63]. Our study examined how gender affects the link between the off-farm employment recession and mental health. Indeed, the gender differences in the effects of unemployment on mental health are related to individuals' different positions in society and their family [69,70]. While many studies have found

that men's unemployment rate exceeded women's during the recession [47,71,72], women may suffer more pressure from healthcare and subsistence supply responsibilities within the family. Our study investigated the relationship between the off-farm employment recession and mental health among farmers of different ages. We found that older farmers encountered more severe depression due to the off-farm employment recession. This is not in line with some studies which found that older workers face less depression after losing their jobs as they near retirement [47,73]. Farmers in China, however, engage in some informal occupations without employment security and benefits, such as pensions. Many farmers, even those over 60 years old, have to seek some temporary jobs to increase their income and save for their later years. The reduction in off-farm time and income may increase their livelihood burden, such as medical expenses.

On this basis, we conducted a comprehensive investigation to examine whether the rural social safety net from the household-based equally distributed land system in rural China can mitigate the negative impacts of the off-farm employment recession on farmers' mental health. We found that the land plays a crucial role in improving their mental health during the off-farm employment recession. Specifically, our results suggest that the contracted land from collective economic organizations could effectively improve farmers' mental health during the off-farm employment recession. Transferring land to other farmers did not mitigate the impacts of the off-farm employment recession on farmers' mental health. This suggests that land as a social safety net can improve farmers' mental health by providing both a basic income and employment opportunities during an economic recession.

However, it is essential to note that this does not imply discouraging the land transfer to large-scale farms in rural China. With the advancement of large-scale farming, smallholders can lease their land to large-scale farms, earning a rental income that surpasses what they would earn from cultivating the land themselves. Additionally, farmers can be employed on large-scale farms after transferring out their contracted land. Nevertheless, it is crucial to recognize that while large-scale farms can achieve economies of scale, they may encounter higher transaction costs such as regulatory fees and labor hiring expenses. Consequently, large-scale farms may refrain from employing much labor.

The mass migration of farmers to the off-farm sector has occurred due to the development of off-farm industries and the decline in the relative returns to agriculture in China. However, when the farmers encounter unemployment risks, land can provide a basic income and employment opportunities for farmers, serving as a social safety net.

6. Conclusions and Policy Implications

6.1. Conclusions

In this study, we collated panel data from 163 farmers in six of China's provinces (Heilongjiang, Henan, Zhejiang, Yunnan, Shandong, and Anhui) from 2019 to 2020, investigating the impact of the off-farm employment recession on the mental health of farmers and studying the role of land in moderating the relationship between them. The main findings are as follows:

Firstly, our analysis suggests that the off-farm employment recession during the pandemic negatively affected the off-farm employment of farmers. Among those engaged in off-farm employment, 40.6 percent experienced a reduction in their working time. Compared to formal workers, farmers as informal wage workers were significantly more vulnerable to job loss in this economic crisis, highlighting the vulnerability of farm laborers.

Secondly, our analysis suggests that the off-farm employment recession during the pandemic negatively affected the mental health of farmers, with particularly severe effects among farmers who were less educated, older, and female. This supports Hypotheses 1–2, suggesting that disadvantaged farm laborers are more likely to suffer from depression when losing their jobs.

Finally, the dual role of land of providing both a basic income and employment opportunities can mitigate the negative impact of the off-farm employment recession on

farmers' mental health. This supports Hypothesis 3, indicating that land ownership, serving as a social safety net, guarantees the household subsistence. This highlights the importance of upholding the land ownership rights of farmers.

6.2. Limitations and Future Research

As for our data, this study leaves several questions for subsequent studies to address. Some characteristics deserve further study. First, this study did not analyze the mechanisms through which the off-farm employment recession affected farmers' mental health. In future research, in-depth analysis could be conducted to analyze this. Second, our evidence in this paper is derived from China. Future research could further conduct cross-national comparative analyses of different economic development levels and land policy.

6.3. Policy Implications

To make better use of this social safety net function provided by land, several key pieces of advice should be considered:

(i) Local governments in China are obligated to protect farmers' land tenure rights to contract land from the collective economic organizations through the signing of land contracts. The second round of land use periods in some rural areas expired in 2023. The government should promptly formulate the land distribution plan to extend the land contract period, adjusting for changes in household size and other circumstances. When farmers migrate to the off-farm sector or relocate to urban areas, the surrender of land tenure rights shall not be made a precondition for migration.

(ii) Government departments should proactively foster the development of large-scale farming. In confronting the economic recession, land plays a crucial role as a social safety net by providing a basic income and employment opportunities for unemployed migrant workers. Currently, the government is actively promoting the transfer of contracted land from smallholders to large-scale farms. With the expansion of large-scale farms across China, unemployed workers have the opportunity to be employed on large-scale farms. However, local governments should take measures to increase the profitability of large-scale farms, such as reducing the transaction costs associated with labor supervision to boost the number of jobs in the agricultural sector.

(iii) Government departments should prioritize the enhancement of the rural social security system. Currently, China's rural social security coverage is inadequate, providing insufficient protection for farmers against unemployment and insufficient medical service and care. Special attention should be directed towards bolstering the support for landless farmers, ensuring that they receive adequate financial assistance during economic recessions.

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Notes

[1] A rural collective economic organization is an institutional arrangement in which members join together to administer economic activities.

[2] Most workers experienced a decline in the number of months of off-farm employment during the pandemic, a phenomenon we refer to as the "off-farm employment recession".

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