

Article

# Does Social Capital Help to Reduce Farmland Abandonment? Evidence from Big Survey Data in Rural China

Xin Deng <sup>1,†</sup>, Miao Zeng <sup>2</sup>, Dingde Xu <sup>3,†</sup> and Yanbin Qi <sup>1,\*</sup>

<sup>1</sup> College of Economics, Sichuan Agricultural University, Chengdu 611130, China; dengxin@sicau.edu.cn

<sup>2</sup> School of Economics, Sichuan University, Chengdu 610065, China; zengmiao@stu.scu.edu.cn

<sup>3</sup> Sichuan Center for Rural Development Research, College of Management, Sichuan Agricultural University, Chengdu 611130, China; dingdexu@sicau.edu.cn

\* Correspondence: qybin@sicau.edu.cn

† These authors contributed equally to this work and should be regarded as co-first authors.

Received: 28 August 2020; Accepted: 28 September 2020; Published: 29 September 2020



**Abstract:** At a time when COVID-19 is sweeping the world, farmland abandonment is obviously not conducive to solving food security problems. Since the formal institutions of local government in China have not been effective in the reduction of farmland abandonment, this study aims to explore whether informal institutions can help mitigate this problem. Based on big survey data from 8031 farmer households in 27 provinces in mainland China, this study uses an econometric model to investigate the quantitative impact of social capital on farmland abandonment, and to analyze the channels through which that impact manifests itself. The empirical results point to the following conclusions: (i) Social capital, as a key informal institution, can help reduce farmland abandonment. More specifically, after controlling for other variables, for every unit increase in social capital, the proportion of farmland abandonment can be predicted to drop by 7.17 percentage points. (ii) Both off-farm employment and farmland rent are channels for the impact of social capital on farmland abandonment. However, social capital's effect on increasing farmland abandonment via the promotion of off-farm employment is small when compared with its effect on reducing farmland abandonment via the promotion of farmland rent. This study's conclusions may help generate new ideas for reducing farmland abandonment. At the same time, the study may provide a sound, empirical basis for policies aimed at reducing the negative impact of COVID-19 on food security while also revitalizing rural areas.

**Keywords:** social capital; farmland abandonment; off-farm employment; farmland rent; rural China; big survey data

## 1. Introduction

Farmland is an important material carrier for solutions to food security problems [1–3]. However, there is a paradox in farmland use around in the world. On the one hand, the number of hungry people in the world is still large. The Global Report on Food Crises (GRFC) 2020 released by the FAO [4] (FAO means Food and Agricultural Organization) showed that the number of severely hungry people in the world reached 135 million in 2019, the highest number in the past four years. On the other hand, global farmland resources are not fully utilized, and a significant part of the farmland has even been abandoned [5–7]. Indeed, Campbell et al. [8] estimated that about 3.85–4.72 million km<sup>2</sup> of farmland has been abandoned in the world just since the beginning of the present millennium. Such farmland abandonment has undoubtedly increased the difficulty of dealing with increasingly severe food security crises, especially now that COVID-19 is spreading globally. According to historical

experience, this pandemic will have a serious impact on food safety and food security. The FAO [4] suggested that COVID-19 will trigger a famine of biblical proportions, and estimated that the number of severely hungry people may increase to 265 million in 2020. In this context, it is incumbent on all nations to reduce the negative impact of the epidemic on food security by working to improve the efficiency of farmland use. Thus, how to reduce farmland abandonment has become a topic of common concern for scholars and policymakers.

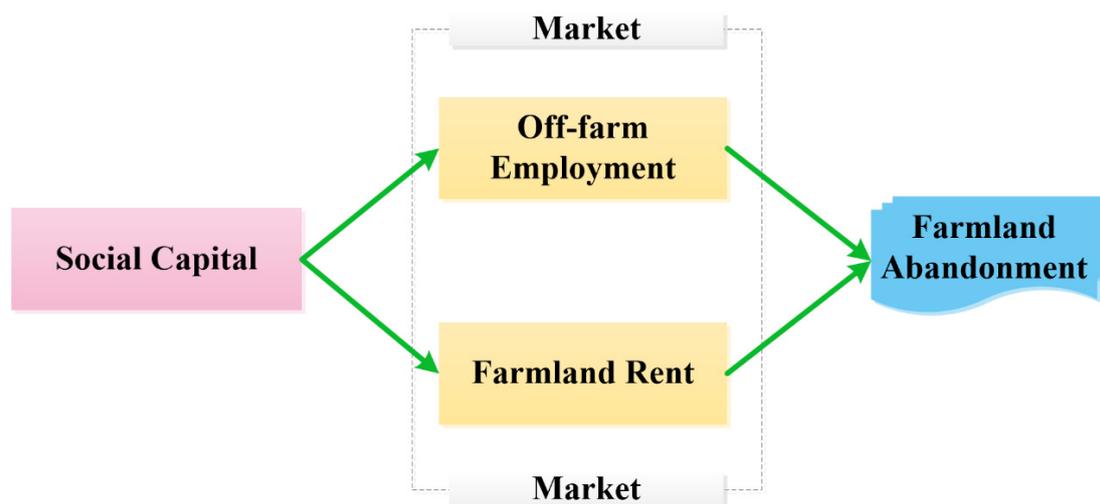
As in other countries with large populations, COVID-19 has highlighted the potential negative effects of pandemics on China's food security [9]. China has been severely affected by COVID-19. Thus far, February and March 2020 have been the peak periods of COVID-19 in China, and these months are also the traditional plowing season for Chinese farmers. During that period, in order to curb the spread of the virus, the Chinese government implemented strict containment measures (e.g., restricting the movement of people and closing shopping malls). As a result, key resources (e.g., seeds, fertilizer, and farm labor) were not made available for the purposes of agricultural production, in keeping with previous years; and this departure from past practice may negatively affect grain yield. Fan et al. [10] suggested that COVID-19 will reduce China's agricultural growth rate by 0.4%–2.0% in 2020. At the same time, as Stephens et al. [11] pointed out, the global COVID-19 pandemic has also brought challenges to the international food trade. China may not be able to import food as it has in previous years. Given that there are about 1.4 billion people in China, accounting for around 20% of the world's total population, issues of food security have raised widespread concern.

In order to cope with the potential for food security crises, Chinese local governments have begun to take steps to reduce farmland abandonment. These governments have sought to use formal institutions to address the problem, but so far, the effectiveness of the measures adopted is not obvious. Since 2004, China's law for land management prohibits any farmer from abandoning farmland, and in attempts to reduce the negative impact of COVID-19 on food security, local governments have stated that they will pay more attention to the problem. For instance, in April 2020, the governments of Yongzhou in Hunan province and Ganzhou in Jiangxi province emphasized that they would severely punish farmers who abandoned their land. Nonetheless, farmland abandonment is still very common in rural China. Deng et al. [6] found that the proportion of farmland abandoned by Chinese farmers to the total farmland was about 7.06% in 2013. Li et al. [12] found that the problem of farmland abandonment was more serious in mountainous areas in China, and that as much as 28% of the total available farmland was abandoned during the period from 2000 to 2010. These findings show that formal institutions have not played an effective role in reducing farmland abandonment in rural China and highlight the need to focus on informal institutions instead. In particular, to address the problem of farmland abandonment, the mechanisms and underlying factors driving that problem need to be studied from the perspective of Chinese social characteristics.

Informal institutions are, in general, the key to understanding the economic and social development of countries in transition [13,14]. Social capital, which can be defined in terms of the networks that are constructed by linking individual and collective interests, provides convenience for individual actions [15]. Thus, social capital can be regarded as an important informal institution that determines a country's economic development. Chinese society is a society marked by a strong emphasis on relationality [16–18], and though the society is currently undergoing modernization, in China's rural culture the traditional concepts of "human affection" and "clan" play a key role, strengthening the resource-allocation function of social capital [19,20]. Farmland is one of the most important resources owned by Chinese farmers [21–24], and it is also the key to solving food security issues. If formal institutions cannot reduce the abandonment of farmland in rural China, can informal institutions play a positive role in this connection? The idea of social capital, as an important informal institution, may afford an answer to this question. That answer, however, must be obtained through empirical evidence as well as theoretical analysis.

## 2. Theoretical Analysis

Social capital can be understood in terms of the networks that are constructed by linking individual or collective interests [25,26]. Such networks may help people reduce the cost of obtaining information and increase the probability of cooperation, which benefits both economic and social development [27,28]. With the rise of new forms of socio-economic inquiry, social capital, viewed as an informal institution, has been used in the study of economic activities and economic development. In rural societies, in particular, social capital exerts an important influence on the flow and allocation of factors in agricultural production. For instance, He et al. [29] found that social capital has a positive effect on the recycling of agricultural waste; Hunecke et al. [30] argued that social capital promoted the diffusion of irrigation technology in rural society, and Gao et al. [31] found that social capital helps promote the spread of agricultural green technologies. Further, and more germane to the present study, farmland serves as the material basis for the survival and development of human society [32,33], and social capital plays an important role in farmland markets [34,35]. Thus, social capital may affect farmers' abandonment of arable land through the channels shown in Figure 1. The precise impacts of social capital on farmland abandonment, however, remain difficult to determine. On the one hand, social capital can promote off-farm employment by agricultural workers, potentially increasing the possibility of farmland being abandoned. On the other hand, social capital can promote farmland rent, potentially reducing the possibility of farmland being abandoned.



**Figure 1.** The theoretical mechanism of impacts of social capital on farmland abandonment.

First, then, social capital affects farmland abandonment by affecting opportunities for off-farm employment. Social capital can help people obtain resources and information [36,37]. Thus, Ayele and Degefa [38] and Williams et al. [39] found that social capital increased workers' willingness to migrate elsewhere for employment. It can reduce information asymmetry in the labor market and increase the probability of workers getting a job [40–43]. In the context of rural China, Zhang and Li [44], Knight and Yueh [45], Wan et al. [46], and Xue et al. [47] have shown that social capital plays an important role in helping rural labors enter the off-farm sector. By the same token, however, off-farm employment can increase the possibility of farmland being abandoned [6,7,22,48,49]; and because social capital promotes labor off-farm employment, it therefore increases the possibility of farmland abandonment.

Second, social capital affects farmland abandonment by affecting farmland rent. Social capital plays an especially important role in farmland markets [34,35,50]. For example, Cheevapattananuwong et al. [51] found that when land rights are unstable, social capital can play a bridging role in protecting the farmland interests of farmers. Further, empirical evidence shows that social capital can promote land rent [17,52,53]. Pitts [54] found that social capital leads to a lower rental rate; this study showed, more specifically, that as farmers' social capital increased, their rental rates decreased by 9%

compared to the market value. Thus, as Liu et al. [17] suggested, social capital can help facilitate lease agreements. In turn, farmers' participation in farmland rent can reduce the misallocation of farmland resources [21,55–57], potentially helping to reduce farmland abandonment. Accordingly, because social capital promotes farmland rent, it reduces the possibility of farmland abandonment.

Based on the complicated human-land relationship in China today, it is essential for farmland to be used efficiently if the country's rural areas are to be revitalized [32,57–59]. Given the preceding theoretical analysis, however, the impact of social capital on farmland abandonment remains indeterminate: social capital may both lead to and reduce farmland abandonment. Thus, we need to combine quantitative methods with empirical analysis to explore the specific impact of social capital on farmland abandonment. More importantly, we need to understand the impact mechanism of social capital on farmland abandonment by using an appropriate econometric model.

### 3. Data, Variables, and Method

#### 3.1. Data

The data of this study come from the China Labor-Force Dynamics Survey (CLDS), conducted by the Social Science Survey Center of Sun Yat-sen University, Guangzhou, China. These data were collected in 2014 and constitute the most recent open-access data offered by the survey center. The survey content covers socio-economic development, land use, and household characteristics. In accordance with the aims of this study, we ignored the urban household data and focused only on rural household data. After this filter was applied, we were left with a sample of 8031 farmers from 27 provinces in mainland China. The distribution of sample provinces is shown in Figure 2.

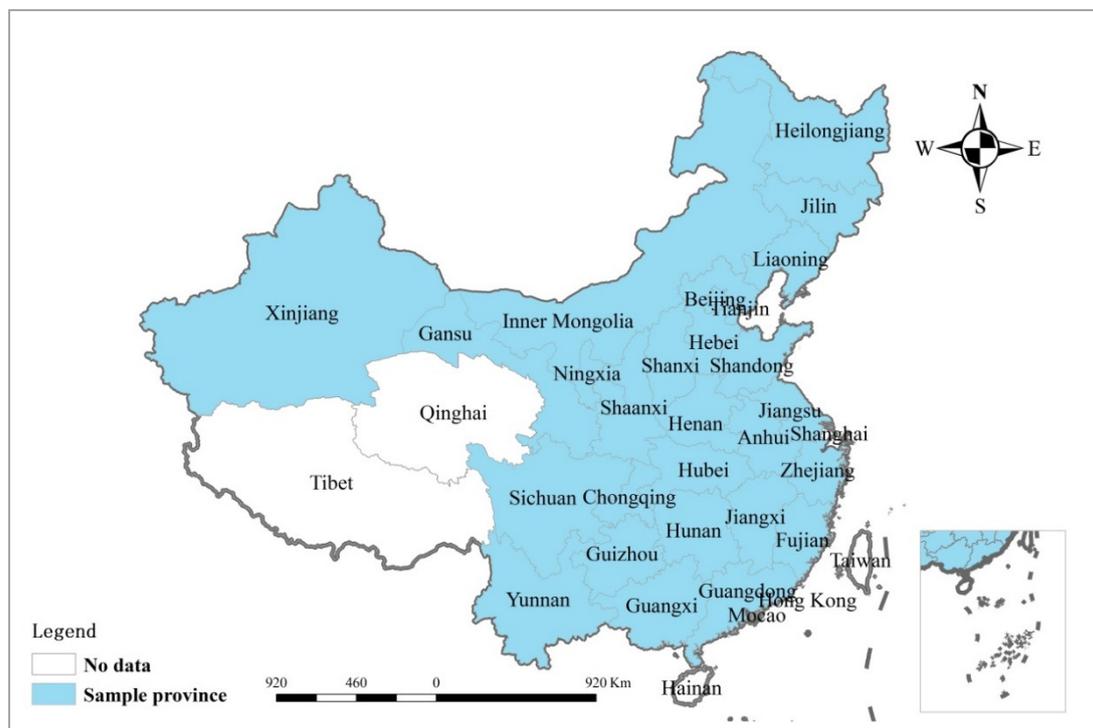


Figure 2. The spatial distribution of sample provinces.

#### 3.2. Variables

##### 3.2.1. Dependent Variable

If a piece of farmland did not receive any investment (e.g., labor, seeds, and fertilizer) in 2013, we define it as being abandoned. The area of abandoned farmland is defined as the total area of farmland

did not receive any investment in 2013. Drawing on Deng et al. [6], Deng et al. [60], Xu et al. [7], and Ma and Zhu [5], this study defines the variable for farmland abandonment as the share of abandoned farmland relative to the total farmland. This variable can be expressed by Equation (1).

$$\text{Farmland Abandonment} = \frac{\text{Area of abandoned farmland}}{\text{Area of total farmland}} \times 100\% \quad (1)$$

### 3.2.2. Focus Variable

Social capital is a concept with rich meaning. Coleman [15] defined social capital as the network that is constructed by linking individual or collective interests. Social capital can help individuals or groups obtain useful information [37,39,61,62]. In empirical research, multiple indicators are generally used to measure the social capital of an individual or a collective. For instance, Wan et al. [46] measured a family's social capital by gifts and also whether the family had relatives working in the government, while von Carnap [63] measured social capital from the perspective of organizational participation, with specific indicators being membership in organizations and whether household members participated in the organizations' meetings. Likewise, Zhao and Yao [64] measured the social-capital level of Chinese farmers in terms of the household gifts the family bestowed on others, whereas Berry and Welsh [65] and Wuepper et al. [66] measured farmers' social capital from the perspective of organizational participation.

In line with these previous studies, we assume that social capital helps farmers obtain valuable information that assists them in achieving personal goals. In turn, the process of obtaining information includes two features: namely, participation in organizations, and communication with others. Therefore, this study measures farmers' level of social capital from the perspectives of organization and communication. Specifically, based on the current situation in rural China, this study uses "Political Groups" and "Cooperation Groups" to measure organizational participation, while using "Gift Expenditure" and "Internet Use" to measure communication. In addition, we calculate the farmers' level of social capital using the entropy weight method (for details, see Appendix A). The larger the value of the calculation result, the higher farmers' level of social capital. The indicators' definitions and weights are shown in Table 1.

**Table 1.** Indicators and weights of social capital.

Types	Indicators	Definition	Weights
Organization	Political Groups	The number of members of the Chinese Communist Party in household (NUM)	0.212
	Cooperation Groups	1 if household has joined the agricultural cooperative; 0 otherwise	0.479
Communication	Gift Expenditure	The total expenditure of gift sent to friends and relatives (CNY)	0.182
	Internet Use	1 if household has access to the Internet; 0 otherwise	0.127

Note: The weights are calculated by the entropy method, and the details of calculative process can be found in Appendix A.

### 3.2.3. Intervening Variables

Our theoretical analysis suggested that social capital affects farmland abandonment by affecting off-farm employment as well as farmland rent (as shown in Figure 1). Thus, the variables of workers' off-farm employment and farmland rent are the intervening variables with respect to social capital's effect on farmland abandonment. This study defines off-farm employment as the proportion of labor devoted to off-farm employment relative to total labor, and farmland rent as the area of farmland being rented out.

## 3.2.4. Other Variables

Referring to the studies of Deng et al. [67], Deng et al. [6], Du et al. [68], Deng et al. [60], Xu et al. [7], and Ma and Zhu [5], this study controls head variables, household variables, and location variables. The details of variables can be found in Table 2.

**Table 2.** Definition and statistical results.

Variables	Definition	Mean	S.D.
Dependent Variable			
Farmland Abandonment	the share of abandoned farmland in total farmland (%)	7.063	22.735
Focus Variable			
Social Capital	the index of social capital owned by household (num)	0.050	0.079
Intervening Variables			
Off-farm Employment	the share of labor with off-farm employment in total labor (%)	40.013	38.537
Farmland Rent	the area of farmland rented out (mu <sup>a</sup> )	1.251	14.209
Head Variables			
Head Age	the household head's age (year)	53.807	13.237
Head Education	1 if household head has a high school diploma or above; 0 otherwise	0.116	0.320
Household Variables			
Farm Income	the share of farm income in total income (%)	33.688	41.313
Household Education	the share of members with high school diploma or above in total members (%)	14.043	20.824
Household Health	the share of members with healthy status in total members (%)	86.339	23.513
Elder Farmer	1 if elder (>64 years old) is still farming; 0 otherwise	0.112	0.315
Young Farmer	1 if head's children are engaged in farm; 0 otherwise	0.080	0.271
Household Asset	the current value of fixed assets of household (10 <sup>4</sup> CNY <sup>b</sup> )	4.323	16.746
Farm Asset	the current value of fixed assets of farm (10 <sup>4</sup> CNY)	0.079	0.532
Land Registration	1 if farmland is registered by government; 0 otherwise	0.413	0.492
Land Evaluation	1 if head evaluates farmland as barren; 0 otherwise	0.028	0.164
Land Irrigation	1 if farm has irrigation facilities; 0 otherwise	0.427	0.495
Location Variables			
Urbanization	the share of urban residents in the total population in same sample county (%)	11.629	20.687
Population Density	the population per unit area of the sample village (num/km <sup>2</sup> )	140.679	134.300
Distance to Town	The distance to the center of the commercial town (km)	7.120	9.179
Plain	1 if household is on the plain; 0 otherwise	0.396	0.489
Hill	1 if household is on the hill; 0 otherwise	0.353	0.478
Mountain	1 if household is on the mountain; 0 otherwise	0.251	0.433

Note: <sup>a</sup> mu is a unit of land area commonly used in rural China, 1 mu  $\approx$  0.067 ha; <sup>b</sup> CNY is Chinese legal tender, during the survey period, 1 USD  $\approx$  6.12 CNY.

### 3.3. Method

This study aims to explore the quantitative impacts of social capital on farmland abandonment. Thus, the econometric model is set as Equation (2):

$$\text{Farmland Abandonment}_i = \beta_0 + \beta_1 \text{Social Capital}_i + \gamma X + \delta_p + \varepsilon_i \quad (2)$$

where the subscripts  $i$  and  $p$  represent farmer household  $i$  and sample province  $p$ , respectively; *Farmland Abandonment* represents the share of abandoned farmland relative to the total farmland. *Social Capital* represents the value of farmers' level of social capital;  $X$  represents the vector of the control variables (e.g., head variables, household variables, and location variables);  $\beta_0$  represents the constant term;  $\beta_1$  represents the estimated coefficient of social capital;  $\gamma$  represents the vector of the estimated coefficients of the control variables;  $\delta$  represents the dummy variable of the sample province; and  $\varepsilon$  represents the random error term.

In addition, in a manner that is aligned with the previous theoretical analysis, this study also uses the model of intermediary effects to explore the impact mechanism of social capital on farmland abandonment. The estimation process used for this purpose can be represented as Equations (3)–(5). More specifically, according to the method provided by Judd and Kenny [69] and Baron and Kenny [70], (i) it needs to determine whether social capital significantly affects off-farm employment and farmland rent, which can be estimated by Equations (3) and (4), respectively; and (ii) it needs to compare the effect of social capital on farmland abandonment through off-farm employment and farmland rent, which can be estimated by Equation (5).

$$\text{Off-farm Employment}_i = \phi_0 + \phi_1 \text{Social Capital}_i + \gamma X + \delta_p + \eta_i \quad (3)$$

$$\text{Farmland Rent}_i = \varphi_0 + \varphi_1 \text{Social Capital}_i + \gamma X + \delta_p + \iota_i \quad (4)$$

$$\begin{aligned} \text{Farmland Abandonment}_i = & \kappa_0 + \kappa_1 \text{Social Capital}_i + \kappa_2 \text{Off-farm Employment} \\ & + \kappa_3 \text{Farmland Rent} + \gamma X + \delta_p + \tau_i \end{aligned} \quad (5)$$

## 4. Results

### 4.1. Descriptive Results

Correlations among variables help illuminate the structure of the data under investigation. Figure 3 shows a heat map of the correlations among the variables included in this study. In Figure 3, the darker the color (the longer the circle radius) means the greater the absolute value of the correlation coefficient between the variables. As indicated in Figure 3, the correlation coefficient between social capital and farmland abandonment is  $-0.03$ ; this finding suggests that social capital may have a negative impact on farmland abandonment. In addition, the correlation coefficient between social capital and off-farm employment is  $0.14$ , with the correlation coefficient between off-farm employment and farmland abandonment being  $0.08$ . These findings suggest that social capital may increase the possibility of farmland abandonment by promoting off-farm employment. Meanwhile, the correlation coefficient between social capital and farmland rent is  $0.11$ , and the correlation coefficient between farmland rent and farmland abandonment is  $-0.02$ . These patterns indicate that social capital may reduce the possibility of farmland abandonment by promoting farmers' participation in the renting of available farmland.

However, the correlations mentioned do not consider the possibility of confounding influence from other variables. Thus, it is necessary to use the proposed econometric model to control for this potential influence, and to explore the actual impacts of social capital on farmland abandonment, as well as the mechanism explaining those impacts.

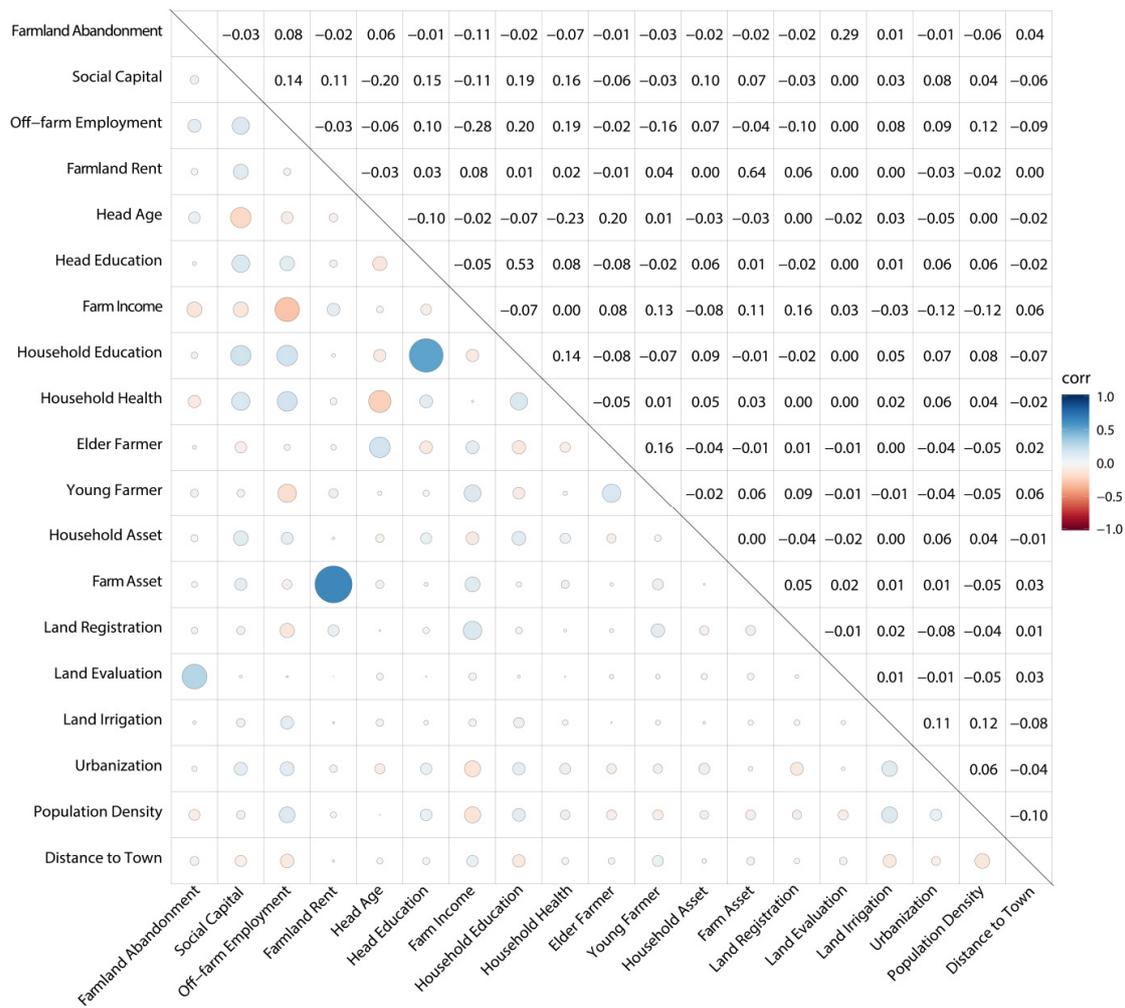


Figure 3. The heatmap of correlation coefficient matrix among variables.

## 4.2. Empirical Results

### 4.2.1. Impacts of Social Capital on Farmland Abandonment

Table 3 reports the estimated results of the impacts of social capital on farmland abandonment. The dependent variables in Table 3 are all related to farmland abandonment. Models (1) to (4) in Table 3 are based on Equation (2), which aims to explore the impacts of social capital on farmland abandonment. More specifically, in Table 3, Model (1) adds the focus variable for social capital and the variables for province dummies; Model (2) adds the location variables based on Model (1); Model (3) adds the head variables based on Model (2); Model (4) adds the household variables based on Model (3). All models are estimated by the ordinary least square method (OLS). In Models (1) to (4), the value of  $R^2$  gradually becomes larger and the value of F is greater than 10, meaning that OLS is effective.

The estimation results in Table 3 show that social capital helps reduce farmland abandonment. As shown in the models included in Table 3, the coefficients of social capital have a negative sign and are significantly different from zero at the level of 5% or higher. More specifically, in Model (4), the coefficient of social capital is  $-7.170$  and significant at the level of 5%. The result of Model (4) means that, if other variables are kept constant, for every unit increase in the social-capital level of farmers, the rate of farmland abandonment will drop by 7.17 percentage points. Hence, there is a negative impact of social capital on farmland abandonment; that is, farmers' social capital can help reduce farmland abandonment.

In addition, the variables of the age of the head of the household, farm income, the household's overall health, elder farmer, household assets, urbanization, and population density also have a negative sign, meaning these variables can also help reduce farmland abandonment. By contrast, the variables of land evaluation, land registration, and land irrigation have a positive sign, meaning these variables may increase farmland abandonment.

**Table 3.** The estimates of impacts of social capital on farmland abandonment.

	Model (1)	Model (2)	Model (3)	Model (4)
Social Capital	−10.841 *** (3.185)	−9.937 *** (3.159)	−6.903 ** (3.219)	−7.170 ** (3.023)
Head Age			−0.355 *** (0.135)	−0.274 ** (0.133)
Head Age2			0.004 *** (0.001)	0.003 *** (0.001)
Head Education			0.900 (0.778)	0.750 (0.865)
Farm Income				−0.050 *** (0.006)
Household Education				0.001 (0.013)
Household Health				−0.046 *** (0.013)
Elder Farmer				−1.526 * (0.784)
Young Farmer				−0.883 (0.739)
Ln(Household Asset)				−0.474 * (0.255)
Ln(Farm Asset)				0.035 (0.956)
Land Registration				1.197 ** (0.552)
Land Evaluation				38.955 *** (2.354)
Land Irrigation				0.989 * (0.562)
Urbanization		−0.032 ** (0.014)	−0.031 ** (0.014)	−0.033 ** (0.014)
Population Density		−0.014 *** (0.002)	−0.014 *** (0.002)	−0.014 *** (0.002)
Distance to Town		0.017 (0.030)	0.016 (0.030)	0.017 (0.028)
Plain		−1.970 ** (0.857)	−1.928 ** (0.855)	−2.188 *** (0.831)
Hill		−0.650 (0.951)	−0.751 (0.950)	−1.595 * (0.929)
Constant	4.166 *** (0.760)	9.006 *** (1.189)	15.033 *** (3.678)	19.012 *** (3.722)
Province Dummies	Yes	Yes	Yes	Yes
F-value	31.091 ***	24.501 ***	21.751 ***	21.207 ***
R <sup>2</sup>	0.041	0.049	0.054	0.138
Observations	8031	8031	8031	8031

Note: Robust standard errors in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

#### 4.2.2. Robustness Test

In order to ensure that the estimation results in Table 3 are robust, this study employs multiple empirical strategies to test. The details are as follows:

First, because we were concerned that mutual causality may have affected the estimation results in Table 3, we use the instrumental variable method to test our results. Specifically, we use the two-stage least squares method to perform our estimation, and the instrumental variable is the average level of social capital of other rural households in the same village (the estimation result is shown in Model (5) of Table 4).

**Table 4.** The estimates of robustness tests.

	Model (5)	Model (6)	Model (7)	Model (8)
Social Capital	−42.027 *** (13.658)	−0.072 *** (0.003)	−0.087 * (0.045)	−1.620 * (0.843)
Head Variables	Yes	Yes	Yes	Yes
Household Variables	Yes	Yes	Yes	Yes
Location Variables	Yes	Yes	Yes	Yes
Province Dummies	Yes	Yes	Yes	Yes
Observations	8031	8031	8031	1123

Note: Robust standard errors in parentheses; \*  $p < 0.10$ , \*\*\*  $p < 0.01$ . “Yes” means that the variables are added in model.

Second, because we were concerned that the truncation characteristics of the variable for farmland abandonment may affect the estimation results in Table 3, we use the Tobit model to check our results. Specifically, we use a non-linear model to perform our estimation (the estimation result is shown in Model (6) of Table 4).

Third, since we were concerned that the measurement method used for the variable for farmland abandonment may affect the estimation results in Table 3, we considered whether farmers actually engage in the behavior associated with farmland abandonment in order to verify our measurement of this variable. Here, we use the Probit model to perform our estimation (the estimation result is shown in Model (7) of Table 4).

Finally, out of concern that a re-sampling of the sample may have destroyed its randomness and, in consequence, affected the estimation results in Table 3, we randomly select three sample provinces for purposes of estimation. Specifically, we extract Sichuan Province (western China), Hunan Province (central China), and Fujian Province (eastern China) through random sampling for our estimation (the estimation result is shown in Model (8) of Table 4).

As shown in Models (5) to (8) of Table 4, the coefficients of social capital are at a significant level (at least the level of 10%) and have a negative sign, meaning that social capital has a negative impact on farmland abandonment. Thus, the estimation results presented in Table 4 confirm that the estimation results shown in Table 3 are robust. In other words, the estimation results in Table 4 prove that farmers’ social capital can help reduce farmland abandonment.

#### 4.2.3. The Mechanism Explaining the Impacts of Social Capital on Farmland Abandonment

This study uses the model of intermediary effects to explore the impact mechanism. As shown in Table 5, the dependent variables of Model (9), Model (12), Model (13), and Model (14) are farmland abandonment; Model (9) is based on the Equation (2); and Model (12), Model (13), and Model (14) are based on the Equation (5). The dependent variables of Model (10) and Model (11) are off-farm employment and farmland rent, respectively, and Model (10) and Model (11) are based on Equations (3) and (4), respectively. All models are estimated by OLS.

**Table 5.** The estimates of impact mechanism of social capital on farmland abandonment.

	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)
Social Capital	−7.170 ** (3.023)	12.799 ** (5.308)	3.690 *** (1.053)	−7.626 ** (3.028)	−5.783 * (2.985)	−6.233 ** (2.985)
Off-farm Employment				0.036 *** (0.008)		0.040 *** (0.008)
Farmland Rent					−0.376 *** (0.040)	−0.392 *** (0.041)
Head Variables	Yes	Yes	Yes	Yes	Yes	Yes
Household Variables	Yes	Yes	Yes	Yes	Yes	Yes
Location Variables	Yes	Yes	Yes	Yes	Yes	Yes
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8031	8031	8031	8031	8031	8031

Note: Robust standard errors in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . “Yes” means that the variables are added in model.

As indicated in Table 5, the coefficient of social capital in Model (10) is significant at the level of 5% and has a positive sign, confirming that social capital significantly and positively affects off-farm employment. In other words, social capital can promote farmers’ participation in off-farm employment. In addition, the coefficient of social capital in Model (11) is significant at the level of 1% and has a positive sign, indicating that social capital significantly and positively affects farmland rent. Social capital can indeed promote farmers’ participation in renting out farmland.

In addition, as shown in Table 5, compared with the coefficient of social capital in Model (9), the coefficients of social capital in Model (12) and Model (13) become smaller and larger, respectively. These patterns show that the impact of social capital on farmland abandonment becomes larger after adding the intervening variable for off-farm employment, but smaller after adding the intervening variable for farmland rent. These findings confirm that social capital may affect farmland abandonment through the channels of off-farm employment and farmland rent. In order to verify the channels in question, we use the method outlined by Sobel [71] to test whether the channels are in fact statistically significant. The Sobel [71] method has two steps: i) calculating the standard errors of  $\phi_1\kappa_2$  and  $\varphi_1\kappa_3$  (where  $S_{\phi_1\kappa_2} = \sqrt{\hat{\phi}_1^2 S_{\kappa_2}^2 + \hat{\kappa}_2^2 S_{\phi_1}^2}$  and  $S_{\varphi_1\kappa_3} = \sqrt{\hat{\phi}_1^2 S_{\kappa_3}^2 + \hat{\kappa}_3^2 S_{\phi_1}^2}$ , and S means standard error); and ii) calculating the Z statistics of  $\phi_1\kappa_2$  and  $\varphi_1\kappa_3$  (where  $Z_{\phi_1\kappa_2} = \hat{\phi}_1\hat{\kappa}_2/S_{\phi_1\kappa_2}$  and  $Z_{\varphi_1\kappa_3} = \hat{\phi}_1\hat{\kappa}_3/S_{\varphi_1\kappa_3}$ ). According to the estimated results of Table 5, we can get  $Z_{\phi_1\kappa_2} = 2.17$  and  $Z_{\varphi_1\kappa_3} = -3.29$ , at a significance level of at least 5%. These findings confirm that social capital can affect farmland abandonment by affecting off-farm employment and farmland rent.

In addition, drawing on the study of Wen et al. [72], we can compare the size of the channel effects of off-farm employment and farmland rent. Their size is measured in terms of the proportion of the channel effect relative to the total effect, which can be expressed as two formulas (i.e.,  $E_{Off-farm\ employment} = \hat{\phi}_1\hat{\kappa}_2/\hat{\kappa}_1$  and  $E_{Farmland\ rent} = \hat{\phi}_1\hat{\kappa}_3/\hat{\kappa}_1$ ). According to the estimated results of Table 5, the values of  $E_{Off-farm\ employment}$  and  $E_{Farmland\ rent}$  are  $-0.08$  and  $0.23$ , respectively. This finding means that the channel effect whereby social capital increases farmland abandonment through promoting off-farm employment is much smaller than the channel effect whereby social capital reduces farmland abandonment through promoting farmland rent. Overall, then, social capital can help reduce farmland abandonment.

### 5. Discussion

Based on survey data from 8031 households in 27 provinces from mainland China, this study explored both the impact of social capital on farmland abandonment and the mechanism explaining that impact. Extending previous research, the present study makes the following contributions: (i) It explores the potential impact of social capital on farmland abandonment from a theoretical perspective; (ii) it provides a quantitative analysis of the impact of social capital on farmland abandonment, using an econometric model to discuss the impact mechanism; and (iii) it compares the size of the channel effects of two main channels through which social capital affects farmland abandonment. In addition,

the study was conducted against the backdrop of COVID-19, which has increased the threat to food security. Our research has the potential to reduce the negative impact of this threat by identifying the factors that drive the effective use of farmland. Finally, given that China is actively promoting rural revitalization at this time, the study also provides policymakers with information about effective ways to reduce farmland abandonment.

Our main finding is that social capital helps reduce farmland abandonment. After controlling for other variables, for every unit increase in social capital, the proportion of farmland abandonment can be predicted to drop by 7.17 percentage points. This finding shows that the social capital of farmers plays a positive role in the allocation of farmland resources. The finding is consistent with the conclusions of Taylor and Featherstone [53], Teshome et al. [73], Tan et al. [52], and Liu et al. [17], who believe that social capital is beneficial to the effective allocation of farmland resources. Conversely, our results diverge from the conclusions of Holden and Ghebru [74] and Levien [50], who believe that informal institutions may hinder the effective allocation of farmland resources, and that the social capital of farmers may even worsen the inequality of rural farmland markets.

Here, it should be noted that, since 1979, China's rural areas have carried out many reforms, with the initiatives driving these reforms reflecting a balance between formal institutions and informal institutions. The complementarity of formal and informal institutions is conducive to economic and social development [13,14]. Thus, we argue that, in rural China, social capital, as a key informal institution, is conducive to reducing farmland abandonment.

This study found that social capital affects farmland abandonment by means of its impact on off-farm employment and farmland rent. Previous studies have discussed the impacts of social capital on off-farm employment (e.g., Zhang and Li [44], Knight and Yueh [45], Wan et al. [46], and Xue et al. [47]), or the impacts of social capital on farmland rent (e.g., Taylor and Featherstone [53], Teshome et al. [73], Tan et al. [52], and Liu et al. [17]), or the impacts of off-farm employment on farmland abandonment (e.g., Deng et al. [48] and Xu et al. [7]). However, there is a research gap when it comes to the specific impact mechanism by means of which social capital affects farmland abandonment through off-farm employment and farmland rent. Based on the model of intermediary effects, this study finds that social capital can affect farmland abandonment through its impact on both off-farm employment and farmland rent. It also finds that channel effect through which social capital increases farmland abandonment by promoting off-farm employment is much smaller than the channel effect through which social capital reduces farmland abandonment by promoting farmland rent. Thus, overall, social capital can help reduce farmland abandonment. This finding suggests that the government should continue to support the establishment of farmland markets in rural areas, and help farmers use social capital to find suitable farmland tenants.

All of this being said, however, the present study still has some limitations that should be addressed in future research. For one thing, there may be a dynamic relationship between social capital and farmland abandonment, and future studies can construct panel data to explore this issue. In addition, this study has focused on the Chinese context specifically. Future research can investigate whether the conclusions of this study, which were affected by the reforms carried out in China's rural areas in particular, are applicable to other developing or developed countries.

## 6. Implications for Government Policy

These results carry some significant implications for policymakers. First of all, they indicate that social capital is important when it comes to making efficient use of farmland. Although formal institutions also play an important role in this connection, we cannot ignore the contribution of informal institutions to effective farmland use. Accordingly, to help cope with the food security threat brought by the COVID-19 pandemic, the government should guide farmers to use social capital to reduce farmland abandonment. For instance, the government can organize online associations to promote the spread of agricultural information. Further, our finding that social capital mainly reduces farmland abandonment by promoting farmland rent indicates that the government should continue to focus on

rural farmland markets. For instance, the government can establish a platform providing information about farmland leases in rural towns and use the online association to provide access to the platform. At the same time, our finding that social capital can increase farmland abandonment by promoting off-farm employment highlights the need to address the problem of brain drain in rural areas. To this end, the government should provide necessary policy support for entrepreneurs who engage in agriculture—for example, by giving credit guarantees to entrepreneurs, and helping farmers increase social capital to establish stable sales channels.

## 7. Conclusions

Based on extensive sample data from rural China, and using quantitative analysis, this study focuses on the theoretical context as well as the empirical impact of social capital on farmland abandonment. The main results can be summarized as follows:

(1) Social capital, as a key informal institution, can help reduce farmland abandonment. More specifically, after controlling for other variables, we found that for every unit increase in social capital, the proportion of farmland abandonment will drop by 7.17 percentage points.

(2) Both off-farm employment and farmland rent are channels by means of which social capital impacts farmland abandonment. However, the channel effect through which social capital increases farmland abandonment by promoting off-farm employment is much smaller than the channel effect through which social capital reduces farmland abandonment by promoting farmland rent.

Finally, the above conclusions implicate that social capital is important when it comes to making efficient use of farmland.

**Author Contributions:** X.D., D.X., and Y.Q. designed the research; X.D., D.X., Y.Q., and M.Z. performed the research; X.D. analyzed the data; and all authors wrote the paper. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the National Social Science Foundation of China (Grant No. 14XGL003) and the Scientific Research Project of Introducing Talent of Sichuan Agricultural University.

**Acknowledgments:** We gratefully acknowledge financial support from the National Social Science Foundation of China (Grant No. 14XGL003) and the Scientific Research Project of Introducing Talent of Sichuan Agricultural University. The authors also extend great gratitude to the anonymous reviewers and editors for their helpful review and critical comments. Additionally, all authors are very grateful to the Center for Social Science Survey at Sun Yat-sen University, Guangzhou, China, who provided the data.

**Conflicts of Interest:** All authors declare no conflict of interest.

## Appendix A

The process of measuring the social capital of farmers by the entropy weight method is as follows:

The first step is to standardize the variables. In order to avoid the adverse effects of different measurement units on the measurement of social capital, the indicators are standardized, and the formula is shown in Equation (A1):

$$Y_{ij} = \frac{X_{ij} - \text{Min}(X_{1j}, X_{2j}, X_{3j}, \dots, X_{nj})}{\text{Max}(X_{1j}, X_{2j}, X_{3j}, \dots, X_{nj}) - \text{Min}(X_{1j}, X_{2j}, X_{3j}, \dots, X_{nj})}, i = 1, 2, 3, \dots, n; j = 1, 2, 3, \dots, m \quad (\text{A1})$$

where the subscripts  $i$ ,  $j$ ,  $n$  and  $m$  represent the farm household  $i$ , social capital indicator  $j$ , the household number  $n$  and the social capital indicator number  $m$  respectively;  $Y$  represents the standardized value;  $X$  represents the original value;  $Max$  and  $Min$  represent the maximum and minimum value of all observed values of the same indicator respectively.

The second step is to calculate the proportion of index  $j$  of household  $i$  in total of this index, see Equation (A2).

$$\text{Ratio}_{ij} = \frac{Y_{ij}}{\sum_{i=1}^n Y_{ij}}, i = 1, 2, 3, \dots, n \quad (\text{A2})$$

The third step is to calculate the entropy value  $E_j$  of the social capital index  $j$ , see Equation (A3).

$$E_j = -\frac{1}{\ln(n)} \times \sum_{i=1}^n [\text{Ratio}_{ij} \times \ln(\text{Ratio}_{ij})], i = 1, 2, 3, \dots, n \quad (\text{A3})$$

The fourth step is to calculate the coefficient of difference  $D_j$  of the social capital index  $j$ , see Equation (A4).

$$D_j = 1 - E_j \quad (\text{A4})$$

The fifth step is to calculate the weight  $W_j$  of the social capital index  $j$ , see Equation (A5).

$$W_j = \frac{D_j}{\sum_{j=1}^m D_j}, j = 1, 2, 3, \dots, m \quad (\text{A5})$$

The sixth step is to calculate the score  $Score_{ij}$  of the social capital index  $j$  of the farmer  $i$ , see Equation (A6).

$$Score_{ij} = W_j \times Y_{ij} \quad (\text{A6})$$

The seventh step is to calculate *Social Capital* <sub>$i$</sub> , see Equation (A7).

$$\text{Social Capital}_i = \sum_{j=1}^m Score_{ij}, j = 1, 2, 3, \dots, m \quad (\text{A7})$$

## References

1. Creutzig, F.; d'Amour, C.B.; Weddige, U.; Fuss, S.; Beringer, T.; Gläser, A.; Kalkuhl, M.; Steckel, J.C.; Radebach, A.; Edenhofer, O. Assessing human and environmental pressures of global land-use change 2000–2010. *Glob. Sustain.* **2019**, *2*, e1. [CrossRef]
2. He, C.; Liu, Z.; Xu, M.; Ma, Q.; Dou, Y. Urban expansion brought stress to food security in China: Evidence from decreased cropland net primary productivity. *Sci. Total Environ.* **2017**, *576*, 660–670. [CrossRef] [PubMed]
3. Wang, Y.; Liu, Y. New material for transforming degraded sandy land into productive farmland. *Land Use Policy* **2020**, *92*, 104477. [CrossRef]
4. FAO. Global Report on Food Crises (Grfc) 2020. Available online: <http://www.fao.org/emergencies/resources/documents/resources-detail/en/c/1272014/> (accessed on 21 April 2020).
5. Ma, W.; Zhu, Z. Reducing cropland abandonment in China: Do agricultural cooperatives play a role? *J. Agric. Econ.* **2020**, *71*, 929–935. [CrossRef]
6. Deng, X.; Xu, D.; Zeng, M.; Qi, Y. Does Internet use help reduce rural cropland abandonment? Evidence from China. *Land Use Policy* **2019**, *89*, 104243. [CrossRef]
7. Xu, D.; Deng, X.; Guo, S.; Liu, S. Labor migration and farmland abandonment in rural China: Empirical results and policy implications. *J. Environ. Manag.* **2019**, *232*, 738–750. [CrossRef]
8. Campbell, J.E.; Lobell, D.B.; Genova, R.C.; Field, C.B. The global potential of bioenergy on abandoned agriculture lands. *Environ. Sci. Technol.* **2008**, *42*, 5791–5794. [CrossRef]
9. Zhang, S.; Wang, S.; Yuan, L.; Liu, X.; Gong, B. The impact of epidemics on agricultural production and forecast of Covid-19. *China Agric. Econ. Rev.* **2020**. ahead-of-print. [CrossRef]
10. Fan, S.; Si, W.; Zhang, Y. How to prevent a global food and nutrition security crisis under Covid-19? *China Agric. Econ. Rev.* **2020**. ahead-of-print. [CrossRef]
11. Stephens, E.C.; Martin, G.; van Wijk, M.; Timsina, J.; Snow, V. Impacts of Covid-19 on agricultural and food systems worldwide and on progress to the sustainable development goals. *Agric. Syst.* **2020**, *183*, 102873. [CrossRef]
12. Li, S.; Li, X.; Sun, L.; Cao, G.; Fischer, G.; Tramberend, S. An estimation of the extent of cropland abandonment in mountainous regions of China. *Land Degrad. Dev.* **2018**, *29*, 1327–1342. [CrossRef]

13. Allen, F.; Qian, J.; Qian, M. Law, finance, and economic growth in China. *J. Finan. Econ.* **2005**, *77*, 57–116. [[CrossRef](#)]
14. North, D.C. Institutions and the performance of economies over time. In *Handbook of New Institutional Economics*; Menard, C., Shirley, M.M., Eds.; Springer: Boston, MA, USA, 2005; pp. 21–30.
15. Coleman, J.S. *Foundations of Social Theory*; Harvard University Press: Cambridge, MA, USA, 1994.
16. Liu, L.; Paudel, K.P.; Li, G.; Lei, M. Income inequality among minority farmers in China: Does social capital have a role? *Rev. Dev. Econ.* **2019**, *23*, 528–551. [[CrossRef](#)]
17. Liu, R.; Gao, Z.; Nian, Y.; Ma, H. Does social relation or economic interest affect the choice behavior of land lease agreement in China? Evidence from the largest wheat-producing Henan province. *Sustainability* **2020**, *12*, 4279. [[CrossRef](#)]
18. Yang, Y.; He, Y.; Li, Z. Social capital and the use of organic fertilizer: An empirical analysis of Hubei province in China. *Environ. Sci. Pollut. Res.* **2020**, *27*, 1–12. [[CrossRef](#)] [[PubMed](#)]
19. Hui, C.; Lee, C.; Rousseau, D.M. Employment relationships in China: Do workers relate to the organization or to people? *Organ. Sci.* **2004**, *15*, 232–240. [[CrossRef](#)]
20. Miao, R.-T. Perceived organizational support, job satisfaction, task performance and organizational citizenship behavior in China. *J. Behav. Appl. Manag.* **2011**, *12*, 105.
21. Deng, X.; Xu, D.; Zeng, M.; Qi, Y. Does early-life famine experience impact rural land transfer? Evidence from China. *Land Use Policy* **2019**, *81*, 58–67. [[CrossRef](#)]
22. Xu, D.; Deng, X.; Huang, K.; Liu, Y.; Yong, Z.; Liu, S. Relationships between labor migration and cropland abandonment in rural China from the perspective of village types. *Land Use Policy* **2019**, *88*, 104164. [[CrossRef](#)]
23. Zou, B.; Mishra, A.K.; Luo, B. Aging population, farm succession, and farmland usage: Evidence from Rural China. *Land Use Policy* **2018**, *77*, 437–445. [[CrossRef](#)]
24. Bowles, S.; Gintis, H. Social capital and community governance. *Econ. J.* **2002**, *112*, 419–436. [[CrossRef](#)]
25. Coleman, J.S. Social capital in the creation of human capital. *Am. J. Sociol.* **1988**, *94*, 95–120. [[CrossRef](#)]
26. Putnam, R.D.; Leonardi, R.; Nanetti, R.Y. Making democracy work: Civic traditions in modern Italy. *Foreign Aff.* **1994**, *72*, 202.
27. Lin, N. *Social Capital: A Theory of Social Structure and Action*; Cambridge University Press: Cambridge, UK, 2001.
28. Bourdieu, P. The Forms of Capital. In *Handbook of Theory & Research of for the Sociology of Education*; Greenwood Press: Westport, CT, USA, 1986; pp. 280–291.
29. He, K.; Zhang, J.; Feng, J.; Hu, T.; Zhang, L. The impact of social capital on farmers' willingness to reuse agricultural waste for sustainable development. *Sustain. Dev.* **2016**, *24*, 101–108. [[CrossRef](#)]
30. Hunecke, C.; Engler, A.; Jararojas, R.; Poortvliet, P.M. Understanding the role of social capital in adoption decisions: An application to irrigation technology. *Agric. Syst.* **2017**, *153*, 221–231. [[CrossRef](#)]
31. Gao, Y.; Liu, B.; Yu, L.; Yang, H.; Yin, S. Social capital, land tenure and the adoption of green control techniques by family farms: Evidence from Shandong and Henan provinces of China. *Land Use Policy* **2019**, *89*, 104250. [[CrossRef](#)]
32. Zhou, Y.; Li, X.; Liu, Y. Rural land system reforms in China: History, issues, measures and prospects. *Land Use Policy* **2020**, *91*, 104330. [[CrossRef](#)]
33. Ma, L.; Long, H.; Tu, S.; Zhang, Y.; Zheng, Y. Farmland transition in China and its policy implications. *Land Use Policy* **2020**, *92*, 104470. [[CrossRef](#)]
34. Robison, L.J.; Myers, R.J.; Siles, M.E. Social capital and the terms of trade for farmland. *Appl. Econ. Perspect. Policy* **2002**, *24*, 44–58. [[CrossRef](#)]
35. Qiu, T.; Luo, B.; He, Q. Does land rent between acquaintances deviate from the reference point? Evidence from rural China. *China World Econ.* **2020**, *28*, 29–50. [[CrossRef](#)]
36. Zhao, Y. The role of migrant networks in labor migration: The case of China. *Contemp. Econ. Policy* **2003**, *21*, 500–511. [[CrossRef](#)]
37. Serbeh, R.; Adjei, P.O.-W. Social networks and the geographies of young people's migration: Evidence from independent child migration in Ghana. *J. Int. Migr. Integr.* **2020**, *21*, 221–240. [[CrossRef](#)]
38. Ayele, L.; Degefa, T. Temporary Rural–Rural Labor Migration from Quarit District, Northwest Ethiopia: A Search for the Determinants. *Afr. Geogr. Rev.* **2020**, 1–19. [[CrossRef](#)]

39. Williams, N.E.; Hughes, C.; Bhandari, P.; Thornton, A.; Young-DeMarco, L.; Sun, C.; Swindle, J. When does social capital matter for migration? A study of networks, brokers, and migrants in Nepal. *Int. Migr. Rev.* **2020**, 0197918319882634. [[CrossRef](#)]
40. Calvo-Armengol, A.; Jackson, M.O. The effects of social networks on employment and inequality. *Am. Econ. Rev.* **2004**, 94, 426–454. [[CrossRef](#)]
41. Brady, G. Network social capital and labour market outcomes: Evidence for Ireland. *Econ. Soc. Rev.* **2015**, 46, 163–195.
42. Obukhova, E.; Zhang, L. Social capital and job search in urban China: The Strength-of-Strong-Ties Hypothesis revisited. *Chin. Sociol. Rev.* **2017**, 49, 340–361. [[CrossRef](#)]
43. Batistic, S.; Tymon, A. Networking behaviour, graduate employability: A social capital perspective. *Educ. Train.* **2017**, 59, 374–388. [[CrossRef](#)]
44. Zhang, X.; Li, G. Does guanxi matter to nonfarm employment? *J. Compar. Econ.* **2003**, 31, 315–331. [[CrossRef](#)]
45. Knight, J.; Yueh, L. The role of social capital in the labour market in China 1. *Econ. Transit.* **2008**, 16, 389–414. [[CrossRef](#)]
46. Wan, J.; Deng, W.; Song, X.; Liu, Y.; Zhang, S.; Su, Y.; Lu, Y. Spatio-temporal impact of rural livelihood capital on labor migration in Panxi, southwestern mountainous region of China. *Chin. Geogr. Sci.* **2018**, 28, 153–166. [[CrossRef](#)]
47. Xue, K.; Xu, D.; Liu, S. Social network influences on non-agricultural employment quality for part-time peasants: A case study of Sichuan province, China. *Sustainability* **2019**, 11, 4134. [[CrossRef](#)]
48. Deng, X.; Xu, D.; Qi, Y.; Zeng, M. Labor off-farm employment and cropland abandonment in rural China: Spatial distribution and empirical analysis. *Int. J. Environ. Res. Public Health* **2018**, 15, 1808. [[CrossRef](#)]
49. Qiu, B.; Yang, X.; Tang, Z.; Chen, C.; Li, H.; Berry, J. Urban expansion or poor productivity: Explaining regional differences in cropland abandonment in China during the early 21st century. *Land Degrad. Dev.* **2020**, 65, 369–384. [[CrossRef](#)]
50. Levien, M. Social capital as obstacle to development: Brokering land, norms, and trust in rural India. *World Dev.* **2015**, 74, 77–92. [[CrossRef](#)]
51. Cheevapattananuwong, P.; Baldwin, C.; Lathouras, A.; Ike, N. Social capital in community organizing for land protection and food security. *Land* **2020**, 9, 69. [[CrossRef](#)]
52. Tan, S.; Liu, B.; Hannaway, D. Age, social capital, and herders grassland renting decisions in inner Mongolia, P.R. China. In Proceedings of the International Association of Agricultural Economists (IAAE) 2018 Conference, Vancouver, British Columbia, 28 July–2 August 2018.
53. Taylor, M.; Featherstone, A. The value of social capital in cropland leasing relationships. In Proceedings of the Agricultural and Applied Economics Association (AAEA) 2016 Annual Meeting, Boston, MA, USA, 31 July–2 August 2016.
54. Pitts, A.L. A Study of Social Capital: How Much Do Relationships Matter in Farmland Leasing? Master Thesis, Kansas State University, Manhattan, KS, USA, 2019.
55. Deng, X.; Xu, D.-d.; Zeng, M.; Qi, Y.-b. Does Labor Off-Farm Employment Inevitably Lead to Land Rent Out? Evidence from China. *J. Mt. Sci.* **2019**, 16, 689–700. [[CrossRef](#)]
56. Xu, D.; Yong, Z.; Deng, X.; Zhuang, L.; Qing, C. Rural-urban migration and its effect on land transfer in rural China. *Land* **2020**, 9, 81. [[CrossRef](#)]
57. Zhang, Y.; Halder, P.; Zhang, X.; Qu, M. Analyzing the deviation between farmers' land transfer intention and behavior in China's impoverished mountainous area: A logistic-ism model approach. *Land Use Policy* **2020**, 94, 104534. [[CrossRef](#)]
58. Zhou, Y.; Li, Y.; Xu, C. Land consolidation and rural revitalization in China: Mechanisms and paths. *Land Use Policy* **2020**, 91, 104379. [[CrossRef](#)]
59. Han, J. How to promote rural revitalization via introducing skilled labor, deepening land reform and facilitating investment? *China Agric. Econ. Rev.* **2020**. ahead-of-print. [[CrossRef](#)]
60. Deng, X.; Zeng, M.; Xu, D.; Wei, F.; Qi, Y. Household health and cropland abandonment in rural China: Theoretical mechanism and empirical evidence. *Int. J. Environ. Res. Public Health* **2019**, 16, 3588. [[CrossRef](#)] [[PubMed](#)]
61. Zhou, J.; Liu, Q.; Liang, Q. Cooperative membership, social capital, and chemical input use: Evidence from China. *Land Use Policy* **2018**, 70, 394–401. [[CrossRef](#)]

62. Wossen, T.; Berger, T.; Di Falco, S. Social capital, risk preference and adoption of improved farm land management practices in Ethiopia. *Agr. Econ.* **2015**, *46*, 81–97. [[CrossRef](#)]
63. Von Carnap, T. Irrigation as a historical determinant of social capital in India? A large-scale survey analysis. *World Dev.* **2017**, *95*, 316–333. [[CrossRef](#)]
64. Zhao, L.; Yao, X. Does local social capital deter labour migration? Evidence from rural China. *Appl. Econ.* **2017**, *49*, 4363–4377. [[CrossRef](#)]
65. Berry, H.L.; Welsh, J.A. Social capital and health in Australia: An overview from the household, income and labour dynamics in Australia survey. *Soc. Sci. Med.* **2010**, *70*, 588–596. [[CrossRef](#)]
66. Wuepper, D.; Yesigat Ayenew, H.; Sauer, J. Social capital, income diversification and climate change adaptation: Panel data evidence from rural Ethiopia. *J. Agr. Econ.* **2018**, *69*, 458–475. [[CrossRef](#)]
67. Deng, X.; Xu, D.; Zeng, M.; Qi, Y. Landslides and cropland abandonment in China’s mountainous areas: Spatial distribution, empirical analysis and policy implications. *Sustainability* **2018**, *10*, 3909. [[CrossRef](#)]
68. Du, J.; Zeng, M.; Xie, Z.; Wang, S. Power of agricultural credit in farmland abandonment: Evidence from rural China. *Land* **2019**, *8*, 184. [[CrossRef](#)]
69. Judd, C.M.; Kenny, D.A. Process analysis: Estimating mediation in treatment evaluations. *Eval. Rev.* **1981**, *5*, 602–619. [[CrossRef](#)]
70. Baron, R.M.; Kenny, D.A. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J. Personal. Soc. Psychol.* **1986**, *51*, 1173. [[CrossRef](#)]
71. Sobel, M.E. Direct and indirect effects in linear structural equation models. *Sociol. Methods Res.* **1987**, *16*, 155–176. [[CrossRef](#)]
72. Wen, Z.; Zhang, L.; Hou, J.; Liu, H. Testing and application of the mediating effects. *Acta Psychol. Sin.* **2004**, 614–620.
73. Teshome, A.; de Graaff, J.; Kessler, A. Investments in land management in the north-western highlands of Ethiopia: The role of social capital. *Land Use Policy* **2016**, *57*, 215–228. [[CrossRef](#)]
74. Holden, S.; Ghebru, H. *Kinship, Transaction Costs and Land Rental Market Participation*; Department of Economics and Management, Norwegian University of Life Sciences: Ås, Norway, 2005.



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).