



Article The Capitalization Effect and Its Consequence of Agricultural Support Policies—Based on the Evidence of 800 Villages in China

Wensheng Lin¹ and Rongyuan Chen^{2,*}

- School of Advanced Agricultural Sciences, Peking University, Beijing 100871, China; linwensheng.ccap@pku.edu.cn
- ² School of Economics & Management, Beijing Forestry University, Beijing 100083, China
- * Correspondence: chenrongyuan1990@163.com

Abstract: The theoretical and empirical results of the capitalization effect of agricultural support policies on land rental price remain inconclusive. Based on the survey of Chinese Household Income Projects in 2007 and 2008, this paper adopts the panel data of 800 villages in 11 provinces in China to empirically analyze the impact of agricultural support policies on village-level land rental price. It shows that both output price support and agricultural subsidies have a significant positive effect on land rental price in the village. For each 1 CNY/kg increase in output price support, the land rental price in the village will rise by about 322.44 CNY/mu, while with an additional 1 CNY/mu increase in agricultural subsidies, it will increase by CNY 0.45. The stronger the social relationships in the village, the less area of land transfer for a fee and the lower the land rental price. For villages with weak social relationships or renting land to outsiders, output price support and agricultural subsidies not only have a significant positive effect on the area of land transfer in the village but also an indirect negative effect on it by raising the price of regional land rent.

Keywords: output price support; agricultural subsidies; land rental price; area of land transfer

1. Introduction

Over the past 20 years, to ensure food security and increase farmers' income, China had gradually established an agricultural support policy system based on output price support and agricultural subsidies following the elimination of agricultural tax and fees [1]. The output price support policies mainly include the minimum purchase price for rice and wheat and the temporary purchase and storage price for maize, while the agricultural subsidy policies mainly include three types of subsidies for grain production, high-quality seeds, and agricultural inputs, which were consolidated into "agricultural support and protection subsidies" in 2016.

With the implementation of agricultural support policies in China, a noteworthy phenomenon is that the land rental price has been rising year by year. Based on farm household surveys conducted in 11 provinces in China from 2000 to 2018, the land rental price rapidly rose from 2004 to 2014 and fell slightly from 2014 to 2018 [2]. According to the China Small and Micro Enterprise Survey (CMES) in 2015, 44.79% of agricultural enterprises and cooperatives regarded land rental price as an important determining factor when renting land, while 14.34% of them revealed that unreasonable land rental price had become a mainly negative factor affecting their land rental activities. It is obvious that the rising land rental price has become an important part of the cost of agricultural production, which has a largely negative impact on land rental activities and agricultural competitiveness.

In fact, the capitalization effect of agricultural support policies on land value, land sale price, and land rental price has become an important research topic since the 1960s. Over the



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Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). last decades, the most important agricultural support instruments in developed countries were output price support and agricultural subsidies [3]. Early studies on the capitalization effects of agricultural support policies focused on coupled policies linked to current production decisions. With the implementation of the decoupled agricultural support policies in the United States in the late 1990s and the European Union in 2003, respectively, the focus of policy evaluation has gradually shifted from output price support coupled with current production to decoupled agricultural subsidies that are related to farmland.

It is generally believed that both output price support and agricultural subsidies in theory have a positive effect on land rental price. The most important determinant affecting the capitalization rate of agricultural support policies in relation to land rental price is the price elasticity of land supply [3,4]. Since the land supply is almost completely inelastic, landowners acquire almost all of the policy dividend of output price support or agricultural subsidies by raising land rental price [5–9]. Other determinants are the possibility of substitution between production factors [3,4], the proportion of eligible agricultural area to entitlements [9], different implementation models of subsidies [10], and transaction costs due to information asymmetry in the land market [7]. Moreover, agricultural subsidies tied to farmland have a higher capitalization effect on land rental price than that of output price support [11] because output price support has a production effect that the owners of various production factors can share part of the policy dividend [12,13].

However, there are many inconsistencies between empirical results and theoretical predictions on the capitalization effect of agricultural support policies, which are manifested in three aspects: First, output price support has an insignificant or even negative effect on land rental price [14–16]. Second, the degree of capitalization of agricultural subsidies on land rental price varies dramatically across different countries and regions. For example, the capitalization rate of decoupled agricultural subsidies is 11–90% in the United States [12–17], 6–77.8% in original EU member states [18–23], and 18–25% in new EU member states [24,25]. Third, the empirical estimates of the capitalization effects of agricultural support policies are often significantly lower than the theoretical expectations. As mentioned above, the capitalization rate of agricultural support policies on land rental price in the U.S. and European countries ranged from 6% to 90%, and most of them were significantly lower than the expectations in the theory that assumes almost all of the policy dividend will be acquired by landowners.

Furthermore, most theoretical and empirical studies focused on the land transaction markets in the United States and the European countries, and little attention has been paid to the land rental market in China. Moreover, although the policy evaluation of agricultural support policies in China has been extensively studied in terms of agricultural investment, rural labor allocation, sown area of grain, grain output, and agricultural production efficiency, the capitalization effect of agricultural support policies in China has not yet been the subject of fully effective systematic research. To the best of our knowledge, some researchers pointed out that output price support in China has a significant positive effect on land rental price [2,26,27], while the effect of agricultural subsidies in China on land rental price is inconclusive. Some researchers believe that agricultural subsidies do not have a significant effect on land rental price [2,26,28], as the decoupled subsidies in China were allocated to the land contractor [2,28], while Xu and Zhang indicated that agricultural subsidies will decrease the land rental price in China based on the National Fixed Point Survey in 2009 and 2012 [29]. Others found that agricultural subsidies in China will increase land rental price and the capitalization rate of agricultural subsidies also varied dramatically [28,30]. Based on a household survey of 55 villages in Jiangsu Province in China from 2001 to 2007, for every CNY 1 increase in direct subsidies for grain production, the land rental price will increase by CNY 0.97 [28]. In contrast, according to a household survey in 24 provinces in China in 2012, with each 1% increase in agricultural subsidies, the land rental price only increased by 0.087% [30]. In addition, few studies have simultaneously examined the capitalization effect and its consequence of output price support and agricultural subsidies in China.

Revealing the capitalization effect and its consequence of agricultural support policies in China will not only help promote the process of the moderate-scale operation of agriculture but also help enhance the international competitiveness of agricultural products. Therefore, to empirically analyze the impact of output price support and agricultural subsidies on land rental price in the village, this paper complements the existing study in three ways. First, this paper empirically analyzes the capitalization effect of output price support and agricultural subsidies on land rental price based on village-level panel data of 800 villages in 11 provinces from the Chinese Resident Income Survey (CHIP) in 2007 and 2008. Second, this paper reveals the heterogeneity of the capitalization effect of agricultural support policies in the village with weak social relationships or renting land to outsiders. Third, using the mediating effect model, this paper examines whether agricultural support policies can indirectly inhibit the further expansion of land transfer by raising regional land rent.

The structure of the rest of this paper is as follows: Section 2 reviews the evolution of agricultural support policies in China; Section 3 presents the data source, variable selection, and econometric models; Section 4 explains the results of the empirical analysis; and the last section presents the conclusion, discussions, and suggestions of this paper.

2. Background

2.1. Output Price Support Policies

To ensure food security and increase farmers' income, the Chinese government has adopted output price support policies, including the minimum purchase prices for rice and wheat that started in 2004 and 2006, respectively, and the temporary purchase and storage price for maize initiated in 2008. On the one hand, the minimum purchase price for early indica rice was maintained at 1.4 CNY/kg in 2004–2007, and the provinces where the policy was implemented were Anhui, Jiangxi, Hubei, and Hunan, while the minimum purchase prices for mid-late rice and japonica rice were 1.44 and 1.5 CNY/kg, respectively, and the provinces where the policy was implemented were the policy was implemented were Heilongjiang, Jilin, Anhui, Jiangxi, Hubei, and Hunan. On the other hand, the provinces where the minimum purchase price for wheat was implemented have remained unchanged, and these include Hebei, Henan, Shandong, Anhui, Jiangsu, and Hubei. From 2006 to 2007, the minimum purchase price for wheat was 1.44 CNY/kg, while that for red wheat and mixed wheat was maintained at 1.38 CNY/kg.

Since 2008, in order to stabilize grain production and guarantee the reasonable income of farm households, the Chinese government has intensified the implementation of output price support, which has been manifested in three aspects: First, it has not only expanded the provinces where the policy has been implemented, but it has also raised the support standard for rice. Guangxi was added to the provinces of policy implementation for early indica rice, and for mid-late rice, Liaoning, Henan, Jiangsu, and Guangxi were newly added. The minimum purchase price for rice increased by 0.14 CNY/kg in 2008 and increased year by year until 2014. From 2014 to 2016, the minimum purchase prices for early indica rice, mid-late indica rice, and japonica rice were maintained at 2.7, 2.76, and 3.1 CNY/kg, respectively. The second aspect involves increasing the minimum purchase price for wheat. The minimum purchase price for white wheat in 2008 increased by 0.1 CNY/kg, while that for red wheat and mixed wheat increased by 0.06 CNY/kg, which increased year by year until the peak level in 2014 (2.36 CNY/kg), and it was maintained at the highest level from 2014 to 2017. The third aspect involves the implementation of the temporary purchase and storage price for maize in Heilongjiang, Jilin, Liaoning, and Inner Mongolia, which was 1.5 CNY/kg in 2008 and 2009 and increased year by year from 2010 to 2013. In 2014, the temporary purchase and storage price for maize remained the same as that of the previous year, remaining at 2.24 CNY/kg.

In recent years, with the increase in grain stocks and facing huge financial pressure, the Chinese government began to adjust its price support policies for grain crops (such as rice, wheat, and maize) since 2015, which was manifested via the following three aspects:

First, the temporary purchase and storage price for maize was lowered to 2 CNY/kg in 2015, and completely phased out in 2016. Second, the minimum purchase prices for early indica rice and mid-late rice were lowered since 2016 and 2017, respectively. Third, the minimum purchase price of wheat was lowered in 2018.

2.2. Agricultural Subsidy Policies

Agricultural subsidies are another kind of important agricultural support instrument aimed at increasing grain production and improving farmers' incomes. Among them, subsidies for grain production and high-quality seeds were implemented in 2004, while comprehensive subsidies for agricultural inputs were initiated in 2006.

Since the implementation of agricultural subsidies (especially since 2008), the financial support from the central government in China has continued to expand, reaching a peak level of CNY 145.3 billion in 2012. The comprehensive subsidies for agricultural inputs changed dramatically, while the direct subsidies for grain production remained almost unchanged. This is reflected in the following three aspects: First, the direct subsidies for grain production remained stable over the years, from CNY 11.6 billion in 2004 to CNY 14.2 billion in 2006, and remained at CNY 15.1 billion from 2007 to 2015. Secondly, the comprehensive subsidy for agricultural inputs increased significantly in 2008, from CNY 27.6 billion in 2007 to CNY 71.6 billion in 2008, and increased year-by-year to CNY 1078 in 2012. From 2013 to 2015, the comprehensive subsidy for agricultural inputs was maintained at CNY107.1 billion. Third, the subsidy for high-quality seeds increased from CNY 2.85 billion in 2004 to CNY 12.34 billion in 2008 and remained at CNY 20 to 23 billion between 2009 and 2015.

Due to high financial pressures, the central government began to cut the budget level of total agricultural subsidies in 2013. The number of agricultural subsidies fell slightly from 2013 to 2015, from CNY 144.8 billion in 2013 to CNY 141.5 billion in 2015. Furthermore, the Chinese government combined the previous direct subsidies for grain production, subsidies for high-quality seeds, and comprehensive subsidies for agricultural inputs into "agricultural support and protection subsidies" in 2016. Agricultural subsidies fell to CNY 140.5 billion in 2016 and remained at CNY 120.5 billion between 2017 and 2020.

3. Empirical Analysis

3.1. Data Sources

Both micro- and macro-data were used in this paper. The microdata mainly came from the nationally representative Chinese Household Income Projects (CHIP) conducted by the Income Distribution Research Group of the Economic Research Institute of the Chinese Academy of Social Sciences. CHIP surveys were conducted in 1988, 1995, 2002, 2007, 2008, and 2013. Since the sampling frame and the interviewees are completely different among CHIP2002, CHIP2007 and CHIP2013, this paper adopts the village administrative survey databases of CHIP2007 and CHIP2008, in which the data include key issues such as agricultural subsidies, agricultural production, and land rental market in the village. The survey samples were distributed in 11 provinces (including Anhui, Zhejiang, Jiangsu, Hebei, Henan, Hubei, Sichuan, Chongqing, and Guangdong), 70 cities, and 84 counties, involving 800 villages.

According to the evolution of agricultural support policies in China mentioned above, the central government significantly intensified the implementation of output price support and agricultural subsidies in 2008, which is manifested in the expansion of the number of provinces of policy implementation and the increase in output price support for grain crops. Therefore, the village-level panel data of CHIP2007 and CHIP2008 provide a good data basis for identifying the effects of agricultural support policies.

On the other hand, the macrodata of output price support for rice, wheat, and maize and the regions' policy implementation come from the website of the National Development and Reform Commission (https://www.ndrc.gov.cn/, accessed on 21 May 2021). In the databases of CHIP2007 and CHIP2008, the provinces implementing the early indica rice price support are Anhui and Hubei; the provinces implementing the mid-late rice price support are Anhui, Jiangsu, Henan, Hubei, and Sichuan; and the provinces implementing the wheat price support are Hebei, Henan, Anhui, Jiangsu, and Hubei. The provincial sale price of grain crops comes from the "National Compilation of Cost and Revenue in Agricultural Production (2007–2008)". In addition, the rural consumer price index comes from the "China Statistical Yearbook (2008–2009)".

3.2. Variable Selection

The variables used in this paper and their definitions are as follows (Table 1):

- 1. The dependent variables: The land rental price and area of land transfer in the village, which are measured by "the rental price of cultivated land in the village (CNY/mu·year)" and "the area of land transfer paid for a fee in the village". Among them, the land rental price in the village increased from 207.8 CNY/mu in 2007 to 240 CNY/mu in 2008. The area of land transfer paid for with a fee in the village increased from 178 mu in 2007 to 241.2 mu in 2008 (15 mu equals 1 hectare).
- 2. The key independent variable: Agricultural support policies, including output price support and agricultural subsidies. Following Lin and Huang [2], the output price support is measured by using the national intervention price corresponding to the cereal crops with the largest sown area in the village (the provinces where the output support policy is implemented) and the provincial sale price of grain crops in the previous year (the provinces where the output support policy is not implemented). In order to avoid the incompatibility between the price information caused by the differences in the types of cereals in the village, this paper set the output price support as 1 in 2007. Output price support increased from 1 in 2007 to 1.03 in 2008. Agricultural subsidies are measured using the "direct subsidies for grain production, subsidies for high-quality seeds, and comprehensive subsidies for agricultural inputs in the village". The agricultural subsidies increased from 53 CNY/mu in 2007 to 87.7 CNY/mu in 2008.
- 3. The mediator variable, the regional land rent, is measured using the "average land rental price of other villages in the province". The regional land rent increased from 195.3 CNY/mu in 2007 to 240 CNY/mu in 2008.
- 4. The control variables include market return of land, development of land market, agricultural support services provided by the village collective (such as services for irrigation or labor migration), and incidence of natural disasters. Among them, the average yield of grain in the county referred to as market return of land is 407.8 kg/mu. In total, 20% of the villages had land rental activities 5 years ago, while 40% and 10% of the villages provide services for irrigation and labor migration by village collective, respectively. Villages suffering from natural disasters dropped from 60% in 2007 to 40% in 2008.

3.3. Econometric Models

3.3.1. Basic Regression Model

In order to empirically analyze the impact of output price support and agricultural subsidies on land rental price in the village, this paper constructs the following econometric model:

$$r_{it} = \gamma_0 + \gamma_1 P_{(j/k)t} + \gamma_2 X_{it} + \gamma_3 Z_{it} + \varepsilon_{it}^1 \tag{1}$$

where r_{it} is land rental price in *i*th village in *t*th year. $P_{(j/k)t}$ is agricultural support policies, including output price support or average sale price in the *j*th province and agricultural subsidies in the *k*th county. X_{it} is a vector of exogenous control variables that may affect both agricultural support policies and land rental price. Z_{it} is the individual fixed effect. ε_{it}^1 is the error term.

Variables	Definition	Mean				
variables.	Demnition	2007	2008	2007–2008		
Land rental price ^a	Land rental price in the village (CNY/mu·year)	207.8	240.0	224.0		
Area of land transfer	Area of land transfer in the village (mu)	178.0	241.2	209.6		
Output price support ^a	Intervention price or sale price corresponding to the largest sown area of grain crops in the village (2007 = 1)	1.0	1.03	1.01		
Agricultural subsidies ^a	Subsidies for grain production, high-quality seeds, and agricultural inputs (CNY/mu)	53.0	87.7	70.4		
Regional land rent ^a	Land rental price of other villages in the province (CNY/mu·year)	195.3	240.0	217.7		
Market return	Yield of grain in the county (kg/mu)	400.7	414.9	407.8		
Market development	Land rental activities existed in the village 5 years ago. Yes = 1, No = 0	0.2	0.2	0.2		
Irrigation service	Irrigation service provided by village collective. Yes = 1, No = 0	0.4	0.4	0.4		
Migration service	Labor migration service provided by village collective. Yes = 1 , No = 0	0.1	0.1	0.1		
Natural disaster	Village suffered from natural disaster. Yes = 1, No = 0	0.6	0.4	0.5		

Table 1. Definition and descriptive statistics of key variables.

Note: 'a' indicates all values are measured in the real 2008 price deflated by the rural consumer price index from the China Statistical Yearbook (2008–2009), NBSC. 15 mu equals to 1 hectare.

3.3.2. The Mediating Effect Model

To further empirically analyze the agricultural support policies that indirectly affect the area of land transfer in the village through increasing regional land rent, this paper constructs the following mediating effect model:

$$A_{it} = a_0 + a_1 P_{(j/k)t} + a_2 X_{it} + a_3 Z_{it} + \varepsilon_{it}^2$$
⁽²⁾

$$R_{jt} = b_0 + b_1 P_{(j/k)i} + b_2 X_{it} + b_3 Z_{it} + \varepsilon_{it}^3$$
(3)

$$A_{it} = c_0 + c_1 P_{(j/k)t} + c_2 R_{j(t-1)} + c_3 X_{it} + c_4 Z_{it}^p + \varepsilon_{it}^4$$
(4)

where A_{it} is the area of land transfer in the *i*th village in the *t*th year; $R_{j(t/t-1)}$ is land rental price in the *j*th province in the *t*th *or* previous year; Z_{jt}^p is the provincial fixed effect; and ε_{it}^2 , ε_{it}^3 , and ε_{it}^4 are random error terms. In Equation (2), a_1 is the total effect of agricultural support policies on the area of land transfer in the village. In Equation (3), b_1 is the influence of agricultural support policies on the mediator variable (regional land rent). In Equation (4), c_1 and c_2 are the direct effects of agricultural support policies and the mediator variable (regional land rent) on the area of land transfer in the village, respectively. Substituting Equation (3) into Equation (4) can allow one to obtain the mediating effect b_1c_2 of agricultural support policies, that is, the indirect impact of agricultural support policies on the village through affecting the mediator variable (regional land rent). The *Sobel test* is used to examine the significance of the mediating effect (b_1c_2) of agricultural support policies in this paper.

3.3.3. Identification Strategy

Equations (1)–(4) may face endogeneity problems. Theoretically, endogeneity mainly comes from four aspects: measurement error, simultaneity, omitted variables, and sample selection bias. On the whole, measurement error and simultaneity are not the main sources of endogeneity in this paper. On the one hand, the problem caused by measure-

ment error is not serious. The output price support is consistent within the provinces where the intervention policy is implemented, while agricultural subsidy is also consistent within the county. At the same time, the advanced release of output price support and agricultural subsidies is conducive to the formation of price expectations in the land rental market, which helps to avoid the expectation errors in future policies. On the other hand, there will be no problems of mutual causality. Output price support is highly exogenous in the process of decision-making and implementation, and top-down agricultural policy adjustments are not affected by land rental price and area of land transfer in the village. The provincial (rather than village-level) land rental price is used as mediator variable in Equation (3), and the lagged one-year provincial land rental price is adopted in Equation (4), thus avoiding the simultaneity between land rental price and area of land transfer in the same village.

The source of endogeneity in this paper may mainly come from sample selection bias and omitted variables. On the one hand, if there is no land rental activity in the village, the corresponding land rental price cannot be observed. Treating the land rental price in the above-mentioned villages as "rent-free" does not truly reveal the price constraints of land supply and demand faced by transaction partners in the land rental market. After directly removing the village sample that does not present land rental activity, the problem of sample selection bias is likely to occur [14,24]. On the other hand, the omission of variables that simultaneously affect output price support, agricultural subsidies, and land rental price (such as land productivity referred to as market return of land) may overestimate the capitalization effect of agricultural support policies on land rental price [16].

In order to solve the above-mentioned potential endogeneity problems, this article mainly adopts the following five methods: First, the villages that have not yet formed a transaction price in the land rental market are replaced with the lowest land rental price in other villages in the same county to reflect the reserve price of land transaction in that region. Second, a fixed-effect model based on village-level panel data is used to control the time-unvarying and unobserved factors. Third, the yield of grain in the county is used as a proxy variable for market return of land to alleviate the endogeneity caused by omitted variables. Fourth, the "bad control" variables in the econometric models are avoided. The socio-economic factors (such as the proportion of migrant workers in the village and the annual net income per capita of village farmers) that affect the dependent variables (e.g., land rental price and area of land transfer) are also likely to be the outcome variables of agricultural support policies. Meanwhile, the contract structure of the land rental activity (such as the transaction partner, contract duration, contract form, and type of rent payment) and land rental price are mutually and simultaneously determined. If the bad control variables mentioned above are introduced into the econometric model, they will absorb the impact of the key independent variable (agricultural support policies) on the dependent variable (e.g., land rental price and the area of land transfer in the village), which will cause the coefficients of the key independent variable to be estimated with a bias. Finally, output price support, agricultural subsidies, and land rental price are often highly correlated within the same county but less correlated across different counties. Therefore, the clustering robust standard error at the county level was conducted in the regression analysis.

4. Results

4.1. Basic Results

Table 2 is the basic regression results of the impact of output price support and agricultural subsidies on land rental price in the village. To show the robustness of the empirical results, this paper gradually introduces different control variables into the econometric models. The estimated coefficient of output price support and agricultural subsidies correspond to γ_1 in Equation (1). The values of *F* test are significantly different from zero at the 1% statistic level, indicating the fitness of econometric models, which is of significance for further analysis.

X7	Dependent Variable: Land Rental Price									
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)			
Output price support	466.40 **	340.92 **	322.44 **				174.83			
	(179.12)	(160.09)	(154.77)				(145.25)			
Agricultural subsidies				0.61 **	0.48 **	0.45 **	0.39 **			
0				(0.24)	(0.21)	(0.20)	(0.19)			
Market return		0.76 **	0.80 **	× ,	0.63 **	0.69 **	0.65 **			
		(0.32)	(0.33)		(0.30)	(0.31)	(0.30)			
Market development			110.50 **			106.90 **	104.77 **			
-			(46.71)			(45.67)	(45.14)			
Irrigation service			-20.67 *			-19.60 *	-19.48 *			
C			(11.58)			(11.27)	(11.25)			
Migration service			32.86 ***			30.56 ***	31.04 ***			
C			(11.26)			(11.30)	(11.09)			
Natural disaster			18.29			19.60	19.84			
			(17.58)			(17.50)	(17.49)			
Constant	-249.22	-431.74 *	-458.27 *	180.85 ***	-65.68	-115.78	-272.29			
	(181.72)	(219.46)	(238.92)	(16.99)	(121.47)	(136.22)	(210.58)			
Fixed effect	YES	YES	YES	YES	YES	YES	YES			
Observation	1598	1598	1598	1598	1598	1598	1598			
F test	6.78 ***	4.56 ***	3.22 ***	6.44 ***	5.13 ***	3.37 ***	2.94 ***			
R squared	0.019	0.035	0.062	0.034	0.044	0.070	0.072			

 Table 2. Capitalization effects of agricultural support policies on land rental price.

Note: *, **, and *** represent the significance levels of 10%, 5%, and 1%, respectively. Standard errors are clustered at county level in parentheses.

First, output price support increases the land rental price in the village. Output price support has a significant positive impact on land rental price in the village at a statistical level of 5%, and its estimated coefficient is 322.44 (Column 3, Table 2), indicating that with each 1 CNY/kg increase in output price support, the land rental price in the village will rise to about 322.44 CNY/mu.

Second, agricultural subsidies also have a positive effect on land rental price in the village. Agricultural subsidies have a significantly positive impact on land rental price in the village at a statistical level of 5%. The estimated coefficient of agricultural subsidies on land rental price in the village is 0.45 (Column 6, Table 2), indicating that with an additional 1 CNY/mu increase in agricultural subsidies, the land rental price in the village will increase by 0.45 CNY. The capitalization effect of agricultural subsidies is as high as 45%.

Third, the impact of output price support and agricultural subsidies on and rental price in the village has a shading effect. Simultaneously considering output price support and agricultural subsidies in the econometric model, output price support will no longer be significant, while agricultural subsidies still maintain a significant positive impact on the land rental price in the village at a statistical level of 5%, and its estimated coefficient decreases to 0.39 (Column 7, Table 2).

Finally, other control variables also have a significant impact on land rental price in the village. Market return of land has a steady positive effect on land rental price, indicating that the omission of time-varying and unobservable land productivity will lead to a serious problem of omitted variables. Both the development of the land market and labor migration services provided by the village collective have a positive effect on land rental price, while the irrigation service provided by the village collective reduces the land rental price. Meanwhile, natural disasters do not have a significant effect on land rental price.

4.2. Heterogeneity Analysis

For villages with a strong social relationship, the price mechanism of the land market may not function effectively, resulting in a relatively lower land rental price and less area of land transfer paid for with a fee. Based on CHIP data in 2007 and 2008, the land rental price and area of land transfer paid for a fee in the villages with a strong social relationship is 187 CNY/mu and 148 mu, respectively, which is significantly lower than that of villages with a weak social relationship (240 CNY/mu and 236 mu, respectively). Meanwhile, for villages where land rental activity only occurs between farm households within the same village, the land rental price and area of land transfer paid for with a fee are 163 CNY/mu and 136 mu, respectively, significantly lower than that of villages renting land to outsiders (358 and 386 CNY/mu, respectively).

Based on the social relationship in the village and the transaction partner of land transfer, this paper further reveals the heterogeneity of the capitalization effect of output price support and agricultural subsidies. In Table 3, the estimated coefficient values of output price support and agricultural subsidies also correspond to $\gamma 1$ in Equation (1). The values of the *F test* are significantly different from zero at the 1% statistic level.

Variable	Villages with Strong Social Relationship		Villages w Social Rel	Villages with Weak Social Relationship		Renting Land within the Same Village		Villages Renting Land to Outsiders	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Output price support	38.29		434.51 **		-53.52		915.99 *		
	(114.23)		(202.36)		(98.48)		(518.18)		
Agricultural subsidies		0.20 *		0.63 *		0.20		0.60 *	
		(0.12)		(0.33)		(0.12)		(0.35)	
Market return	0.07	0.01	1.17 ***	0.96 **	0.66 **	0.56 **	-0.18	-0.39	
	(0.26)	(0.23)	(0.42)	(0.39)	(0.32)	(0.28)	(0.33)	(0.36)	
Market development	81.33 **	77.58 **	122.94 **	118.06 **	139.72 **	131.26 **	140.85	160.67	
-	(35.35)	(36.56)	(59.98)	(58.34)	(65.57)	(64.05)	(100.11)	(102.73)	
Irrigation service	-70.76 ***	-69.22 ***	-8.72	-7.61	-14.14	-13.43	-67.97 **	-64.70*	
U U	(25.57)	(24.70)	(11.79)	(11.86)	(11.33)	(11.23)	(32.99)	(34.23)	
Migration service	7.53	6.14	37.88 ***	34.48 **	22.94	22.49	21.21	18.41	
5	(8.90)	(8.92)	(13.76)	(14.05)	(14.89)	(14.81)	(29.28)	(30.12)	
Natural disaster	-12.43	-11.30	28.01	29.37	-8.48	-5.39	14.05	4.84	
	(12.06)	(12.20)	(22.36)	(22.19)	(9.14)	(8.61)	(42.23)	(40.40)	
Constant	133.72	182.08 *	-720.14 **	-237.35	-67.94	-96.31	-514.28	451.71 ***	
	(135.76)	(93.61)	(296.85)	(166.24)	(123.73)	(118.20)	(517.88)	(142.97)	
Fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	
Observation	476	476	1122	1122	1099	1099	499	499	
F test	2.53 **	2.56 **	2.78 **	2.59 **	1.94 *	1.91 *	3.34 ***	3.22 ***	
R squared	0.076	0.087	0.083	0.089	0.081	0.089	0.088	0.073	

Note: *, **, and *** indicate significant at the statistical level of 10%, 5%, and 1%, respectively. Standard errors are clustered at county level in parentheses.

On the one hand, for villages with a weak social relationship, output price support and agricultural subsidies can significantly increase the land rental price in the village. For villages with a strong social relationship, output price support has no significant impact on the land rental price (column 1, Table 3), while agricultural subsidies have a significantly positive impact on land rental price in the village at a 10% statistical level (column 2, Table 3). In contrast, for villages with a weak social relationship, both output price support and agricultural subsidies have a significantly positive effect on land rental price in the village (columns 3 and 4, Table 3).

On the other hand, for villages renting land to outsiders, output price support and agricultural subsidy can significantly increase village-level land rental price. For villages where land rental activity only occurs between farm households within the same village, output price support and agricultural subsidies do not have a statistically significant impact on land rental price in the village (columns 5 and 6, Table 3). In contrast, for villages renting land to outsiders, both output price support and agricultural subsidies have a significantly positive impact on land rental price in the village at a statistical level of 10%, and the estimated coefficients are 915.99 and 0.60, respectively (columns 7 and 8, Table 3).

4.3. Results of Mediating Effect

Tables 2 and 3 only provide the above-mentioned capitalization effects of output price support and agricultural subsidies and the scenarios in which they play a greater role. In order to further reveal the potentially negative impact of the capitalization effect of output price support and agricultural subsidies on the area of land transfer in the village, the mediating effect model is adopted in this paper to empirically analyze this mechanism.

Table 4 shows the estimated results of output price support and agricultural subsidies that influence the area of land transfer in the village through increasing regional land rent. The estimated coefficient of output price support and agricultural subsidies in columns 1, 4, and 7 corresponds to a_1 in Equation (2). The estimated coefficient of output price support and agricultural subsidies in columns 2, 5, and 8 correspond to b_1 in Equation (3). The estimated coefficient values of agricultural support policies (including output price support and agricultural subsidies) and mediator variables (regional land rent) in columns 3, 6, and 9 correspond to c_1 and c_2 in Equation (4), respectively. The values of the *F test* in all of the econometric models are significantly different from zero at the 1% statistic level, indicating that the empirical results of the mediating effect model are sufficient for further analysis.

Table 4. Mediating effect of agricultural support policies.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output price support	630.39 *	453.31 ***	106.35				299.08	206.27 ***	69.40
11	(363.17)	(72.65)	(423.36)				(403.40)	(57.01)	(434.51)
Agricultural subsidies				0.98 ***	0.73 ***	0.79	0.87 **	0.65 ***	0.78
Region land rent			-47.66 *** (13.07)	(0.30)	(0.12)	(0.85) -46.65 *** (12.51)	(0.33)	(0.11)	(0.86) -46.61 *** (12.62)
Market return	1.57 ***	0.49 ***	0.60	1.29 ***	0.28 **	0.53	1.23 ***	0.23 **	0.53
	(0.47)	(0.15)	(0.37)	(0.41)	(0.13)	(0.36)	(0.41)	(0.11)	(0.36)
Market development	167.09	9.15	135.09 ***	157.87	2.07	136.91 ***	154.22	-0.45	137.18 ***
1	(114.08)	(7.33)	(41.92)	(113.50)	(5.66)	(41.49)	(113.45)	(5.60)	(41.61)
Irrigation service	54.08	-10.71 **	112.64 ***	56.55	-8.85 **	113.03 ***	56.76	-8.71 **	112.94 ***
-	(36.28)	(4.51)	(38.49)	(36.21)	(3.86)	(38.01)	(36.20)	(3.71)	(38.15)
Migration service	39.37	-3.02	162.56 *	34.47	-6.62	160.76 *	35.28	-6.07	160.26 *
	(42.73)	(4.74)	(89.08)	(43.18)	(4.29)	(86.27)	(43.03)	(4.09)	(87.66)
Natural disaster	2.17	-17.90 ***	118.34 **	5.24	-15.58 ***	116.68 **	5.65	-15.30 ***	116.63 **
	(17.03)	(5.50)	(49.54)	(16.43)	(4.94)	(48.79)	(16.40)	(4.81)	(48.86)
Constant	-1132.33 ***	-432.87 ***	5681.48 ***	-447.18 **	63.03	5641.59 ***	-714.94 *	-121.64 *	5563.52 ***
	(396.16)	(76.76)	(1876.86)	(171.28)	(47.97)	(1568.08)	(423.95)	(71.84)	(1829.37)
Fixed effect	YES	YES	NO	YES	YES	NO	YES	YES	NO
Provincial FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Observation	1598	1598	798	1598	1598	798	1598	1598	798
F test	4.95 ***	13.52 ***	2.78 **	7.78 ***	16.73 ***	4.99 ***	6.55 ***	16.56 ***	5.76 ***
R squared	0.045	0.346	0.083	0.055	0.550	0.124	0.056	0.573	0.124

Note: *, **, and *** indicate significant at the statistical level of 10%, 5% and 1%, respectively. The dependent variable in columns (1), (4), and (7) is land rental price in the village. The dependent variable in columns (2), (5), and (8) is region of land rent. The dependent variable in columns (3), (6), and (9) is area of land transfer in the village. Standard errors are clustered at county level in parentheses.

First, output price support and agricultural subsidies have a significant positive effect on the area of land transfer in the village. On the one hand, the output price support has a significantly positive impact on the area of land transfer in the village at a statistical level of 10% and its estimated coefficient is 630.39 (Column 1, Table 4). For each 1 CNY/kg increase in output price support, the area of land transfer in the village will increase by 630.39 mu. On the other hand, agricultural subsidies have a significantly positive effect on the area of land transfer in the village at a statistical level of 1%, and the estimated coefficient is 0.98 (column 4, Table 4). With an additional 1 CNY/mu increase in agricultural subsidies, the area of land transfer in the village will increase by 0.98 mu. Due to the shading effect of different policies, after considering both output price support and agricultural subsidies in the econometric models, output price support no longer significantly affects the area of land transfer in the village, while agricultural subsidies still significantly and positively affect the area of land transfer in the village at the 5% statistical level and its estimated coefficient drops to 0.87 (column 7, Table 4).

Second, both output price support and agricultural subsidies have a significantly positive effect on regional land rent. On the one hand, the output price support has a significantly positive impact on the regional land rent at a statistical level of 1%, and its estimated coefficient is 453.31 (Column 2, Table 4). For each 1 CNY/kg increase in output price support, the regional land rent will increase by 453.31 CNY/mu. On the other hand, agricultural subsidies have a significant positive effect on regional land rent at a statistical level of 1%, with an estimated coefficient of 0.73 (column 5, Table 4). With an additional 1 CNY/mu increase in agricultural subsidy, the regional land rent will increase by 0.73 CNY/mu. As for the shading effect of different policies, after considering both output price support and agricultural subsidies still positively affect regional land rent at a statistical level of 1%, and the estimated coefficient values of output price support and agricultural subsidies still positively affect regional land rent at a statistical level of 1%, and the estimated coefficient values of output price support and agricultural subsidies drop to 206.27 and 0.65, respectively (column 8, Table 4).

Third, the agricultural support policies have an indirect, negative effect on the area of land transfer in the village by increasing the regional land rent. In columns 1 to 3 of Table 4, the Z score of the *Sobel test* on the mediation effect of output price support is -3.15; in columns 4 to 6 of Table 4, the Z score of the *Sobel test* on the mediation effect of agricultural subsidies is -3.18; in columns 7 to 9 of Table 4, the Z scores of the Sobel *test* on the mediation effect of output price support and agricultural subsidies are -2.58and -3.13, respectively. This means that the mediation effect of output price support and agricultural subsidies indirectly affecting the further expansion of land transfer in the village by raising regional land rent is significant at the 1% statistical level. The regional land rent has a significantly negative effect on the area of land transfer in the village at a statistical level of 1%, with the estimated coefficient ranging from -46.61 to -47.66(columns 3, 6, and 9, Table 4). For each 1 CNY/mu increase in regional land rent, the area of land transfer in the village will decrease by 46.61 mu to 47.66 mu. In contrast, agricultural support policies (including output price support and agricultural subsidies) no longer have a significant influence on the area of land transfer (columns 3, 6, and 9, Table 4) after adding the mediator variable (regional land rent) to the econometric models. Therefore, output price support and agricultural subsidies do not have a significantly direct effect on the area of land transfer in the village, while both of them have an indirect and negative effect on the area of land transfer in the village by increasing the regional land rent at the 1% statistical level, and the regional land rent plays a completely mediating role.

Finally, other control variables also have a significant effect on the area of land transfer in the village and land rental price in the region. On the one hand, market return of land will improve the area of land transfer in the village (columns 1, 4, and 7, Table 4), while development of the land market, irrigation or migration services provided by the village collective, and natural disasters have a significant effect on the area of land transfer in the next year. On the other hand, market return of land will increase the regional land rent, while irrigation services provided by the village collective and natural disasters will decrease it.

5. Conclusions and Suggestions

The capitalization effect of agricultural support policies on land rental price in theoretical and empirical research remains inconclusive. Most existing studies focus on the land markets in developed countries (e.g., the United States and European countries), but less attention has been paid to the capitalization effects of agricultural support policies in developing countries. Based on the panel data of 800 villages in 11 provinces from the Chinese Resident Income Survey (CHIP) in 2007 and 2008, this paper empirically analyzed the capitalization effect of agricultural support policies (including output price support and agricultural subsidies) and its potential impact on the expansion of land transfer. It showed the following: (1) Both output price support and agricultural subsidies in China have a significant positive effect on land rental price in the village. With each 1 CNY/kg increase in output price support, the land rental price in the village will increase by CNY 322.44. With an additional 1 CNY/mu increase in agricultural subsidies, the land rental price in the village will increase by CNY 0.45. (2) For villages with stronger social relationships, the area of land transfer paid for with a fee is smaller, and the land rental price is relatively lower than those with weak relationships. For villages with weak social relationship or renting land to outsiders, output price support and agricultural subsidies can significantly increase the land rental price in the village. (3) Both output price support and agricultural subsidies have a significant positive effect on the area of land transfer in the village and regional land rent, while the regional land rent has a significant negative effect on the area of land transfer in the village. Meanwhile, output price support and agricultural subsidies have a shading effect on land rental price and area of land transfer in the village. Therefore, the capitalization effect of agricultural support policies not only helps to promote the formation of the transaction price mechanism in the land rental market but also inhibits the further expansion of land transfer.

As the original goal of agricultural support policies in China is to increase grain production and improve farmers' income, the capitalization effect of agricultural support policies on land rental price and their indirectly negative impact on the area of land transfer in the village do not indicate the failure of policy design. The empirical results of this paper showed that output price support and agricultural subsidies in China not only substantially increase the subsidized income of land contractors but also have a directly negative impact on the further expansion of land transfer in the village by pushing up the price of regional land rent. Therefore, it is recommended that other policy tools should be introduced in China with the aim of reducing the production costs of land operators based on local actual conditions.

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