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Exploring the Impact of Land Certification on Centralized Transfer in Rural China: The Roles of Timing, Inequality, and Governance

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Abstract: The existing studies have primarily discussed the impact of land certification on farmers' land transfer behaviors, neglecting its potential for centralized transfer under the orientation of optimizing land utilization and allocation efficiency. This study employed the Probit model, Propensity Score Matching method, and IV-Probit model to explore the effects and underlying mechanisms of land certification on centralized transfer based on the China Land Economic Survey data, especially emphasizing the roles of timing, inequality, and governance. Among transfer-out households, land certification increases the likelihood of farmers adopting centralized transfer rather than decentralized transfer. After considering the differential influence exerted by the timing of certification, the earlier the households obtain the land contract management certificates, the greater the positive impact. This phenomenon can be explained from the dual perspectives of economy and governance, including rural industrial development and rural governance performance. In the heterogeneity analysis, we focused on land inequality, farmers' risk preference, and village governance teams' capacity. Land certification mainly benefits farmers facing weak land inequality or low-risk preference, as well as those in villages with highly educated cadres. In the new round of land certification program, our findings provide new insights for continuously optimizing land utilization and allocation.

Keywords: property rights; land certification; timing; centralized transfer; rural China; rural industrial development; rural governance performance; land inequality; governance

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1. Introduction

The reform of land property rights, with the "Three Rights Separation" reform (land ownership, contractual rights, and management rights are divided, land ownership belongs to rural collectives, contractual rights belong to farmers, and management rights can be transferred and owned by actual operators) as the main thrust, has stimulated the orderly transfer of land and optimized the efficiency of land resource utilization and allocation [1]. As the basis and important content of the "Three Rights Separation" reform, land certification is the right to confirm, register, and certify farmers' contracted land management rights, always exerting a positive influence on their land transfer behaviors [2–4]. Firstly, land certification can mitigate risks and reduce transaction costs in the transfer process, which are often caused by unclear property rights [5–7]. Secondly, land certification can expand the options available to tenants and enable landowners to transfer their land to more efficient users who are capable of compensating them [8,9]. Finally, land certification can permit landowners to transfer their land while still retaining the social security function of their land [3].

Since the last century, the land certification program (LCP) has gained widespread popularity across numerous countries globally, primarily aiming to strengthen tenure security

and enhance land use efficiency [10]. For example, in the East Gojjam zone of the Amhara region in Ethiopia, Deininger et al. (2011) discovered that land certification increased the likelihood and scale of land transfer-out, and that higher levels of tenure security could influence productivity by enabling landowners to establish longer-term contracts or choose more productive tenants who were not necessarily part of their immediate social networks [8]. Holden et al. (2011) observed a similar phenomenon in Ethiopia [2]. Beg (2022) has pointed out that in Pakistan, the property rights reform made landowning households more likely to transfer their land out and participate in non-farm employment [11]. In India, as shown by Subramanian and Kumar (2024), the LCP increased land liquidity and land use productivity [12]. However, in Latin America, numerous rural households still lack formal land contract management certificates, resulting in severe tenure insecurity [6,7]. At this time, they tend to increase labor input on their land to avoid losing their land rights, resulting in low economic efficiency.

China's LCP is the largest in the world [3], and the new round of LCP was initially implemented on a pilot basis in designated reform zones in 2009. Subsequently, Document No. 1 of the Central Committee of the Communist Party of China in 2013 clearly stipulated that this program should be expanded to more provinces to attain national coverage until 2019 [10,13]. Compared to previous land reforms, this new round of LCP differs significantly. Firstly, land ownership has become clearer [5]. During the reform of "subfields on the basis of households" in the early 1980s in China, a dual-right system was established, comprising collective ownership and farmers' contracted land management rights [4]. Notably, there was legal ambiguity in distinguishing between contractual rights and management rights, often treating them as a single entity, which resulted in the persistent issues of unclear structure and blurred boundaries. China's new round of LCP emphasizes the separation of three rights, which aims to maintain farmers' contractual rights, and promotes the optimal allocation of management rights to the fullest extent while ensuring that the collective ownership of land remains unchanged. Additionally, this reform primarily leverages modern surveying and mapping technologies, such as drones and GPS, to delineate the physical boundaries of land with precision, thereby ensuring that land parcels, areas, contracts, and certificates are all accurately delivered and verified by households [10]. Secondly, farmers' land rights have become more comprehensive. At the beginning of the first round of contracting, farmers were legally prohibited from transferring their land in any form. Although the prohibition on land transfer was lifted in 1993, farmers' contractual rights remained quite limited. With the advent of the new round of LCP, the core functions of land have been expanded, including possession, use, income generation, and transfer. In addition, mortgage financing based on land contract management certificates is now permitted, resulting in increasingly diverse economic uses of land property rights [14]. Finally, farmers' land rights have attained greater stability. From the temporal perspective, relevant policies aim to increasingly stabilize farmers' land rights. In terms of the spatial dimension, the new round of LCP remeasures plot areas to address issues such as ambiguous boundaries and inaccurate acreage [10]. From the legal perspective, the previous land program suffered from a lack of clear accounting records, and contractors were devoid of definitive plot information. Consequently, land boundaries were largely left to the default discretion of village collectives or farmers, and the majority of farmers lacked written documentation, which hindered their ability to safeguard their rights in disputes. In the new round of LCP, a unified and complete registration and management system has been established, and land contract management certificates with legal effect have been issued comprehensively [4,15,16].

Despite the land certification efforts in China being nearly complete, assessing the impact of the new round of LCP on land transfer remains of paramount importance in advancing moderate-scale management and achieving agricultural modernization, especially in the context of the upcoming expiration and subsequent 30-year extension of the second round of land contracting [3,4,13]. By the end of 2020, the completion rate of land certification had exceeded 96% [15], but there are still farmers who have not received their

land contract management certificates. Furthermore, as the LCP is implemented in villages, the diverse characteristics of villages, such as the capacity of village governance teams and the contradiction between people and land, also influence the timing of farmers' acquisition of certificates [17]. Therefore, this study focused on the variations in the timing of farmers' acquisition of these certificates during the new round LCP period to elucidate the long-term implications and lagged effects of land certification.

From the perspective of land transfer, its growth rate has shown a significant downward trend as a whole during the reform period, and the proportion of Chinese farmers transferring their land has been lower than that in most developed and developing countries [18]. Additionally, the incomplete development of urbanization and the instability of non-farm employment contribute to the informalization of land transfer, which is characterized by relational market transactions predominantly occurring among acquaintances [9]. According to the General Statistical Report on Rural Operation and Management, despite a decrease in the land area transferred to ordinary farmers from 2010 to 2017, the average proportion remained as high as 61.29%. This, coupled with immature market participants, and incomplete market mechanisms, has exacerbated inefficiency in land transfer.

Centralized transfer, in contrast to decentralized transfer organized by farmers themselves, pertains to the mode wherein village collectives or new agricultural business entities consolidate numerous scattered lands into a large-scale contiguous area for transfer [19]. The organizer typically leverages policy opportunities, such as high-standard farmland construction and land consolidation, to facilitate the entry of contiguous land into a standardized transfer market. This aims to achieve moderate-scale management, optimize the allocation of land resources, and address the issue of insufficient development in the standardized land transfer market [1]. Indeed, with the comprehensive advancement of rural revitalization and the strong support of national policies, village collectives and collective economic organizations have emerged as crucial agricultural management and service entities [20,21]. Administrative intervention in land transfer boasts advantages in policy, scale, and collaborative agriculture, and can serve as intermediary agents between land demanders and suppliers, thereby facilitating the completion of transactions [22,23]. Regrettably, the existing studies have primarily concentrated on whether farmers have engaged in the land transfer or the area of transferred land, falling to distinguish between decentralized transfer and centralized transfer [2–4]. Given that decentralized transfer is not conducive to achieving moderate-scale management, whereas centralized transfer enhances land resource allocation and utilization efficiency, this study underscored the significance of centralized transfer.

The existing studies on centralized transfer can be divided into the following categories: Firstly, scholars have focused on the implementation conditions and risks associated with centralized transfer in the context of agricultural modernization transformation [24]. Secondly, they have discussed the differential effects caused by different forms of organizational embedding in land transfer, analyzing these from the perspective of centralized transfer intervention [22,23]. And finally, they have explored the effects of centralized transfer on agricultural production efficiency, household income, and rental income [19,21]. Regrettably, the relationship between land certification and centralized transfer, both as administrative tools, has not yet garnered sufficient attention. From the delimitation of property rights to their implementation, and with the ultimate aim of enhancing land resource utilization and allocation efficiency, does land certification stimulate centralized transfer? What about considering the differential influence exerted by the timing of certification? If so, how to explain this phenomenon from both economic and governance perspectives? Whether there are differences in the roles of land inequality, farmers' risk preference, and village governance teams' capacity? This study utilized the China Land Economic Survey (CLES) data and employed the Probit model, Propensity Score Matching (PSM) method, and IV-Probit model to solve the above questions.

The remainder of this study is organized as follows: Section 2 outlines the theoretical framework and research hypotheses. Section 3 presents the research methodology, includ-

ing data, models, and variables. Section 4 reports and interprets the empirical results. The Discussion and Conclusions are given in Sections 5 and 6, respectively.

2. Theoretical Framework and Research Hypotheses

2.1. Land Certification and Centralized Transfer: The Role of Timing

In theory, clear property rights fundamentally improve resource allocation efficiency. Therefore, land certification can stimulate farmers' land transfer behaviors [2–4,11,13]. Further attention should be given to different land transfer models. Mainstream viewpoints suggest that land, as a factor of production, can only generate marginal flattening and transaction gains when it is mobile and forms scale [1]. In other words, compared to decentralized transfer, centralized transfer is conducive to achieving moderate-scale management and improving the quality of the land transfer market. In this study, we point out that among transfer-out households, land certification increases the likelihood of farmers opting for centralized transfer over decentralized transfer, which can be explained from both an economic and governance perspective (Figure 1). On the one hand, land certification promotes rural industrial development by attracting industrial and commercial capital to rural areas and encouraging entrepreneurship among farmers [14,25]. Large-scale operations in rural industries require higher demands for contiguous land, which can be achieved through centralized transfer [26]. The growth of rural industries bolsters the rural economy's capacity to absorb the rural labor force, leading to an increase in non-farm employment rates [27]. Centralized transfer is more likely to be chosen by farmers due to its high returns and low risks [5,19]. Furthermore, rural industrial development facilitates land factor marketization, thereby disrupting the transactional characteristics embedded in decentralized transfer that are influenced by personal connections [9]. On the other hand, land certification improves rural governance performance by enhancing the subjectivity of village cadres and villagers [28]. As rural governance can be categorized into formal governance and informal governance, the enhancement of formal governance performance encourages farmers to adopt centralized transfer by alleviating their psychological burdens and strengthening collective identity [29], and informal governance performance influences centralized transfer through information dissemination mechanisms and supervisory and restraint mechanisms [30].

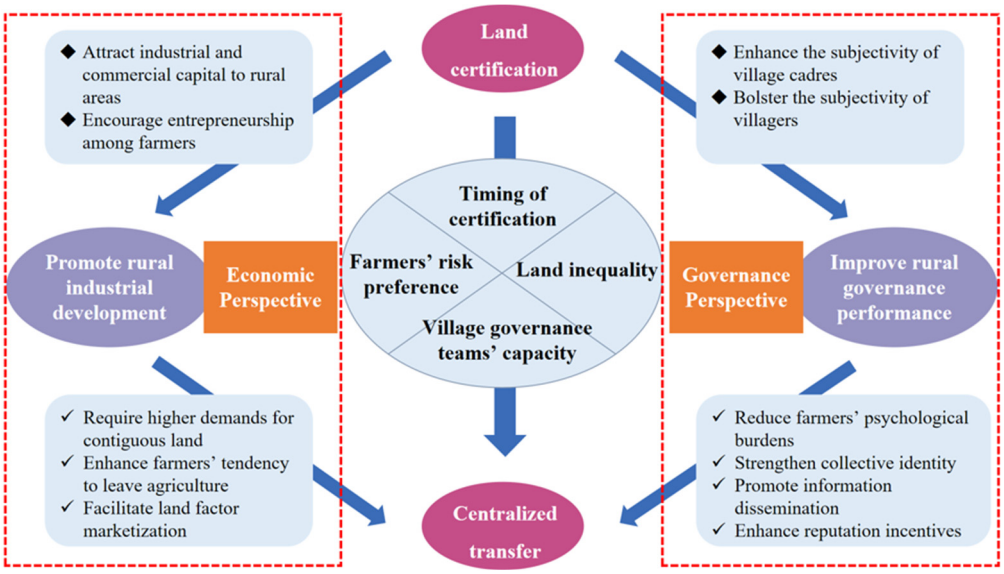

Figure 1. Theoretical framework.

According to institutional economics, rural communities embody a complex amalgamation of formal and informal institutions [31]. Land certification, a formal institution predominantly governed by state power, is influenced to some degree by informal institu-

tions centered on village governance structures. In the context of rural China, which has traditionally relied heavily on informal institutions, farmers undergo a gradual transition from exposure to trust when confronted with the new round of LCP. In other words, the ramifications of LCP may exhibit a lagged impact [13]. Simultaneously, certain villages encounter technical, institutional, or social challenges during the process of confirmation and registration, resulting in a relative delay in land certification and insufficient supporting measures [17]. Consequently, there are notable disparities in the timing of farmers' acquisition of their land contract management certificates.

Based on the above analysis, we propose the following hypothesis:

Hypothesis 1. *Land certification stimulates centralized transfer. After considering the differential influence exerted by the timing of certification, the earlier acquisition of land contract management certificates by households has a proportionately larger positive impact*.

2.2. Underlying Mechanisms of Land Certification on Centralized Transfer

As illustrated in Figure 1, the positive role of land certification on centralized transfer is mainly achieved by both economic and governance perspectives, including promoting rural industrial development and improving rural governance performance.

2.2.1. Economic Perspective: Land Certification, Rural Industrial Development, and Centralized Transfer

Land certification can stimulate centralized transfer by promoting rural industrial development. On the one hand, through meticulous verification and registration processes, land certification clarifies the ownership of management rights for each land, thereby effectively resolving conflicts and disputes arising from ambiguous property boundaries and the absence of definitive proof of ownership [5]. This provides a clearer and more reliable guarantee of property rights for industrial and commercial capital investing in rural areas and agricultural sectors, reducing their investment risks and transaction costs [3]. Compared to traditional agricultural operating entities, enterprises possess distinct advantages in innovating agricultural management methods, extending the agricultural industry chain, and developing new industries and business formats, ultimately addressing the shortcomings of rural areas in terms of production factors and promoting rural industrial development [25]. On the other hand, rural industries and their operating entities often encounter discrimination from financial capital within the traditional financial service system. Even under the stimulus of inclusive financial policies, the credit constraints faced by rural industrial development have not been fundamentally alleviated. By granting loan financing rights to land management rights, land certification enables land assets to serve as collateral, which helps trigger the "De Soto Effect" in rural financial markets [32]. The expansion of credit channels for farmers alleviates the financial pressure on their entrepreneurial activities, thus stimulating their engagement in entrepreneurship [14]. As the primary driving force in rural revitalization, farmers engage in diverse entrepreneurial activities, such as e-commerce and homestays, which introduce new technologies and models, thereby facilitating the transformation and upgrading of rural industries [33].

Furthermore, the development of rural industries promotes centralized transfer. Firstly, new agricultural business entities or rural enterprises inherently necessitate contiguous and consolidated land for effective operations [26]. At this juncture, decentralized transfer by farmers themselves cannot fulfill this requirement, and centralized transfer is a viable solution. Secondly, rural industrial development augments the rural economy's capacity to absorb the rural labor force efficiently [27], and entrepreneurship among farmers further expands income-generating channels and increases the proportion of self-employment [34]. As we all know, non-farm employment typically offers higher wage premiums than agricultural production, diminishing the appeal of agricultural pursuits [35]. In the pursuit of income maximization, rural households are inclined to transfer their land to obtain rental income. From the perspective of transfer modes, farmers are more likely to choose centralized transfer rather than decentralized transfer. On the one hand, centralized transfer

generally involves negotiations between village collectives, acting as organizers, and land demanders, which not only lowers negotiation costs but also alleviates risks [19]. On the other hand, the revitalization of rural industries significantly increases farmers' income levels and improves their quality of life, fostering stronger ties between farmers and enterprises. Under the guidance of village cadres, they tend to embrace centralized transfer as a pivotal means of participating in village construction. Finally, rural industrial development facilitates land factor marketization. The implementation of centralized transfer, which leverages the market as a trading platform and currency as the transaction consideration, disrupts the transactional dynamics of farmers' spontaneous transfer, previously influenced by personal relationships [9,21,36].

Based on the above analysis, we propose the following hypothesis:

Hypothesis 2. *From the economic perspective, land certification stimulates centralized transfer by promoting rural industrial development*.

2.2.2. Governance Perspective: Land Certification, Rural Governance Performance, and Centralized Transfer

Land certification can promote centralized transfer by improving rural governance performance. On the one hand, land certification enhances the subjectivity of village cadres through cadre–mass interaction and government credibility. It represents a complex and systematic program that, while led by the government, necessitates the collaborative efforts of both village cadres and villagers. During the land certification process, village cadres need to promote and elucidate relevant policies and regulations to villagers, ensuring they comprehend the significance, procedures, and requirements of this reform [17]. Furthermore, historical issues, such as ambiguous land contracting relationships and inaccurate land measurements, are intimately tied to farmers' vital interests [10]. Village cadres must engage in multiple rounds of negotiation and communication with villagers to achieve satisfactory resolutions [5]. From a legal empowerment standpoint, land contract management certificates uphold the stability of farmers' land property rights, assuring them long-term and secure land tenure. Secure land property rights for farmers may alleviate their doubts about national land policies and village collectives, thereby fostering their political trust [28]. On the other hand, land certification bolsters the subjectivity of villagers through autonomy capability and rule-of-law capability. As land certification directly affects farmers' vital interests, they are more inclined to actively voice their wishes and demands and cooperate with village cadres, such as by providing land information and participating in certification registration [37]. After experiencing the benefits and conveniences bestowed by land certification, villagers will become more supportive of rural governance initiatives, actively engaging in them and contributing to their villages' development. Moreover, the progression of LCP is frequently accompanied by extensive legal publicity and educational endeavors, aiding farmers in better understanding and applying the law, thereby augmenting their legal literacy.

The enhancement of rural governance performance further fosters centralized transfer. As mentioned above, centralized transfer refers to the mode where numerous scattered lands are consolidated by village collectives or new agricultural business entities for large-scale and contiguous transfer. In other words, this transfer mode typically covers multiple land suppliers, and their purpose is to reduce transfer risks or acquire rental income [19,21]. Therefore, centralized transfer can be regarded as a collective action [19,29]. From the perspective of formal governance performance, an increase in farmers' trust in village cadres and village systems reduces their suspicions and psychological burdens associated with participating in collective actions, such as centralized transfer [29]. Given that centralized transfer is conducive to promoting moderate-scale management and achieving agricultural modernization, farmers are inclined to adopt this transfer mode, motivated by their sense of identity and belonging to the village. In terms of informal governance performance, information dissemination mechanisms and supervisory and restraint mechanisms play crucial roles. On the one hand, some farmers' adoption of decentralized transfer stems

from their inadequate understanding of centralized transfer. Interactions among villagers deepen these farmers' comprehension of centralized transfer. Fueled by the bandwagon effect, increased trust levels further enhance the likelihood of micro-individuals achieving collective actions, thereby fostering the centralized transfer mode [30]. On the other hand, the collective pressure exerted by village public opinion, embedded within rural society, is a resource frequently leveraged by village cadres. Especially in villages with stronger governance capabilities, close interactions promote repeated games and expand the influence of reputation. At this time, farmers are motivated to participate in collective actions as they attach greater importance to others' perceptions of them [38]. At this time, farmers tend to choose centralized transfer rather than decentralized transfer.

Based on the above analysis, we propose the following hypothesis:

Hypothesis 3. *From the governance perspective, land certification fosters centralized transfer by improving rural governance performance.*

2.3. The Heterogeneity of Land Certification on Centralized Transfer

In order to enrich the application scenarios of the research conclusions, this study further considered the heterogeneity of land certification on centralized transfer from land inequality, farmers' risk preference, and village governance teams' capacity.

2.3.1. The Heterogeneity of Land Inequality

The positive impact of land certification on centralized transfer is more pronounced for households experiencing weak land inequality. Land serves the dual functions of economic production and social security [39]; therefore, land systems and policies should strive to balance efficiency and fairness as much as possible. Since the reform and opening-up, the government has placed great emphasis on the equitable distribution of land. However, due to demographic shifts, family differentiation, irregular land allocation by grassroots organizations, and land policies that restrict adjustments, land distribution among farmers within villages has become unbalanced [40]. For rural households facing severe land inequality, they have a stronger desire for land adjustment, which diminishes the reinforcing effects of land certification on their perception of land rights stability [38]. Furthermore, land certification may provoke competition for land among farmers, thereby intensifying land-related contradictions and conflicts. This, in turn, weakens social and institutional trust, leading to increased apprehension and decreased enthusiasm for participating in collective actions. Conversely, for rural households with equitable land distribution, the positive impact of land certification encourages them to adopt centralized transfer.

2.3.2. The Heterogeneity of Farmers' Risk Preference

The positive role of land certification in facilitating centralized transfer is more evident for farmers with low-risk preferences. Compared to decentralized transfer, centralized transfer entails lower risks. On the one hand, centralized transfer involves larger land areas and more stakeholders, effectively reducing risks arising from information asymmetry. On the other hand, centralized transfer typically involves village cadres as intermediaries for negotiation, and the collective credit of the village helps to minimize the risk of breach of contract disputes and their associated handling costs during the transfer process [19,21,36]. Given these advantages, it is understandable why, in the context of land certification, farmers who are risk-averse are more inclined to adopt centralized transfer over decentralized transfer. Land certification provides farmers with a clearer sense of ownership and security [5,10], and for those who are inherently cautious, the reduced risks and added security provided by centralized transfer make it an even more appealing option.

2.3.3. The Heterogeneity of Village Governance Teams' Capacity

The higher education level of village cadres amplifies the promoting effect of land certification on centralized transfer. Based on the New Endogenous Development concept,

village governance teams' capacity significantly impacts the intensity and effectiveness of policy implementation [41], and their education level is often considered as an important indicator for measuring comprehensive quality. On the one hand, highly educated village cadres are more capable of deeply understanding the significance of land certification. They can also effectively address and resolve issues arising during the process, thereby safeguarding the legitimate rights and interests of farmers and enhancing their satisfaction. On the other hand, the higher the education level of village cadres, the greater their reputation and influence among villagers. This facilitates their role in negotiation and promotion during centralized transfer [22,23].

Based on the above analysis, we propose the following hypotheses:

Hypothesis 4. *The positive impact of land certification on centralized transfer is more pronounced for households experiencing weak land inequality.*

Hypothesis 5. *The positive role of land certification in facilitating centralized transfer is more evident for farmers with low-risk preferences.*

Hypothesis 6. *The higher education level of village cadres amplifies the promoting effects of land certification on centralized transfer.*

3. Materials and Methods

3.1. Data Source

The data for this study was derived from the 2020–2022 CLES conducted by Nanjing Agricultural University. The survey employed the Probability Proportional to Size (PPS) method to guarantee the randomness of the sampling results. Firstly, two sample districts or counties were selected from each of the 13 cities in Jiangsu Province. Secondly, two sample townships were selected from each district or county. Finally, one sample village was selected from each township, and 50 rural households were randomly selected from each village. Therefore, the CLES baseline survey contained 52 villages, spanning the northern, central, and southern parts of Jiangsu Province, thereby ensuring a degree of representativeness.

Although this survey only focuses on Jiangsu Province in China, the economic development trend from south to north in this province has obvious gradient characteristics, which is, to some extent, a microcosm of the national level. As a demonstration area for land certification, Jiangsu Province had largely completed the pilot tasks, with 98% of the eligible administrative villages fulfilling contract improvement and 94% issuing land contract management certificates by the end of 2017. In addition, Jiangsu Province has attached great importance to the land transfer market, including establishing a rural property rights transaction information service platform with a four-level network of provinces, cities, counties, and townships. The total area of land transferred has exceeded 30 million mu (the Chinese unit of land measurement, which is commonly 666.67 square meters), with a transfer proportion of nearly 60%. Therefore, it is typical and universal to choose Jiangsu Province as the study area [17,21,22].

The CLES encompasses land certification, land transfer, demographic background, and economic characteristics, providing sufficient data support for this study. It has been extensively utilized by numerous scholars for scientific research [21,42–45]. Therefore, we integrated three phases of the survey to form hybrid cross-section data. Considering that land transfer-in behaviors are more likely to occur among new agricultural business entities rather than small farmers [46], this study only took farmers' land transfer-out behaviors into discussion. Furthermore, as China's new round of LCP is largely different from previous reforms, we only paid attention to the effects of land certification during this specific period. As mentioned above, this program began in 2009 and was implemented nationwide in 2014; therefore, we designated 2009 as the starting point for policy implementation and

utilized 2014 in robustness checks [10]. After removing missing and abnormal information, 2071 rural households were finally retained as the research subjects.

3.2. Empirical Models

3.2.1. Baseline Model

In order to evaluate the effects of land certification on centralized transfer, this study primarily employed the Probit model for analysis. The baseline model is as follows:

$$Transfer_i^* = \alpha + \beta Certification_i + \gamma Controls_i + \varepsilon_i, \quad (1)$$

$$Transfer_i = \begin{cases} 1 \; if \; Transfer_i^* > 0 \\ 0 \; otherwise \end{cases} \quad (2)$$

Among them, $Tranfer_i^*$ is the unobservable latent variable. $Transfer_i$ indicates whether household i has adopted the centralized transfer behavior. $Certification_i$ stands for land certification, including whether the household has received the land contract management certificate and the timing of its certificate acquisition.$Controls_i$ is a set of control variables, including the characteristics of household decision-maker, household, land, village, and year-fixed effect. α, β, and γ are the parameters to be estimated, and ε_i is an error term.

3.2.2. Discussion on Endogeneity

There may be endogeneity problems between land certification and centralized transfer, leading to bias in the baseline estimation results. Due to the multiple influencing factors of farmers' centralized transfer behaviors, using hybrid cross-section data for estimation may introduce the challenge of omitted variables. To address this, we selected control variables as comprehensively as possible and further employed the Oster test to examine potential omitted variables and their impacts on the baseline estimation results [47].

The government selects the time and location for the LCP, and its implementation is conducted in villages. Therefore, the heterogeneous characteristics of villages, such as the contradiction between people and land, clarity of property rights, and land stability, will affect the possibility and timing of farmers obtaining their land contract management certificates [17]. To solve the problem of sample self-selection, we used the PSM method with 1:2 nearest neighbor matching, 0.05 caliper matching, 1:2 nearest neighbor matching within 0.05 caliper, kernel matching, and radius matching to alleviate the potential endogeneity problems [48].

Reverse causality is another important endogenous source. Specifically, when rural households engage in centralized transfer, they may develop stronger ties with village collectives and obtain their land contract management certificates promptly [10,13]. Therefore, we chose village certification years as the instrumental variable and employed the IV-Probit model for further tests.

3.2.3. Mechanism Test Model

To further verify whether land certification can stimulate centralized transfer through promoting rural industrial development and improving rural governance performance, we employed the mechanism test model proposed by Jiang (2022). This method only tests the relationship between independent variables and mechanism variables, and the relationship between mechanism variables and dependent variables should be verified by theory and the literature [49,50]. The model is as follows:

$$Mechanism_i = \alpha' + \beta' Certification_i + \gamma' Controls_i + \varepsilon_i' \quad (3)$$

In Equation (3), $Mechanism_i$ includes rural industrial development and rural governance performance. The other variables are the same as in Equations (1) and (2).

On this basis, in order to avoid the problem that the theoretical demonstration of the causal effect of mechanism variables on dependent variables may not be sufficient,

we further tested the influence of mechanism variables on dependent variables so as to supplement the correlation evidence support.

In addition, we performed heterogeneity analysis by using sub-sample regression.

3.3. Variable Definitions and Descriptive Statistics

3.3.1. Centralized Transfer

As mentioned above, centralized transfer refers to the mode where numerous scattered lands are consolidated by village collectives or new agricultural business entities for large-scale and contiguous transfer. Drawing on the existing studies, this study identified the land transfer mode by inquiring about the transfer routes of transfer-out households [19]. If the land was transferred out through centralized land consolidation and the subsequent unified transfer by village collectives or new agricultural business entities, or through unified operation by village collectives, it was considered as centralized transfer, and the variable was assigned a value of 1; otherwise, it was regarded as decentralized transfer and assigned a value of 0.

To further reflect the degree of centralized transfer, we used centralized transfer ratio (the proportion of concentrated transfer-out area to total transfer-out area) and full centralized transfer (whether the transferred-out land was all through the centralized manner: 1 = yes; 0 = no) in the robustness tests.

3.3.2. Land Certification

In this study, we used certificate acquisition and certification years as independent variables to reflect the new round of LCP in China. Consistent with the existing literature, certificate acquisition was a dummy variable to present whether the household has received the land contract management certificate [15,16]. If the household has possessed this certificate, we assigned a value of 1; otherwise, we assigned a value of 0.

As mentioned above, there are notable disparities in the timing of farmers' acquisition of their land contract management certificates due to the diverse characteristics of villages [17]. To capture the differential influence exerted by the timing of land certification [13], we further constructed the variable "certification years", which referred to the number of years the household has held the certificate. The specific calculation is shown in Equation (4). Notably, if the household has not received this certificate by the survey year, we assigned a value of 0.

$$\text{Certification years} = \text{Year of survey} - \text{Year of the household receiving the certificate} + 1 \quad (4)$$

3.3.3. Control Variables

This study further incorporated control variables at four levels, including characteristics of household decision-maker, household, land, and village [2,4,13]. In addition, we also considered the year-fixed effect because of the hybrid cross-section dataset.

Land transfer decisions are assumed to be made by the household decision-maker [3]. The personal characteristics of the household decision-maker, encompassing gender, age, education years, and health status, were used to specify the land transfer modes [4,13]. And, the square of age was also considered due to its non-linear relationship with the dependent variable [8].

In terms of household characteristics, plenty of studies have shown that the number of labor force is one of the most important factors in influencing the development of the land transfer market [11]. Due to the significant role village cadres play in the centralized transfer [20,21], it is necessary to control the cadre appointment. In addition, considering that there is a correlation between rural households' risk-resistance capacity and the choice of land transfer modes [5,19], this study further controlled for economic status and medical insurance purchase. Specifically, economic status was measured by whether the household was under the "Five Guarantees" system, on minimum living allowance, or with disabled persons under the protection system. If the household belonged to the aforementioned

situation, indicating a low-income household, it was assigned a value of 1. Conversely, it was assigned a value of 0.

At the land level, land area was included to measure land endowment [3]. Land with better quality is more favored by land demanders due to its higher productivity, and households transferring out such land can obtain higher returns [19]. In this study, we used soil fertility to characterize the quality of land. Additionally, the implementation of planting subsidies was also taken into consideration.

As mentioned above, the surveyed administrative villages cover the northern, central, and southern parts of Jiangsu Province. Therefore, controlling for village-level characteristics, such as geographical conditions and economic development, enables us to reflect the potential influence of regional developmental disparities. Specifically, we involved the distance from the village committee to the nearest highroad, per capita disposable income, and village collective operating income [3,28].

3.3.4. Instrumental Variable

As mentioned above, we chose village certification years as the instrumental variable, specifically referring to the period between the issuance of the village's first land contract management certificate and the survey year. Equation (5) shows the specific calculation. Similarly to the definition of certification years, we assigned village certification years a value of 0 if the village has not issued the certificates by the survey year.

$$\text{Village certification years} = \text{Year of survey} - \text{Year of the first certificate in the village} + 1 \quad (5)$$

Correlation and exogeneity are two requirements for a valid instrument that should be satisfied. On the one hand, the implementation of LCP is carried out in villages [13,17]; therefore, the earlier the village starts to conduct land certification, the sooner the farmers receive their land contract management certificates. In other words, this variable meets the correlation condition. On the other hand, the variable "village certification years" has no obvious correlation with farmers' centralized transfer behaviors, satisfying exclusivity.

3.3.5. Mechanism Variables

According to theoretical analysis, land certification stimulates centralized transfer by promoting rural industrial development and improving rural governance performance.

In this study, rural industrial development was measured by the following indicators [51,52]: Firstly, we used the number of types of rural industry, including modern farming, rural tourism, agricultural processing, rural e-commerce, catering industry, and others. If the village did not have rural industries, we assigned a value of 0. And then, to characterize the rural industrial development more comprehensively, the proportion of the tertiary industry and the proportion of non-farm employment were also taken into consideration.

Rural governance performance was proposed to be represented by variables in three dimensions from subjective and objective perspectives: working attitude, governance performance satisfaction, and voter turnout [53]. Respondent's evaluation of the working attitude of village cadres mainly focused on their attitude and quality of service, ranging from 1 (poor) to 4 (good). Respondents' satisfaction with governance performance encompassed village leadership, village public security management, and village affairs open, assigning from 1 (very dissatisfied) to 5 (very satisfied). And, the voter turnout of villagers in the recent election of the village committee was used to reflect the subjectivity of villagers.

The variable definitions and descriptive statistics are presented in Table 1.

Table 1. Variable definitions and descriptive statistics.

Variable	Definition	Mean	S.D.	Min	Max
	Dependent variables				
Centralized transfer	Whether the land was transferred out through centralized land consolidation and unified transfer by village collectives or new agricultural business entities, or through unified operation by village collectives: 1 = yes; 0 = no	0.812	0.391	0.000	1.000
Centralized transfer ratio	The proportion of concentrated transfer-out area to total transfer-out area	0.797	0.392	0.000	1.000
Full centralized transfer	Whether the transferred-out land was all through the centralized manner: 1 = yes; 0 = no	0.773	0.419	0.000	1.000
	Independent variables				
Certificate acquisition	Whether the household has received the land contract management certificate: 1 = yes; 0 = no	0.930	0.255	0.000	1.000
Certification years	The number of years the household has held the land contract management certificate: Year of survey—year of the household receiving the certificate + 1 (years) [1]	3.960	1.975	0.000	13.000
	Control variables				
Gender	Gender of the household decision-maker: 1 = male, 0 = female	0.795	0.404	0.000	1.000
Age	Actual age of the household decision-maker (years)	58.974	11.647	18.000	75.000
Age [2]	Explore the non-linear relationship between age and centralized transfer: Square of the household decision-maker's actual age/100	36.136	12.810	3.240	56.250
Education	Number of years the household decision-maker has been educated in school (years)	7.572	3.856	0.000	22.000
Health	Health status of the household decision-maker: 5 = excellent; 4 = good; 3 = middle; 2 = poor; 1 = incapacity	3.990	1.111	1.000	5.000
Labor force	Number of labor force in the household	2.585	1.538	0.000	8.000
Cadre appointment	Whether any family member is serving as a cadre: 1 = yes; 0 = no	0.170	0.376	0.000	1.000
Low income	Whether the household is under the "Five Guarantees" system [2], on minimum living allowance, or with disabled persons under the protection system: 1 = yes; 0 = no	0.075	0.263	0.000	1.000
Medical insurance	Whether all the family members have purchased medical insurance: 1 = yes; 0 = no	0.944	0.230	0.000	1.000
Land area	Area of household land (mu [3])	5.553	11.787	0.020	500.000
Land quality	Soil fertility: 1 = good; 0 = middle or poor	0.544	0.498	0.000	1.000
Planting subsidy	Whether the household has received planting subsidies: 1 = yes; 0 = no	0.730	0.444	0.000	1.000
Distance	Distance from the village committee to the nearest highroad (km)	11.602	10.730	0.500	60.100
Per capita income	Per capita disposable income of the village (ten thousand yuan)	2.387	0.890	0.180	0.500
Collective income	Collective operating income of the village (ten thousand yuan)	87.627	134.368	0.000	800.000

Table 1. *Cont.*

Variable	Definition	Mean	S.D.	Min	Max
	Instrumental variable				
Village certification years	Year of survey—year of the first certificate in the village + 1 (years) [4]	4.972	1.870	0.000	11.000
	Mechanism variables				
Rural industry types	The number of types of rural industries in the village	0.336	0.718	0.000	4.000
Tertiary industry proportion	The proportion of the tertiary industry income to total operating income	0.228	0.244	0.000	0.953
Non-farm employment proportion	The proportion of the number of non-farm employees to the total number of labor force	0.448	0.293	0.000	0.999
Working attitude	Respondent's evaluation of the working attitude of village cadres: 4 = good; 3 = middle; 2 = relatively poor; 1 = poor	3.731	0.520	1.000	4.000
Governance performance satisfaction	Respondent's satisfaction with governance performance: 5 = very satisfied; 4 = relatively satisfied; 3 = middle; 2 = relatively dissatisfied; 1 = very dissatisfied	4.154	0.757	1.000	5.000
Voter turnout	The voter turnout of villagers in the recent election of the village committee	0.766	0.157	0.200	0.964

[1] if the household has not received the land contract management certificate by the survey year, the variable "certification years" equaled to 0. [2] the "Five Guarantees" refer to a social security system in rural China that provides five basic guarantees to specific vulnerable groups, including food security, clothing security, medical security, housing security, and burial security (education security for orphans). [3] Mu is the Chinese unit of land measurement, which is commonly 666.67 square meters. [4] if the village has not issued the certificates by the survey year, the variable "village certification years" equaled to 0.

3.3.6. Descriptive Statistics

As shown in Table 1, the proportion of rural households that have adopted centralized transfer is 81.20%, and 77.30 percent of the families only transfer their land out in a centralized manner rather than a decentralized manner. Considering that 93.00 percent of the rural households have received their land contract management certificates, this study mainly discussed the differential effects exerted by the timing of certification on farmers' centralized transfer behaviors.

According to the mean value of certification years reported in Table 1, samples were divided into two groups: early certification and late certification. To be mentioned, the household that had not received the certificate by the survey year belonged to the group of late certification. The results in Table 2 show that the probability of centralized transfer in the early certification group is 0.849, which is significantly higher than that of the samples in the late certification group by 9.0 percent. Therefore, we believe that the earlier the households obtain their land contract management certificates, the greater the positive impact of land certification on centralized transfer. In other words, the timing of certification plays an important role in centralized transfer.

Table 2. Mean differences in centralized transfer grouped by the timing of certification.

	Early Certification	Late Certification	Mean Difference
Centralized transfer	0.849	0.759	0.090 ***

Note: *** indicates passing the test at the significance level of 1%. The mean differences were tested by the *t*-test.

4. Results

4.1. Timing—The Timing Influences the Decision-Making Process of Transfers

As mentioned above, the timing of land certification can influence the decision-making process of transfers, particularly in centralized transfer. Specifically, the earlier the acquisition of land contract management certificates by rural households, the larger the positive

impact of land certification on centralized transfer. To examine the above phenomenon, this study employed the Probit model, and the results are shown in Table 3. To make the results easier to interpret, we report the marginal effect results. From column A to column C, we focused on whether households have received their land contract management certificates. And, the relationship between the timing of certification and the centralized transfer was tested from column D to column F. Characters including household decision-maker, household, land, and village were gradually taken into control. And, all the models considered year-fixed effect.

Table 3. Baseline estimation results.

	Centralized Transfer					
	A	**B**	**C**	**D**	**E**	**F**
Certificate acquisition	0.079 **	0.078 **	0.087 ***			
	(0.031)	(0.031)	(0.031)			
Certification years				0.015 ***	0.015 ***	0.017 ***
				(0.005)	(0.005)	(0.005)
Gender	0.001	−0.000	0.001	0.001	−0.000	0.001
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Age	−0.010 *	−0.010 *	−0.010 *	−0.011 *	−0.011 *	−0.011 *
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Age ^{2}	0.012 **	0.012 **	0.012 **	0.013 **	0.013 **	0.012 **
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Education	0.007 ***	0.007 ***	0.006 **	0.007 ***	0.007 **	0.006 **
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Health	0.007	0.006	0.005	0.006	0.006	0.004
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Labor force	0.018 ***	0.018 ***	0.019 ***	0.018 ***	0.018 ***	0.019 ***
	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)
Cadre appointment	0.049 **	0.050 **	0.048 **	0.045 *	0.046 *	0.044 *
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Low income	−0.046	−0.046	−0.039	−0.048	−0.049	−0.042
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.030)
Medical insurance	0.088 **	0.095 ***	0.090 ***	0.089 **	0.096 ***	0.091 ***
	(0.034)	(0.035)	(0.034)	(0.034)	(0.035)	(0.034)
Land area		−0.002	−0.001 *		−0.001	−0.001 *
		(0.001)	(0.001)		(0.001)	(0.001)
Land quality		0.041 **	0.035 **		0.041 **	0.034 **
		(0.017)	(0.017)		(0.017)	(0.017)
Planting subsidy		−0.019	−0.019		−0.019	−0.019
		(0.019)	(0.020)		(0.019)	(0.020)
Distance			−0.000			−0.000
			(0.001)			(0.001)
Per capita income			0.023 **			0.024 **
			(0.010)			(0.010)
Collective income			0.000			0.000 *
			(0.000)			(0.000)
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R^2	0.024	0.029	0.034	0.027	0.032	0.037
Observations	2071	2071	2071	2071	2071	2071

Note: The reported results are the marginal effect results. Delta-method standard errors are in parentheses. *, **, and *** indicate passing the test at the significance levels of 10%, 5%, and 1%, respectively.

From column A to column C, all the coefficients on certificate acquisition are significantly positive at least at the 5% level, indicating that farmers possessing land contract management certificates are more likely to choose centralized transfer. Column D to column F further verifies the long-term implications and lagged effects of land certification. For the

economic significance, as indicated in Column F, after controlling four-level variables and year-fixed effect, the probability of centralized transfer increases by 1.70% for each additional year of certification. In conclusion, land certification stimulates centralized transfer, with the earlier acquisition of land contract management certificates by households having a proportionately larger positive impact. In other words, the timing of land certification influences the decision-making process of transfers, which provides strong support for Hypothesis 1.

Among the control variables, there exists a U-shaped correlation between age and centralized transfer. Household decision-makers with higher education levels typically possess stronger adaptability and the ability to embrace new concepts [3], and have clearer understandings of the potential benefits and efficiency gains associated with centralized transfer. In terms of household characteristics, factors such as labor force, cadre appointment, and medical insurance have positive impacts on centralized transfer. As for land characteristics, centralized transfer is more applicable to land with good soil fertility, as farmers can receive higher rents [19,21]. In addition, the improvement of the village's economic level can also stimulate farmers' centralized transfer behaviors, which may be related to farmers' increased trust in village cadres [28].

4.2. Endogenous Treatment

4.2.1. Oster Test Results

As shown in Table 4, the Oster test was adopted to examine potential omitted variables and their impact on the baseline estimation results [47]. In column A, the "True β" bound is [0.017, 0.018], which excludes zero and is within the 99.5% confidence interval of OLS estimation [0.004, 0.030]. Therefore, we can conclude that there are no omitted factors of equal importance to the observed variables that affect the baseline estimation results. In column B, the value of δ is -22.314. In other words, the unobserved variables would need to have an impact at least 22.314 times larger than the observed variables that have already been controlled. This condition is clearly difficult to meet, indicating that unobserved variables do not significantly affect the baseline estimation results. In conclusion, the results presented are robust to omitted variable bias and can be given a causal interpretation.

Table 4. Oster test results.

	A	**B**
Assumptions	$1.3R^2; \delta = 1$	$1.3R^2; \beta = 0$
Results	"True β" bound: [0.017, 0.018]	$\delta = -22.314$

4.2.2. PSM Estimation Results

To further overcome the potential endogeneity problems caused by sample self-selection, we employed the PSM method to estimate counterfactual outcomes with 1:2 nearest neighbor matching, 0.05 caliper matching, 1:2 nearest neighbor matching within 0.05 caliper, kernel matching, and radius matching [48]. As this method is applicable when the core explanatory variable is a binary variable, therefore, we referred to the classification used in Table 2. And, the control variables are the same as the benchmark model (Table 3 column F).

The results in Table 5 show that the average treatment effect across these five different matching methods is estimated to be 0.111, suggesting a significant positive impact of land certification on centralized transfer after accounting for selection bias. The results are consistent with the theoretical analysis, which verifies Hypothesis 1. In addition, different matching methods show consistent results, indicating the robustness of the conclusions.

Table 5. Average treatment effect of PSM.

Matching Method	ATT	S.E.	*t*-Test Value
1:2 nearest neighbor matching	0.120 ***	0.023	5.120
0.05 caliper matching	0.126 ***	0.026	4.790
1:2 nearest neighbor matching within 0.05 caliper	0.116 ***	0.024	4.930
Kernel matching	0.105 ***	0.019	5.510
Radius matching	0.089 ***	0.014	6.170
Mean	0.111		

Note: *** indicates passing the test at the significance level of 1%.

4.2.3. IV-Probit Estimation Results

As mentioned above, choosing village certification years as the instrumental variable is reasonable. Table 6 exhibits the estimation results of the IV-Probit model, where we included the same control variables as in Table 3 column F. In column A, village certification years have significant positive impacts on certification years, satisfying the correlation condition. In column B, the Wald test rejects the null hypothesis of exogeneity at the 1% level. The estimation results, obtained through the application of the instrumental variable method, demonstrate that certification years remain positively correlated with centralized transfer. In other words, the timing of land certification can influence the decision-making process of transfers, particularly in centralized transfer. The earlier the acquisition of land contract management certificates by rural households, the larger the positive impact of land certification on centralized transfer. The above findings confirm Hypothesis 1 once again.

Table 6. IV-Probit estimation results.

	Certification Years A	Centralized Transfer B
Certification years		0.315 *** (0.105)
Village certification years	0.243 *** (0.031)	
Constant	−0.354 (0.979)	
Control variables	Y	Y
Year FE	Y	Y
Wald chi-squared	49.800 ***	
Endogenous Wald chi-squared		8.200 ***
Observations	1195	1195

Note: In column B, the reported results are the marginal effect results. Standard errors and Delta-method standard errors are in parentheses of column A and column B, respectively. *** indicates passing the test at the significance level of 1%.

4.3. Robustness Tests

We further conducted a series of robustness tests, including adopting the Bootstrap test, changing the measurements of centralized transfer, adjusting the definition of certification years, and controlling the regional fixed effects. The detailed results can be found in Table 7.

In column A, the robustness of the baseline estimation results is verified by the Bootstrap test. The coefficient of certification years is significantly positive at the 1% level, further validating Hypothesis 1.

In column B and column C, we used the centralized transfer ratio and full centralized transfer as the dependent variables. The results indicate that land certification enhances the probability of farmers utilizing centralized transfer, and this promoting effect intensifies with the duration of certification years regardless of the measurements employed.

Table 7. Robustness test results.

	Centralized Transfer	Centralized Transfer Ratio	Full Centralized Transfer	Centralized Transfer	Centralized Transfer Ratio	Full Centralized Transfer
	A	**B**	**C**	**D**	**E**	**F**
Certification years	0.017 ***	0.018 ***	0.017 ***			
	(0.005)	(0.005)	(0.005)			
New certification years				0.020 ***	0.024 ***	0.022 ***
				(0.005)	(0.006)	(0.006)
Constant		0.656 ***			0.659 ***	
		(0.168)			(0.171)	
Control variables	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R^2 or R^2	0.037	0.038	0.032	0.037	0.038	0.033
Observations	2071	2071	2071	2020	2020	2020
	Centralized Transfer	**Centralized Transfer ratio**	**Full Centralized Transfer**	**Centralized Transfer**	**Centralized Transfer Ratio**	**Full Centralized Transfer**
	G	**H**	**I**	**J**	**K**	**L**
Certification years	0.016 ***	0.018 ***	0.017 ***			
	(0.005)	(0.005)	(0.005)			
New certification years				0.020 ***	0.023 ***	0.022 ***
				(0.005)	(0.006)	(0.006)
Constant		0.668 ***			0.673 ***	
		(0.168)			(0.170)	
Control variables	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Regional FE	Y	Y	Y	Y	Y	Y
Pseudo R^2 or R^2	0.043	0.045	0.039	0.043	0.045	0.040
Observations	2071	2071	2071	2020	2020	2020

Note: The reported results are the marginal effect results in column A, column C, column D, column F, column G, column I, column J, and column L. Delta-method standard errors are in parentheses of column A, column C, column D, column F, column G, column I, column J, and column L. Standard errors are in parentheses of column B, column E, column H and column K. *** indicates passing the test at the significance level of 1%.

From column D to column F, we altered the starting point for China's new round of LCP implementation from 2009 to 2014, and subsequently recalculated the certification years. The results suggest that new certification years exert significant positive impacts on centralized transfer, centralized transfer ratio, and full centralized transfer, implying that the earlier the farmers acquire land contract management certificates, the greater the likelihood they will opt for centralized transfer.

From column G to column L, considering that the significant regional developmental disparities among the northern, central, and southern parts of Jiangsu Province may be critical factors affecting centralized transfer, therefore, we further controlled this regional fixed effect. Notably, the coefficients of certification years or new certification years are significantly positive at the 1% level. The main conclusions of this study are robust regardless of whether the regional fixed effects are controlled. In other words, the inclusion of variables such as village-level location and economic development in the baseline models has effectively captured the potential influence of regional differences.

In conclusion, the main conclusion of our study, the timing of land certification can influence the decision-making process of centralized transfers, shows great robustness even after conducting the above tests.

4.4. Mechanism Analysis

4.4.1. Economic Perspective: Rural Industrial Development

Theoretical analysis has suggested that land certification enhances the likelihood of centralized transfer by promoting rural industrial development. The results presented in column A, column C, and column E of Table 8 demonstrate a significant positive correlation between land certification and rural industrial development, including rural industry types, tertiary industry proportion, and non-farm employment proportion. The previous literature has pointed out that the development of rural industries stimulates farmers' centralized transfer behaviors by requiring higher demands for contiguous land, enhancing farmers' tendency to leave agriculture, and facilitating land factor marketization [9,26]. Furthermore, the results in column B, column D, and column F of Table 8 prove the above viewpoints. Therefore, we can conclude that land certification significantly augments the prospects for land to be transferred in a centralized manner, driven by their pivotal role in fostering rural industrial development. In other words, Hypothesis 2 is verified.

Table 8. Mechanism analysis results of rural industrial development.

	Rural Industry Types	**Centralized Transfer**	**Tertiary Industry Proportion**	**Centralized Transfer**	**Non-Farm Employment Proportion**	**Centralized Transfer**
	A	**B**	**C**	**D**	**E**	**F**
Certification years	0.018 ** (0.008)		0.009 *** (0.003)		0.007 ** (0.003)	
Rural industry types		0.022 * (0.013)				
Tertiary industry proportion				0.087 ** (0.045)		
Non-farm employment proportion						0.112 *** (0.032)
Constant	0.024 (0.280)		0.229 * (0.127)		0.453 *** (0.128)	
Control variables	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
R^2 or Pseudo R^2	0.099	0.031	0.148	0.042	0.129	0.044
Observations	2071	2071	1524	1524	1912	1912

Note: The reported results are the marginal effect results in column B, column D, and column F. Robustness standard errors are in parentheses of column A, column C, and column E. Delta-method standard errors are in parentheses of column B, column D, and column F. *, **, and *** indicate passing the test at the significance levels of 10%, 5%, and 1%, respectively.

4.4.2. Governance Perspective: Rural Governance Performance

As mentioned in theoretical analysis, land certification promotes centralized transfer by improving rural governance performance. The results in column A, column C, and column E of Table 9 reflect that certification years are positively and significantly associated with working attitude, governance performance satisfaction, and voter turnout. These findings suggest that land certification enhances rural governance performance. Furthermore, we have contended that the improvement of rural governance performance stimulates centralized transfer by reducing farmers' psychological burdens, strengthening collective identity, promoting information dissemination, and enhancing reputation incentives [29,30,38]. To supplement the correlation evidence support, we also tested the influence of rural governance performance on centralized transfer, and the results are shown in column B, column D, and column F of Table 9. In conclusion, Hypothesis 3 is confirmed.

Table 9. Mechanism analysis results of rural governance performance.

	Working Attitude	Centralized Transfer	Governance Performance Satisfaction	Centralized Transfer	Voter Turnout	Centralized Transfer
	A	B	C	D	E	F
Certification years	0.035 * (0.019)		0.041 *** (0.015)		0.009 *** (0.002)	
Working attitude		0.031 * (0.017)				
Governance performance satisfaction				0.025 ** (0.012)		
Voter turnout						0.133 ** (0.063)
Constant					0.475 *** (0.056)	
Control variables	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R^2 or R^2	0.031	0.034	0.025	0.036	0.283	0.042
Observations	1734	1734	1729	1729	1626	1626

Note: The reported results are the marginal effect results in column B, column D, and column F. Robustness standard errors are in parentheses of column A, column C, and column E. Delta-method standard errors are in parentheses of column B, column D, and column F. *, **, and *** indicate passing the test at the significance levels of 10%, 5%, and 1%, respectively.

4.5. Heterogeneity Analysis

4.5.1. Inequality—Addressing Inequality Facilitates the Promotion of Transfers

Compared to rural men, women's land rights are less secure [7,54–56]. In other words, rural women's rights are susceptible to erosion during the allocation of rural collective land involving various identities. Firstly, rural land distribution is based on households, and the majority of household heads are male fathers. Therefore, unmarried women often face difficulties in asserting their individual land rights within the family. Secondly, despite national legal provisions stating that men who marry into a woman's family can settle in her household and receive land resources, in practice, some village collectives only permit one daughter from a household without sons to recruit a son-in-law, guaranteeing the above rights, while other daughters cannot take advantage of these benefits. Thirdly, due to the inconsistency between the timing of married women's household registration transfer to their husbands' families and the timing of land contracting and adjustment by the village collective in their husbands' village, they often miss opportunities for land allocation, making it difficult for them to realize their rights to land use and benefits. Furthermore, the certainty of their land property rights over time hinges on the stability of their marriage. For divorced women, the erosion of land rights is particularly prevalent. According to China's land system, which operates under the principle of "recognition by individual but implementation by household", therefore, divorced women often lose their eligibility to enjoy land rights from their husband's family following changes in their household registration due to marital changes. In addition, upon returning to their parents' village, they also face difficulties in obtaining land reallocation from the village collective.

Based on the above discussion, this study used the number of female members in a household as an indicator to quantify the degree of land inequality. The sample was divided into two groups based on the mean number of women: those exceeding the average were classified as experiencing severe land inequality, while the remainder were deemed to have weak land inequality. From the estimation results presented in column A and column B of Table 10, it is evident that land certification exerts a significant positive effect on centralized transfer in both groups. However, this promoting effect is more pronounced in households experiencing weak land inequality, confirming Hypothesis 4. Therefore, we

suggest that the rational distribution of land plays a vital role in land transfer. In other words, addressing land inequality can facilitate the promotion of centralized transfer.

Table 10. Heterogeneity analysis results.

	Land Inequality		Risk Preference		Education Level	
	Weak Land Inequality	Severe Land Inequality	Low-Risk Preference	High-Risk Preference	Low Education Level	High Education Level
	A	B	C	D	E	F
Certification years	0.017 *** (0.006)	0.015 * (0.008)	0.019 *** (0.005)	0.010 (0.011)	0.012 (0.008)	0.018 *** (0.006)
Control variables	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Pseudo R^2	0.042	0.049	0.044	0.073	0.061	0.066
Observations	1440	631	1671	400	927	1144

Note: The reported results are the marginal effect results. Delta-method standard errors are in parentheses. * and *** indicate passing the test at the significance levels of 10% and 1%, respectively.

4.5.2. Risk Preference—Concentrated Transfer Is Preferred Among Low-Risk Farmers

Considering that most farmers are risk averse, this study included farmers with risk neutral and risk preference into the group named "high-risk preference", and the rest into the group named "low-risk preference". The detailed results can be seen in column C and column D of Table 10. In the "low-risk preference" sub-sample, the coefficient on certification years is significantly positive at the 1% level. However, in the "high-risk preference" sub-sample, the effect of land certification is not obvious. Taken together, these results indicate that the positive effects of land certification on centralized transfer only exist in farmers with low-risk preferences, confirming Hypothesis 5.

4.5.3. Governance-Effective Governance Enhances the Efficacy of Transfers

Based on the New Endogenous Development concept, the capacity of village governance teams significantly impacts the intensity and effectiveness of policy implementation [41]. In other words, effective governance can enhance the efficacy of transfers. To examine this viewpoint, we used village cadres' education years as a feasible index to characterize the capacity of village governance teams. According to the average education years of village cadres, the total sample was divided into two groups: "low education level" and "high education level". The results illustrated in column E and column F of Table 10 show that certification years are positively and significantly associated with centralized transfer at the 1% level within the "high education level" group. In contrast, within the "low education level" sub-sample, the coefficient of certification years is not statistically significant. Therefore, we can conclude that the higher education level of village cadres enhances the positive effects of land certification on centralized transfer, further emphasizing the importance of effective governance and verifying Hypothesis 6.

5. Discussion

Compared to spontaneous and decentralized transfer by farmers themselves, centralized transfer has garnered significant attention from the government due to its notable advantages, such as achieving moderate-scale management, optimizing land resource utilization and allocation efficiency, and filling the gap of the insufficient development of the standardized land transfer market [1,19]. Although the existing studies have extensively discussed the relationship between land certification and land transfer, clarifying its underlying mechanisms related to risks and transaction costs, transaction radius, and the land's social security function [3,5,18], the impact of land certification on farmers' centralized transfer behaviors has not yet received the attention it deserves. Furthermore, the new round of LCP owns specific characteristics, featuring clearer ownership, more comprehen-

sive rights, and more stable rights [5,10,14]. Therefore, this study mainly focused on this reform period.

In order to demonstrate the long-term implications and lagged effects of land certification, we also conducted a differential analysis of the timing of farmers obtaining their land contract management certificates. The results show that the timing of land certification influences the decision-making process of transfers. Specifically, the earlier rural households obtain the land contract management certificates, the higher their enthusiasm to participate in the centralized transfer.

Land systems and policies should strive to balance efficiency and fairness due to the social security function of land [39]. However, land inequality is widespread [40]. Compared to rural men, women's land rights are less secure [7,54–56]. Therefore, this study used the number of female members in a household as an indicator to characterize the degree of land inequality. For households facing severe land inequality, the positive role of land certification in facilitating centralized transfer is weakened. Therefore, it is important to distribute the land rationally and equally. Especially in the areas where land inequality is serious, much attention should be paid to solving this problem to further stimulate the vitality of the land transfer market.

Furthermore, this study emphasized the importance of effective governance. On the one hand, land certification stimulates centralized transfer by promoting rural industrial development and improving rural governance performance. Among them, rural governance performance is specifically manifested in the enhancement of the subjectivity of village cadres and villagers [28]. By reducing farmers' psychological burdens, strengthening collective identity, promoting information dissemination, and enhancing reputation incentives, centralized transfer becomes more popular among transfer-out farmers [29,30,38]. Therefore, in the process of promoting centralized transfer to optimize land space, attention should not only be paid to rural economic development but also to the enhancement of rural governance capabilities. On the other hand, we paid attention to the influence of village governance teams' capacity on the implementation effect of China's new round of LCP [41]. As expected, highly educated village cadres amplify the promoting effects of land certification on centralized transfer, further verifying that effective governance enhances the efficacy of transfers.

The aforementioned findings provide several policy implications. Firstly, centralized transfer is beneficial to optimizing the efficiency of land resource utilization and allocation. Therefore, the government and village collectives should actively implement this transfer mode, vigorously improve the land property rights trading platform, optimize the market environment of land transfer, and guide farmers to actively transfer their land management rights to village collectives or new agricultural management entities by providing comprehensive and accurate market information, consultation, price assessment, and other services. Secondly, in the stage where land certification has been largely completed, the quality and capacity of village cadres should be further improved to enhance the effects of the new round of LCP and increase farmers' satisfaction and trust. At the same time, the conclusions of this study suggest that we should assess the rationality of the contracted land adjustment system and strive to balance the relationship between efficiency and fairness. Lastly, in rural development, the government should not solely focus on economic construction, such as attracting industrial and commercial capital to rural areas and enhancing farmers' enthusiasm for participating in industrial revitalization. Rather, the government should also prioritize improving rural governance performance and giving full play to the subjectivity of village cadres and villagers.

However, this study also has certain limitations. Although the economic development trend from south to north in Jiangsu Province has obvious gradient characteristics and this province is typical in land certification and centralized transfer, only using one province still has difficulty in identifying regional heterogeneity. In future studies, scholars can pay attention to the spillover effect of land certification using a wider range of samples.

6. Conclusions

This study utilized the data from CLES to investigate the effects and underlying mechanisms of land certification on centralized transfer by establishing the Probit model. The Oster test, PSM method, and IV-Probit model were used to alleviate the possible endogeneity problems. Notably, our study introduces several innovations, especially emphasizing the roles of timing, inequality, and governance. Firstly, we distinguished between decentralized transfer and centralized transfer, and focused on the variations in the timing of farmers' acquisition of land contract management certificates during the new round LCP period to elucidate the long-term implications and lagged effects of land certification. Secondly, we explored the underlying mechanisms from the dual perspectives of economy and governance, specifically encompassing rural industrial development and rural governance performance. Finally, we analyzed the heterogeneity of land inequality, farmers' risk preference, and village governance teams' capacity, further expanding the application scenarios of the conclusions of this study.

The conclusions are as follows:

(1) Land certification promotes centralized transfer. And, the timing of land certification influences the decision-making process of transfers. Especially, after considering the differential influence exerted by the timing of certification, we found that the earlier the rural households obtain the land contract management certificates, the higher their enthusiasm to participate in the centralized transfer. The above results are robust after conducting endogenous treatment, adopting the Bootstrap test, changing the measurements of centralized transfer, adjusting the definition of certification years, and controlling the regional fixed effects.

(2) The positive effect of land certification on centralized transfer is mainly achieved by promoting rural industrial development and improving rural governance performance. These findings highlight the importance of efficient markets and effective governance.

(3) Addressing inequality facilitates the promotion of transfers. Compared to rural households with severe land inequality, the promoting effect of land certification on centralized transfer is more obvious in those with weak land inequality. In other words, land systems and policies should pay attention to fairness in land distribution while improving its efficiency. The promotional impact of land certification on centralized transfer is more pronounced among farmers who exhibit a preference for low risk.

(4) Effective governance enhances the efficacy of transfers. As an indicator of village governance teams' capacity, the higher education level of village cadres further amplifies the promoting effect of land certification on centralized transfer, verifying the importance of the construction of a grass-roots management team.

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