Article

Is There Herd Effect in Farmers' Land Transfer Behavior?

Jia Gao [ID], Rongrong Zhao and Xiao Lyu *[ID]

School of Humanities and Law, Northeastern University, Shenyang 110169, China
* Correspondence: lvxiao@mail.neu.edu.cn

Abstract: China's rural land transfer market has been plagued by issues including poor information transmission, limited scale, and an incoherent structure. In this context, this study collected the data of 337 farmers in Qufu City, Shandong Province, and incorporated into the analysis the acquaintance-based nature of rural society that includes strong geographic ties. Taking the herd effect as the starting point, this paper it considers how farmers in the same geo-network affect the land transfer behavior of individual farmers, and adopts the Probit model to analyze the impact of geo-networks to verify the function of the herd effect in farmers' land transfer behavior. Then, the IV-Probit model is applied to solve the endogenous problem of the herd effect. The results show that: (1) Farmers imitate the land transfer behavior of other farmers in the same geo-network. Geo-networks positively impact the land transfer behavior of farmers, and the herd effect is apparent in farmers' land transfer behavior. (2) Farmers' family background, resource endowment, and cognitive features are key factors that influencing farmers' land transfer behavior. (3) Farmers' land transfer behavior is more significantly influenced in groups with low and middle agricultural income than in groups with high agricultural income. This study aims to assist the government in giving full play to the positive role of the herd effect, promoting the leading role of village cadres as leader sheep, and smoothing the transmission of land transfer information. Governments should place more emphasis on developing land transfer platforms and invest more in the construction of farmland infrastructure. This paper may serve as a reference to achieve large-scale agriculture operation via land transfer and promote the prosperity of the land transfer market.

Keywords: farmers' land transfer behavior; herd effect; geo-network

1. Introduction

During recent decades, China has seen rapid urbanization as well as intensified crises including farmland abandonment, deficiency of rural land use, and rural decline [1–3]. Since the massive outward rural migration due to rapid urbanization, rural land use has been dramatically affected, especially in cases of farmland abandonment [4,5]. Due to the household contract responsibility system in place in China, even though the rural migrants left the agricultural industry and abandoned their land in the countryside, they could not sell the rural land nor could other farming households obtain more rural land [6]. Under the household contract responsibility system, all residents of a village collective own all the rural land within the village, and the amount of land any household can own depends on its historical numbers of household family members [7]. In fact, this household contract responsibility system stipulates that farming households cannot sell their contracted land even if they intend to leave the countryside permanently, as the farming households only have contractual and usage rights to the contracted land, but not the ownership rights. As a result, the household contract responsibility system increased the levels of farmland abandonment and rural land use deficiency in rural China [1,7]. Thus, land transfer was proposed to solve the rural land use problem in rural areas through the promulgated "separating three property rights" reform [8]. Thanks to the "separating three property rights" reform, the contractual and usage rights of rural land are divided into non-tradable contractual rights and tradable usage rights, which make it possible for farmers who cease

engaging in agricultural industry to transfer outward the land usage rights to others, and it also makes it possible for farmers remaining in agricultural industry to transfer inward more rural land to enlarge the scale of their farming operations [9]. Land transfer refers to this inward and outward transfer of rural land usage rights, and is used with that meaning in this study.

Land transfer is nowadays the route one must take to revitalize abandoned rural land resources and develop moderate-scale operations in rural areas in China [10,11]. Reasonable land transfer is vital for developing modern agriculture, to address problems in rural areas [6,7]. The 18th, 19th, and 20th National Congresses of the Communist Party of China all urged efforts to implement the tasks and requirements of land transfer reform, and to obtain rural revitalization through optimal allocation of land elements [12–14]. At present, despite legal protection and central government support, the rural land transfer market still suffers from ineffective information transmission, small scale, and uncoordinated structures [15,16]. Further attempts are required to facilitate rural land transfer and allocate land resources appropriately to support rural economic progress and revitalization. These are key to promoting reform of rural land systems and actualizing agricultural scale management in the new era.

For famers, obtaining land transfer information is fundamental to the land transfer process. With limited information channels broadcasting government policies, instead of spending more time, cost, and energy collecting and interpreting land transfer information, farming households are more inclined to refer to and imitate the behavior of other farmers in their social networks when making decisions on land transfer, showing a herd effect [17,18]. Herd effect refers to the behavior of individuals extracting information from other people's behaviors and imitating them to maximize utility when information is asymmetric or insufficient due to imitations of information-discrimination ability [19]. Although farmers have a general tendency to pursue the maximization of economic benefits and utility, behavioral economics research shows that farmers' individual willingness and behavior are also influenced by the willingness and behavior of other individuals in their groups [20].

As the most important subjective factor, the group psychology of farmers affected by the herd effect plays a key role in the process of land transfer. Due to group psychology, there may be a big difference between an individual's response in the group environment and their response in the independent environment [21–23]. Farmers' land transfer decision-making behavior shows conformity, and in order to avoid being isolated or treated differently by other farmers, they choose to imitate the land transfer behavior of other farmers [24,25]. At the same time, due to the narrow channels of information transmission, farmers tend to rely on decision-making information obtained from other farmers such as acquaintances, relatives, and friends as active reference when obtaining land transfer information [26]. Therefore, in the process of land transfer, due to incompleteness and difficulty in obtaining information, farmers rely on public information when making decisions affecting land transfer behavior, which leads to a herd effect in farmers' land transfer behavior [20–26].

Since land transfer is now protected and recognized by the law, numerous academics have started to investigate the costs, obstacles, and issues regarding land transfer and have put forward helpful policy proposals. In China, farmers live together in villages relying on land resources and maintaining geo-network relationships [18], but little focus has been placed on the geo-network characteristics of the acquaintance society in rural areas, where farmers have few options for getting information about land transfer policies and therefore frequently follow the land transfer behavior of the majority when unsure how to proceed. To examine how geo-networks affect land transfer behavior, this study considers the herd effect, which reflects the actions of people in a group. Therefore, this paper takes herd effect as the starting point, considers the influence on farmers' land transfer behavior of herd effect caused by group psychology, analyze the mechanism of the herd effect in farmers' land transfer behavior, puts forward a research hypothesis, and verifies it through

micro-investigation data, to obtain an effective theoretical and empirical basis for guiding land transfer practice.

The remainder of this paper is structured as follows: Section 2 reviews the existing literature and Section 3 proposes the research objective and research hypotheses. Section 4 displays the data and methodology. Section 5 presents the results of empirical analysis and the discussion of this research. Section 6 presents the conclusions.

2. Review of Literature

Recently, many studies have performed extensive research on the external factors influencing land transfer behavior, such as the size of the farming household, resource endowment, household income status, the size of the household labor force, agricultural machinery level, awareness of property rights, land transfer policies, the external environment, and so on [1,6,10,13,14,27–32]. It can be seen from the existing literature that there are various factors affecting farmers' land transfer behavior, but the existing studies have paid little attention to the effect of group psychology on farmers' land transfer behavior. China's rural society is characterized by acquaintance society formed by geographic ties, and group psychology is held to have a significant impact on farmers' land use behavior [33]. In reality, access to land transfer information and direction is related largely to farmers' social networks [34]. According to available studies, social networks can significantly influence farmers' decisions on allocating production factors, especially land resources, and may even change a farmer's land transfer transaction mode and lead to lower land transfer prices [35,36]. Furthermore, land transfer relies heavily on invisible commitments made by members of the kin society. To be specific, the transferor reduces or waives rents in exchange for favorable assistance from the transferee, so land transfer is more likely to occur among friends and relatives, featuring low transfer prices or even zero rents [37,38]. Meanwhile, some scholars have found that in areas where farmers have no strong willingness to transfer land, or social networks play a major part, most farmers access land transfer information through communicating with others in their social networks, revealing that the social network mechanism of farmers promotes the development of land transfer to some degree [39,40].

As stated above, China's rural areas are home to an acquaintance-based society with geographic ties [33]. Such a society boasts the advantages of information symmetry and social network access [41], so land transfer information can be transmitted smoothly among acquaintances. Farmers in the same region basically know each other well. Hence, when a farmer is unable to access land transfer information effectively, he tends to consult his acquaintances and farmers in the same group, within the same village, who are experienced in land transfer. If he follows their actions without fully considering his resource endowments and limitations, his land transfer behavior is thus affected by the herd effect [21,22,42,43]. The herd effect has distinct functions of information transfer and demonstration [22,42]. It is an efficient way to transmit information that impacts individual decision-making while also enabling individuals to change their behavior based on information obtained from other subjects in a group [21,42], hence its vital role in disseminating land transfer information. Scholars have previously focused on the herd effect in the stock market, financial investment, securities market, agricultural production, and rural land use [17,18,23,42,44]. This current paper takes into account the specificity of rural geo-networks, links the herd effect with farmers' land transfer behavior, considers the information transmission and demonstration function of the herd effect, and analyzes how the herd effect influences farmers' land transfer practices.

In this research, we focused on geo-networks to observe the herd effect, because Chinese farmers tend to live together in villages where they maintain geo-network relationships [18]. Geo-networks are considered the contractual basis of rural society [45]. Because rural residents live together in villages, they form interpersonal relationships through mutual social activities and exchanges, leading to close ties between farmers in contexts of politics, economy, culture, customs, socializing, and agricultural production. In China's

rural areas, geo-network relationships have long affected economic development and the establishment of new structures [45]. It is precisely because of the existence of geo-networks that villagers in the same village have form general rules for long-term production and life processes, which indirectly affect farmers' land use behavior. Therefore, this study applied the concept of geo-networks to assess the herd effect in farmers' land transfer behavior.

3. Research Objective and Hypotheses

For its research objective, this study begins with the herd effect, integrates the features of acquaintance society with geographic ties in China's rural areas, and considers the influence of group psychology on individual farmers' land transfer behavior. By taking farmers themselves as the channel of disseminating land transfer information, to explore how the geo-network, exerting the herd effect, impacts farmers' individual land transfer behavior. In this research, the IV-Probit model was employed to verify the herd effect of farmers' land transfer behavior. The herd effect based on geo-networks may act as a scientific reference for shareholders to further normalize and direct orderly rural land transfer, solve the problem of fragmented arable land, and facilitate large-scale farming operations.

In order to verify whether there is herd effect in farmers' land transfer behavior, we put forward hypotheses based on theoretical analysis.

In terms of land transfer, the herd effect supports information transfer and provides an example for farmers in the same geo-network to copy [46]. On the one hand, collecting information about land transfer can prove costly, and the traditional land transfer market can fail to match efficiently demand with supply, and as a result, many potential land transfer transactions cannot be realized [1]. Social networks, by contrast, greatly reduce the costs of farmers' information searches [33]. Farmers with abundant social network resources can acquire more useful information quicker and at lower cost that those with less social networks resources. They can also spread land transfer information more effectively and reach land transfer deals more easily [47]. On the other hand, the more that individual farmers identify with the group they belong to in their geo-network, the greater their decision making is influenced by the other farmers in the geo-network. The closer their relationship with the geo-network they belong to, the more likely it is that their decision-making on land transfer is influenced by the group's opinions [23,47]. Therefore, farmers who are unable to acquire land transfer information in advance, cannot make decisions on their own and must instead refer to other land transfer behaviors to decide whether to transfer their land. In this process, farmers' inclination to transfer land is inevitably influenced by the actions of their peers in the same geo-networks, thereby exhibiting the herd effect [22].

According to existing studies, village collectives are function as the main channels for the spread of land transfer information, having the innate advantages of releasing land transfer information, and their functions and effects have been recognized by farmers and academics [28,35,37]. There remains a necessity for developing new channels for land transfer information dissemination in rural areas. To this end, this paper examines the interplay between the land transfer behaviors of farmers in a group based on a collective geo-network, and dissects the land transfer behavior of individual farmers with the aid of the information transmission and demonstration functions of the herd effect. This paper proposes the following research hypotheses:

H1. *Geo-networks positively impact farmers' land transfer behavior.*

H2. *Farmers imitate the land transfer behavior of other farmers in the same geo-network, and a herd effect exists.*

4. Data and Methodology

4.1. Data Source and Variables

4.1.1. Data Source

In recent years, land transfer in Shandong Province has been at the forefront of China's advancements in this field. However, a mature transfer-market mechanism has not yet been formed throughout the province, and all levels of local government lack in-depth understanding of land transfer needs from the perspectives of both supply and demand, and communications platforms for land transfer information are in need of improvement. As one of the prefecture-level cities in Shandong Province, the construction of the land transfer platform for Qufu City started late, and the spread of land transfer information was asymmetric and irregular. Due to the low education levels of farmers, and their lack of awareness of land transfer policies, farmers usually transfer land by oral confirmation. Among acquaintances, even if a land transfer contract is signed between the transferor and the transferee, the terms agreed in the contract are often not clear enough, the land transfer procedures are not complete, and there is no uniform standard for the land transfer price, frequently leading to land transfer disputes and bringing severe challenges to the large-scale management of land in Qufu City. Thus, we conducted the investigation in Qufu City, Shandong Province.

The data used in this paper were gathered from a questionnaire-based survey of farmers in Qufu City, conducted by the author's research group in August 2020. Based on the preliminary investigation and demonstration, the research group took into full account the natural resources, socioeconomic situation, agricultural development, and land transfer practices among towns in Qufu City, and found that Wucun, Shimenshan and Xizou, three typical agricultural towns, are representative in terms of agricultural production and land transfer [48]. Hence these three towns were selected as the research areas. The investigators were assigned four randomly chosen villages in each of the three towns, and a number of farmers in the villages were randomly selected for face-to-face questionnaire-based interviews. The investigators on site were responsible for filling out questionnaires according to the interviews. A total of 359 farmers were surveyed. By reviewing and screening out invalid questionnaires, a total of 337 valid answer sets were obtained, at a survey response rate of 93.8%. The questionnaires covered such aspects as family composition, family livelihood, family contracted land and its transfer, rural land transfer policy cognition, and so on, to reflect fully every farming household's land transfer and land use status.

4.1.2. Variables

- Dependent variable

The dependent variable in this paper is farmers' land transfer behavior (Y), including inward transfer and outward transfer. It was considered whether or not farmers had performed land transfer behavior, be it transferring the land outward to a transferee or inward from a transferor. Assigned values were 1 for "transfer", and 0 for "no transfer".

- Core independent variables

The core independent variables of this study were intended to characterize scientifically the farmers' geo-networks. By referring to existing research [18,49] and considering data availability, this study used the number of farmers in the same village making land transfers (X1) and the number of village cadres in the same village making land transfers (X2) as the core independent variables to reflect the characteristics of the geo-network.

- Instrumental variable

Farmers' land transfer behavior is causally related to the behavior of their peers in the same geo-network, i.e., the endogeneity of the herd effect may occur during estimation. In order to control the estimation bias caused by such endogeneity, the area where farmers are

located (IV) was used as an instrumental variable for the number of farmers in the same village making land transfers.

- Control variables

For more accurate estimates of the model, this study included control variables in the model representing farmers' family features, resource endowment features, and cognitive features, with reference to current literature [1,16,17,22,26,28,30]. Variables reflecting farmers' family features included age of the householder (X3), gender of the householder (X4), educational attainment of the householder (X5), and occupation of the householder (X6). Variables for resource endowment features were arable land area (X7), number of land plots (X9), agricultural income (X8), agricultural input–output ratio (X10), changes of unit grain yield in the past five years (X11), and living expenses (X12). Farmers' cognitive features comprise their perception of life and their understanding of policies and regulations. Farmers' perception of life included two variables, their way of accessing information in the village (X13) and their satisfaction with farmland infrastructure (X14), whereas farmers' cognition of policies involved three variables, whether they think contracted land can be inherited by their children (X15), whether farmers are sure that the confirmation and registration of the right to contracted management of rural land are performed in their villages (X16), and farmers' understanding of farmland protection policies (X17). Table 1 describes the symbols and descriptions of the variables.

Table 1. Variables and their symbols and descriptions.

Symbol	Variable	Description	Mean	Standard Deviation
Y	Land transfer behavior	Transfer = 1, No transfer = 0	0.49	0.51
X1	Number of farmers in the same village making land transfers	Proportion of farmers in the same village making land transfer, (30%,40%] = 1, (40%,50%] = 2, (50%,60%] = 3, >60% = 4	2.14	1.16
X2	Number of village cadres in the same village making land transfers	Proportion of village cadres in the same village making land transfer, (0,50%] = 0, >50% = 1,	0.06	0.23
X3	Age of the householder	Age of the householder	60.43	10.83
X4	Gender of the householder	Male = 1, Female = 2	1.07	0.25
X5	Educational attainment of the householder	Uneducated = 0, Primary school = 1, Junior middle school = 2, Senior middle school = 3, Technical secondary school/vocational high school = 4, Junior college and above = 5	1.77	0.95
X6	Occupation of the householder	Farming = 1, Farming with by-business = 2, Non-farming with by-business = 3, Non-farm employment = 4, Unemployed = 5	2.09	1.36
X7	Arable land area	Unit: *mu*, [0,10] = 0, (10,20] = 1, (20,30] = 2, (30,50] = 3, (50,100] = 4, >100 = 5	0.50	1.13
X8	Agricultural income	Agricultural earnings (RMB 10,000)	2.97	9.63
X9	Number of land plots	Number of land plots operated by farmers	3.21	4.78

Table 1. *Cont.*

Symbol	Variable	Description	Mean	Standard Deviation
X10	Agricultural input–output ratio	Input-output ratio	0.65	0.56
X11	Changes of unit grain yield in the past five years	Decrease = 0, Increase = 1, Unchanged = 2	1.39	0.79
X12	Life expenses	Life expenses (RMB 10,000)	0.69	1.13
X13	Farmers' method of accessing information in the village	Broadcasting = 1, Bulletin board = 2, Villages' meeting = 3, Communication with people = 4, Others = 5	1.45	0.96
X14	Farmers' satisfaction with farmland infrastructure	Highly satisfied = 1, Satisfied = 2, Average = 3, Unsatisfied = 4, Highly unsatisfied = 5	2.03	0.81
X15	Whether farmers think contracted land can be inherited by their children	No = 0, Yes = 1, No idea = 2	0.94	0.65
X16	Whether farmers are sure the confirmation and registration of the right to contracted management of rural land are performed in their village	No = 0, Yes = 1, No idea = 2	0.97	0.16
X17	Farmers' understanding of farmland protection policies	Full = 1, Little = 2, Heard but no idea = 3, Never heard = 4	3.01	1.05
IV	The area where farmers are located	By reference to "same village and same town", same village of the same town = 1, different villages of the same town = 2, different villages of different towns = 3	2.64	0.59

4.2. Methodology

As the dependent variable, farmers' land transfer behavior, is a dichotomous choice, this paper employs a Probit model for regression analysis. Also, endogeneity is likely to arise in the analysis of the herd effect in farmers' land transfer behavior. For one thing, environmental factors may cause farmers to perform similar land transfer behaviors against the same backgrounds, resulting in the overestimation of the herd effect. For another, farmers will interact, because when impacted by group behavior they will influence the group behavior, hence invoking mutual causality. Therefore, the herd effect of farmers' land transfer behavior cannot be inferred simply from the fact that farmers' land transfer behavior is influenced by group behavior; the endogeneity issue should be solved first. Based on available research results, the instrumental variable approach was administered to address endogeneity in the model [18]. Considering the dichotomy of the response variable, the IV-Probit model was developed to solve the endogeneity of the herd effect. The formula is:

$$\text{Probit}(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \sum_{n=1}^{n} X_n + \mu + \varepsilon \tag{1}$$

$$X_i = \gamma_0 + \gamma_1 IV + \gamma_2 \sum_{n=1}^{n} \beta_n X_n + \mu + \omega \tag{2}$$

$$\text{IV} - \text{Probit}(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_2 IV + \sum_{n=1}^{n} \beta_n D_n + \varepsilon \tag{3}$$

In Formulas (1) to (3), Probit (Y) denotes farmers' land transfer behavior. X_1 and X_2 represent the number of farmers in the same village making land transfers and the number of village cadres in the same village making land transfers, respectively, and these two are jointly employed as geo-network variables affecting farmers' land transfer behavior. X_i (i = 3, 4, ..., n) denotes a control variable reflecting farmers' family features, resource endowment features, or cognitive features. IV means an instrumental variable. β_0 is a constant, β_1 is the core coefficient, and ω and ε represent error terms.

5. Results and Discussion

5.1. Results

5.1.1. Farmers' Land Transfer Features

Table 2 details the respondents' land transfer features. In this study, a number of farmers in 12 administrative villages were randomly selected for survey.

Table 2. Land transfer features of respondents.

Town	Village	Number of Respondents	Number and Proportion of Farmers Making Land Transfers	Transfer Price (RMB)	Transfer Period (Year)	Number and Proportion of Transfer Recipients Selection
Shimenshan	Dongzhuang South	21	18 (85.71%)	535.71	2.59	2 (72.22%), 3 (16.67%), 4 (16.67%)
	Linjiawa	27	13 (48.15%)	406	1.67	2 (75%), 3 (16.67%), 1 (16.67%)
	Hedong	26	15 (57.69%)	261.98	1.63	2 (58.33%), 1 (33.33%), 5 (8.33%),
	Dongzhuang North	25	16 (64.00%)	489.58	2.00	3 (50%), 2 (33.33%), 4 (16.67%)
Wucun	Zhangzhuang	33	16 (48.48%)	232.14	1.69	2 (81.81%), 1 (36.36%), 3 (9.09%)
	Wucun	27	14 (51.85%)	260.42	1.47	2 (81.81%), 1 (9.09%), 3 (9.09%)
	Zhongxin	28	12 (42.86%)	363.25	1.29	2 (57.14), 1 (28.57%), 3 (14.29%)
	Liuzhuang	26	9 (34.62%)	387.5	1.50	2 (66.67%), 1 (33.33%), 3 (16.67%)
Xizou	Jiangxiahou	32	11 (34.38%)	232	1.60	2 (57.14%), 1 (28.57%), 3 (14.29%)
	Bujiazhuang	31	12 (38.71%)	224	1.60	2 (33.33%), 1 (33.33%), 3 (33.33%)
	Beixiasong	32	10 (31.25%)	275	4.40	1 (60%), 2 (40%)
	Beiyuantuan	29	19 (65.52%)	595	1.20	2 (50%), 3 (30%), 1 (10%)

Note: Options for transfer recipients include: 1. relatives, 2. other individuals in the same village, 3. groups in the village, 4. individuals from other villages, 5. groups from other villages, 6. others. This question about selection transfer recipients was a multiple choice question, so the total proportions are not always equal to 100%. Numbers inside the parentheses represent the proportion.

The results reveal that there were similarities and differences between villages in terms of the numbers and proportions of farmers making land transfers, transfer price, transfer period, and selection of transfer recipients. Concretely, in terms of the numbers and proportion of farmers involved in land transfer, Dongzhuang South and Beiyuantuan villages had more farmers making land transfers, accounting for 85.71% and 65.52% respectively, while Liuzhuang, Jiangxiahou, Bujiazhuang, and Beixiasong villages had fewer farmers involved in land transfer, with less than 40% in each. In regard to transfer price, land transfer prices varied considerably between villages. In terms of average land transfer price, Beiyuantuan took the first spot, with RMB 595/*mu* (1 *mu* = 0.667 hectare), while Bujiazhuang came in last with RMB 224/*mu*, a gap of around RMB 370/*mu*. This implies

a nonnormalized mechanism of land transfer price in the research areas, and arbitrary price setting. Beixiasong village had the longest average transfer period of 4.40 years, whereas Beiyuantuan had the shortest, 1.20 years. The average transfer periods of the remaining villages ranged from 1 to 3 years. With regard to transfer recipients, except for Dongzhuang South and Beixiasong, the remaining 10 villages comprised 81.81% of the total, with most of their farmers transferring their land to individuals in the same village. In addition, some farmers transferred their land to relatives and groups in the same village, but few transferred their land to individuals and groups in other villages, confirming that the recipients of farmers' land transfers were often acquaintances.

5.1.2. Impact of Geo-Networks on Farmers' Land Transfer Behavior

With the aid of the Probit model, we performed regression analysis of the number of farmers in the same village making land transfers (X1), the number of village cadres in the same village making land transfers (X2), farmers' family features (X3–X6), resource endowment (X7–X12), and cognitive features (X13–X17). Prior to regression analysis, these variables were tested for possible multicollinearity. Only if the variance inflation factor (VIF) value is less than 10 can it be considered that no multicollinearity exists between the variables. The test results confirmed that the explanatory variables all had a VIF of less than 10, thus satisfying the independence principle. The regression results are shown in Table 3.

Table 3. Summary of model fitting results.

Name of Variables	Coefficient	Exp(B)	Name of Variables	Coefficient	Exp(B)
X1	0.358 *** (5.15)	1.102	X9	−0.026 (−0.76)	2.984
X2	1.649 *** (3.33)	1.129	X10	−0.003 (−0.03)	1.098
X3	−0.015 * (−1.83)	1.497	X11	−0.090 (−0.92)	1.047
X4	−0.732 ** (−2.20)	1.110	X12	−0.141 (−1.55)	1.166
X5	−0.148 (−1.55)	1.418	X13	0.139 (1.64)	1.126
X6	0.050 (0.85)	1.189	X14	0.189 ** (1.89)	1.186
X7	0.594 *** (4.33)	2.800	X15	−0.140 (−1.19)	1.057
X8	−0.021 (−1.43)	2.696			

Note: ***, ** and * denote significance at 1%, 5% and 10% respectively. Numbers inside the parentheses represent the standard error, the same below.

- Geo-networks positively impact farmers' land transfer behavior

According to the regression results of the Probit model, the number of farmers making land transfer in the same village (X1) was positively significant at 1% with a coefficient of 0.358, showing increasing marginal effects. For each unit increase in the number of farmers in the same village making land transfers, farmers' land transfer behavior was 1.102 times its original value, demonstrating that the number of farmers making land transfer in the same village positively affected farmers' land transfer behavior. The reason for this is that farmers in the same village are in the same geo-networks that a farmer typically interacts with most frequently, and they are crucial in transmitting information about land transfer. Individual farmers may also imitate the land transfer behavior of other farmers in the same village, because these individuals, uncertain about their judgments, tend to follow the majority. Hence, the probability of farmers making land transfers increases as more land transfer occurs in the village, affirming the herd effect in farmers' land transfer behavior.

The number of village cadres in the same village making land transfers (X2) was positively significant at 1% with a coefficient of 1.649, presenting increasing marginal effects. For each unit increase in the number of village cadres making land transfers, farmers' land transfer behavior was 1.129 times its original value. This means that the number of village cadres making land transfers positively affected the land transfer behavior of farmers in the same village. This is because the village cadres are the organizers and leaders of the villagers in their respective villages, and they access more information about land transfer policies and information, hence taking the role of releasing and disseminating information. Village cadres are highly respected by farmers and provide them with support; their decisions often direct farmers' actions. The number of farmers in the same village making land transfers and the number of village cadres in the same village making land transfers, as two geo-network variables, positively influenced farmers' land transfer behavior. Hence, hypothesis H1 is verified.

- Impact of control variables on farmers' land transfer behavior

The age and gender of the householder, the area of arable land operated by farmers, and farmers' satisfaction with farmland infrastructure were all related to farmers' land transfer behavior. Specifically, the age of the householder (X3) was negatively significant at 10% with a coefficient of −0.015, showing decreasing marginal effects. This denotes that the younger the householder, the higher is the probability of land transfer. The gender of the householder (X4) was negatively significant at 5% with a coefficient of −0.502, showing decreasing marginal effects. This indicates that male householders are more likely than female individuals to transfer their land.

The arable land area (X7) was positively significant at 1%, with a coefficient of 0.541, and farmers' land transfer behavior was raised 2.603 times its original value for each unit increase in arable land area, showing increasing marginal effects. This may be attributed to the fact that increased cultivated land areas require a longer operating cycle, and more economic inputs lead to higher earnings. Farmers continue transferring land inward to enlarge their farming scale for financial gain, hence the probability of land inward transfer grows. Meanwhile, as the arable land area continues to enlarge, economic inputs are positively proportional to the risks facing cultivated land. In other words, the more economic inputs, the greater are the risks involved, hence the increased possibility of outward land transfer.

Farmers' satisfaction with farmland infrastructure (X14) is positively significant at 5%, with a coefficient of 0.189, suggesting increasing marginal effects. Increased satisfaction among farmers with farmland infrastructure was associated with greater probability of land transfer. This indicates that farmers' satisfaction with farmland infrastructure positively affects farmers' land transfer behavior. The better the farmland infrastructure, the more favorable it is for agricultural production. Farmers conducting land transfer tend to have better farmland infrastructure and thus earn more rent, and those who transfer land inward can benefit from upgraded farmland infrastructure, which will raise agricultural output and allow additional land transfer activities.

5.1.3. Verification of Herd Effect in Farmers' Land Transfer Behavior

Probit regression cannot effectively address the correlation effect and reflexivity when identifying the herd effect [18]. In order to overcome possible endogeneity in the Probit model, this study developed the IV-Probit model for regression analysis of the sample data and tested the validity of the instrumental variable of the area where farmers are located (IV) using weak instruments. The regression results are tabulated in Table 4. The first-stage F statistic of the IV-Probit was 11.43, greater than the empirical value of 10. The weak identification shows that the *p*-values of the Anderson–Rubin and Wald tests are positively significant at 5%, demonstrating that the instrumental variable selected in this paper was not a weak instrument. This proves that farmers' land transfer behavior imitates the behavior of those in the same group within a geo-network, and the herd effect exists. Hence, hypothesis H2 is verified.

Table 4. Herd effect in farmers' land transfer behavior: IV Results.

Variables	Number of Farmers' Land Transfers
The area where farmers are located (IV)	0.407 *** (3.26)
Farmers' family features	control
Resource endowment features	control
Farmers' cognitive features	control

Note: *** denotes positive significance at 1%.

5.1.4. Difference in Herd Effect between Agricultural Income Groups

In order to better examine the herd effect in farmers' land transfer behavior, this paper divides farmers into three groups according to their agricultural income, viz. low, middle, and high agricultural income groups. Regression analysis was carried out to investigate whether the impact of the number of farmers in the same village making land transfers on farmers' land transfer behavior differed between the three groups, and Table 5 summarizes the regression results.

Table 5. Results of model fitting for various agricultural income groups.

Name of Variables	Low Agricultural Income		Middle Agricultural Income		High Agricultural Income	
	Coefficient	Exp(B)	Coefficient	Exp(B)	Coefficient	Exp(B)
X1	0.30 *** (2.72)	1.176	0.52 *** (3.73)	1.323	0.32 ** (2.09)	1.266
Farmers' family features	Control	Control	Control	Control	Control	Control
Resource endowment features	Control	Control	Control	Control	Control	Control
Farmers' cognitive features	Control	Control	Control	Control	Control	Control

Note: *** and ** denote significance at 1% and 10% respectively.

According to the analysis, the number of farmers in the same village making land transfers was positively significant at 1% in low- and middle-income groups. The number of farmers in the same village making land transfers was significant at 5% in the high-income group. This indicates that the herd effect is more noticeable in the land transfer behavior of farmers in the low- and middle-income groups. The reason may be that farmers in low- and middle-income groups, in contrast to those in the high-income group, may have no other income sources except the land, so their likelihood of inward land transferring increases in order to raise agricultural earnings and facilitate cultivation and harvesting using large machinery. Furthermore, farmers in the low-income and middle-income may tend to transfer land outwards to others and work for an employer, hence earning much less from the land, and the likelihood of outward land transfer increases.

5.2. Discussion

5.2.1. Contribution of Research

This study suggests that farmers' family features, resource endowment, and cognitive features have a major influence on farmers' land transfer behavior, which corresponds with current research findings, especially regarding the impact on farmers' land transfer behavior of age and gender of the householder, arable land area, and farmers' satisfaction with farmland infrastructure [1,6,17,18,27].

However, among these existing studies few have focused on the impact of group psychology on farmers' land transfer behavior. The current research verifies that the herd effect does exert an influence on farmers' land transfer behavior. On the one hand, there are close social networks linked by geography in rural China. With the development of urbanization, large numbers of young people go to work in cities. Most of those who stay in rural areas are farmers with generally low levels of education. They face high costs in collecting, interpreting, and utilizing the land transfer policy information provided by the government. Therefore, in this suboptimal situation of information asymmetry, farmers

tend to trust the behaviors of other farmers in the same geo-network, including relatives, friends, acquaintances, or village cadres, resulting in a herd effect. On the other hand, when it is not clear whether the land transfer behavior can bring benefits, farmers will imitate other farmers' decision-making behavior, and the process of referring to other farmers' decision-making information is bound to have an impact on farmers' own decision-making behavior. Thus, farmers follow others to make the same land transfer decisions, resulting in an obvious herd effect in the land transfer behavior. Hence, this study enriches the research focusing on the impact of group psychology on farmers' land transfer behavior, and offers a reference for applying the herd effect in research into farmers' land use behavior.

5.2.2. Limitation and Future Perspectives

This research concludes that there is a herd effect in farmers' land transfer behavior, and that the herd effect can encourage rural land transfer and support extensive land management. Farmers' experience of the land transfer process can be separated into three stages. Firstly, individual farmers incentivized by land transfer information develop their willingness to transfer land, referred to as land transfer willingness. Secondly, farmers transfer their land by utilizing the useful information accessed from other farmers, referred to as land transfer behavior. Finally, they set a rational land transfer price for transferring land based on the price information obtained from other farmers, referred to as the land transfer outcome. It remains unknown whether the herd effect is exerted during all these stages, and the function of the herd effect on the formatting of land transfer price has not been analyzed. Thus, further exploration is required to overcome the failings in this study's examination of how the herd effect impacts all stages of the land transfer process and its outcome.

6. Conclusions

According to the results, the number of farmers in the same village making land transfers and the number of village cadres in the same village making land transfers, reflecting the geo-network and indicating the herd effect, positively impact farmers' land transfer behavior. Farmers imitate the land transfer behavior of other farmers in the same geo-network, so a herd effect exists in farmers' land transfer behavior. Farmers' family features, resource endowment, and cognitive features are key factors influencing their land transfer behavior. Farmers' land transfer behavior is more significantly influenced in groups with low and middle agricultural income than in groups with high agricultural incomes.

In view of the above results, if land transfer information can be effectively disseminated among farmers within a geo-network, the possibility of their involvement in land transfer will rise prominently, and the information transfer function of the herd effect will promote land transfer. If individual farmers prefer to access information from other farmers in the same geo-network rather than consulting related land transfer policies when deciding whether to transfer their land, the demonstration function of the herd effect significantly affects their land transfer behaviors. This study provides the following policy suggestions:

1. During land transfer, attention should be paid to the positive role of the herd effect. Since a geo-network is positively associated with farmers' land transfer behavior, farmers and village cadres in the same village are conducive to spreading land transfer information. Therefore, the government should focus specifically on farmers' geo-networks when promoting land transfer, to give full play to the role of capable farmers, major farmers, and village cadres among the geo-networks, and guide farmers in carrying out land transfer to enable large-scale agricultural operation.
2. More efforts are required to develop platforms for land transfer information and to standardize related procedures. The study found that most recipients of land transfer are farmers in the same village, relatives or friends, and land transfers are made based on mutual trust, featuring problems such as imperfect pricing systems. Hence, when developing platforms for land transfer information, emphasis should be placed on standardizing the release of land transfer information, supervising the execution

of land transfer contracts, enhancing the protection of land transfer contracts, and promoting real-name registration for land transfer, with a view to improving land transfer services and management, and expanding the scale of land transfer.

3. Greater investment in construction of farmland infrastructure are needed to encourage land transfer among farmers. According to the study, farmers' satisfaction with farmland infrastructure plays a key role in their land transfer behavior. Excellent farmland infrastructure conditions are positive contributors to increased land transfer prices and favorable agricultural production conditions for farmers. Hence, further research is essential for raising investments in farmland infrastructure and upscaling land transfer.

References

1. Gao, J.; Song, G.; Sun, X. Does labor migration affect rural land transfer? Evidence from China. *Land Use Policy* **2020**, *99*, 105096. [CrossRef]
2. Su, Y.; Araral, E.; Wang, Y. The effects of farmland use rights trading and labor outmigration on the governance of the irrigation commons: Evidence from China. *Land Use Policy* **2020**, *91*, 104378. [CrossRef]
3. Long, H.; Li, Y.; Liu, Y.; Woods, M.; Zou, J. Accelerated restructuring in rural China fueled by 'increasing vs. decreasing balance' land-use policy for dealing with hollowed villages. *Land Use policy* **2012**, *29*, 11–22. [CrossRef]
4. Liu, Y.; Fang, F.; Li, Y. Key issues of land use in China and implications for policy making. *Land Use Policy* **2014**, *40*, 6–12. [CrossRef]
5. Liu, Y.S. Introduction to land use and rural sustainability in China. *Land Use Policy* **2018**, *74*, 1–4. [CrossRef]
6. Gao, J.; Strijker, D.; Song, G.; Li, S. Drivers Behind Farmers' Willingness to Terminate Arable Land Use Contracts. *Tijdschr. Econ. Soc. Geogr.* **2017**, *109*, 73–86. [CrossRef]
7. Xiao, W.; Zhao, G. Agricultural land and rural-urban migration in China: A new pattern. *Land Use Policy* **2018**, *74*, 142–150. [CrossRef]
8. Long, H. Land use policy in China: Introduction. *Land Use Policy* **2014**, *40*, 1–5. [CrossRef]
9. Li, Y.; Wu, W.; Liu, Y. Land consolidation for rural sustainability in China: Practical reflections and policy implications. *Land Use Policy* **2018**, *74*, 137–141. [CrossRef]
10. Liu, Y.; Yan, B.; Wang, Y.; Zhou, Y. Will land transfer always increase technical efficiency in China?—A land cost perspective. *Land Use Policy* **2019**, *82*, 414–421. [CrossRef]
11. Lyu, X.; Wang, Y.; Niu, S.; Peng, W. Spatio-Temporal Pattern and Influence Mechanism of Cultivated Land System Resilience: Case from China. *Land* **2021**, *11*, 11. [CrossRef]
12. Jiang, X.; Lu, X.; Liu, Q.; Chang, C.; Qu, L. The effects of land transfer marketization on the urban land use efficiency: An empirical study based on 285 cities in China. *Ecol. Indic.* **2021**, *132*, 108296. [CrossRef]
13. Xi, Q.; Mei, L. How did development zones affect China's land transfers? The scale, marketization, and resource allocation effect. *Land Use Policy* **2022**, *119*, 106181. [CrossRef]
14. Li, C.; Jiao, Y.; Sun, T.; Liu, A. Alleviating multi-dimensional poverty through land transfer: Evidence from poverty-stricken villages in China. *China Econ. Rev.* **2021**, *69*, 101670. [CrossRef]
15. Jiali, W.; Yanfang, L.; Xiaoling, Z. Conflict in informal rural construction land transfer practices in China: A case of Hubei. *Land Use Policy* **2021**, *109*, 105573. [CrossRef]
16. Yu, C.A.O.; Zou, J.; Fang, X.; Wang, J.; Cao, Y.; Li, G. Effect of land tenure fragmentation on the decision-making and scale of agricultural land transfer in China. *Land Use Policy* **2020**, *99*, 104996.

17. Ye, W.J.; Su, Y.C.; Yang, J.F. Study on Herding Effect in the Transfer Behavior of Forest Land Management right. *Issues For. Econ.* **2020**, *40*, 13–146. (In Chinese)

18. Zhang, X.; Zhou, M. The Herd Effect in Farmers' Planting Structure Adjustment: A Case Study of Corn Farmers in Liaoning Province. *J. Huazhong Agric. Univ.* **2019**, *4*, 54–62+171–172. (In Chinese)

19. Manski C, F. Economic analysis of social interactions. *J. Econ. Perspect.* **2000**, *14*, 115–136. [CrossRef]

20. Duflo, E.; Saez, E. Participation and investment decisions in a retirement plan: The influence of colleagues' choices. *J. Public Econ.* **2002**, *85*, 121–148. [CrossRef]

21. Asch, S.E. Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychol. Mono-Graphs Gen. Appl.* **1956**, *70*, 1. [CrossRef]

22. Yang, W.Z. Herding Behavior in the Transfer of Farmers' Residential Land Use Rights: Private or Public Information? *China Land Sci.* **2017**, *31*, 43–51. (In Chinese)

23. Xiong, H.; Wang, P.; Bobashev, G. Multiple peer effects in the diffusion of innovations on social networks: A simulation study. *J. Innov. Entrep.* **2018**, *7*, 2. [CrossRef]

24. Yang, Y.Z. Influencing factors and policy convergence of farmers' idle homestead withdrawal-from the perspective of behavioral economics. *Econ. Geogr.* **2015**, *7*, 140–147. (In Chinese)

25. Guan, J.H.; Huang, C.X. Farmers' Homestead Transfer from the Perspective of Micro-welfare and Risk: Wuhan Survey. *Reform* **2013**, *8*, 78–85. (In Chinese)

26. Yang, Y.Z. Theoretical analysis of farmers' behavior decision in homestead vacating. *Agric. Technol. Econ.* **2014**, *4*, 53–62. (In Chinese)

27. Su, B.; Li, Y.; Li, L.; Wang, Y. How does nonfarm employment stability influence farmers' farmland transfer decisions? Implications for China's land use policy. *Land Use Policy* **2018**, *74*, 66–72. [CrossRef]

28. Gao, L.; Sun, D.; Ma, C. The Impact of Farmland Transfers on Agricultural Investment in China: A Perspective of Transaction Cost Economics. *China World Econ.* **2019**, *27*, 93–109. [CrossRef]

29. Deng, X.; Xu, D.; Zeng, M.; Qi, Y. Does early-life famine experience impact rural land transfer? Evidence from China. *Land Use Policy* **2018**, *81*, 58–67. [CrossRef]

30. Wang, Y.; Chen, L.; Long, K. Farmers' identity, property rights cognition and perception of rural residential land distributive justice in China: Findings from Nanjing, Jiangsu Province. *Habitat Int.* **2018**, *79*, 99–108. [CrossRef]

31. Ma, X.; Heerink, N.; van Ierland, E.; Lang, H.; Shi, X. Decisions by Chinese households regarding renting in arable land—The impact of tenure security perceptions and trust. *China Econ. Rev.* **2020**, *60*, 101328. [CrossRef]

32. Bambio, Y.; Agha, S.B. Land tenure security and investment: Does strength of land right really matter in rural Burkina Faso? *World Dev.* **2018**, *111*, 130–147. [CrossRef]

33. Xiong, H.; Payne, D. Characteristics of Chinese rural networks: Evidence from villages in central China. *Chin. J. Sociol.* **2017**, *3*, 74–97. [CrossRef]

34. Isaac, M.E.; Matous, P. Social network ties predict land use diversity and land use change: A case study in Ghana. *Reg. Environ. Chang.* **2017**, *17*, 1823–1833. [CrossRef]

35. 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]

36. 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]

37. Chen, Y.S.; Zhong, F.N.; Ji, Y.Q. Why Is There Zero Rent In Land Transfer? An Empirical Analysis from the Perspective of Favour-based Rents. *China Rural. Surv.* **2017**, *4*, 43–56. (In Chinese)

38. Wang, Y.N.; Ji, Y.Q.; Xu, Z.G.; Zhong, F.N. Paid vs. Unpaid: The Added Value of Farmland under Property Rights Risk and Farmers' Choice of Subcontracting. *Manag. World* **2015**, *11*, 87–94+105. (In Chinese)

39. Wang, X.; Wang, X.; Wu, J.; Zhao, G. Social network analysis of actors in rural development: A case study of yanhe village, Hubei Province, China. *Growth Chang.* **2017**, *48*, 869–882. [CrossRef]

40. Xia, H.; Li, C.; Zhou, D.; Zhang, Y.; Xu, J. Peasant households' land use decision-making analysis using social network analysis: A case of Tantou Village, China. *J. Rural. Stud.* **2020**, *80*, 452–468. [CrossRef]

41. Li, N.; Tang, L.; Che, X.; Shi, X.; Ma, X. Does the democratization level of village governance affect perceptions of security and integrity of land rights?—An analysis from the perspective of social network abundance. *J. Rural Stud.* **2022**, *94*, 305–318. [CrossRef]

42. Vedadi, A.; Warkentin, M.; Dennis, A. Herd behavior in information security decision-making. *Inf. Manag.* **2021**, *58*, 103526. [CrossRef]

43. Wydick, B.; Hayes, H.K.; Kempf, S.H. Social networks, neighborhood effects, and credit access: Evidence from rural Guatemala. *World Dev.* **2011**, *39*, 974–982. [CrossRef]

44. Beshears, J.; Choi, J.J.; Laibson, D.; Madrian, B.C.; Milkman, K.L. The Effect of Providing Peer Information on Retirement Savings Decisions. *J. Finance* **2015**, *70*, 1161–1201. [CrossRef] [PubMed]

45. Fei, H.T.; Fei, X.; Hamilton, G.G.; Zheng, W. *From the Soil: The Foundations of Chinese Society*; Fei, X., Xiang, T., Zhong, G., Eds.; University of California Press: Bekerley/Los Angeles, CA, USA, 1992.

46. Li, F.; Wei, Y. Simulation Analysis of Impact of Complex Network on Herd Effect. *J. Syst. Simul.* **2021**, *33*, 539.

47. Wang, Y.; Zhu, H.; Aziz, N.; Liu, Y. Does Social Capital Affect Farmers' Land Transfer Behavior? A CFPS-based Empirical Test. *J. Nanjing Agric. Univ.* **2017**, *17*, 88–99+153–154. (In Chinese)

48. Lyu, X.; Peng, W.; Niu, S.; Qu, Y.; Xin, Z. Evaluation of sustainable intensification of cultivated land use according to farming households' livelihood types. *Ecol. Indic.* **2022**, *138*, 108848. [CrossRef]

49. Zhou, X.G.; Chen, X. Relationship Strength, Financing Channels and Welfare Effect of Farmers' Loan—An Empirical Study from the Perspective of Trust. *China Rural. Econ.* **2017**, *1*, 16–29.