Research on rising labor cost and farmer's peanut planting scale under the background of labor allocation

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Abstract

Peanut is an important oil crop in our country, its planting has typical labor-intensive characteristics. The impact of rising labor cost on the peanut planting scale is related to the security of the oil supply. The survey data of 596 peanut farmers in 17 provinces are used for this paper, it attempts to follow the logic line of "rising labor cost - labor reallocation - peanut planting scale", and analyzes the influence of rising labor cost on the decision of farmers' peanut planting scale with different operating scales from two dimensions of adjustment intention and adjustment scale of peanut planting area. The results show that the direction of farmers' peanut planting intention adjustment with different operation scales has significant differences under the rising labor cost. Large-scale farmers tend to increase the scale of peanut planting to reduce unit pro-duction costs and obtain returns to scale; in contrast, small-scale farmers tend to maintain or reduce the scale of peanut farming to generate off-farm income or increase labor productivity. Further research shows that the impact of rising labor cost on the expected adjustment scale of farmers with different operating scales shows obvious nonlinear characteristics. There is a U-shaped relationship between rising labor cost and planting scale that tends to expand of large-scale farmers, and there is an inverted U-shaped relationship between rising labor cost and planting scale that tends to shrink of small-scale farmers. The conclusion is still robust after using the Instrumental Variable method and Heckman two-step method to overcome endogenous problems. In general, rising labor cost force farmers to redeploy family labor resources, leading to the polarization of peanut planting scale between small farmers and scale farmers, to realize the optimal allocation of labor and land factors. Accordingly, this paper puts forward some policy suggestions that guide land transfer orderly, expand non-agricultural employment channels, strengthen the organic connection between small-scale farmers and new types of agricultural businesses, and consolidate the achievements of scale management.

Keywords: Labor cost. Peanut planting scale. Rural-household differentiation.

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1. Introduction

China is the world's largest producer of peanuts, but it is facing enormous pressure from rising labor cost. China's peanut harvest area accounts for 14.6% of the world's peanut harvest area, and the total peanut production accounts for 33.6% of the world's peanut production. The peanut yield level is 2.3 times the world's average peanut yield (FAOSTAT, 2020). In China, peanuts rank first in oil production efficiency among oilseed crops, with 1 acre of peanut producing oil equivalent to 2 acres of rapeseed or 4 acres of soybean. It can be seen from this that peanuts occupy an extremely important and irreplaceable position among traditional oil crops in China. Unlike land-intensive grain crops, peanuts are a typical labor-intensive crop with high labor input requirements and low mechanization levels, so they are strongly constrained by labor factor endowments. Since the outbreak of the "shortage of migrant workers", labor cost has continued to increase, and wage levels in different regions have shown an accelerating upward trend, spreading from the non-agricultural sector to the agricultural sector. From 1998 to 2020, the daily wage of hired workers in China's grain production increased from 18.43 yuan to 137.03 yuan, and the daily wage of household labor increased from 9.6 yuan to 89.77 yuan. The rapid increase in agricultural production costs, especially labor cost, has led to price inversion at home and abroad, which has become an important reason for the decline in competitiveness of domestic agricultural products, such as the typical soybean industry [1]. Inevitably, the peanut industry is facing similar challenges. The rising labor cost have led to a continuous increase in peanut planting costs, a decrease in peanut production capacity, severe market price fluctuations, and a gradual weakening of export advantages, which have seriously constrained the development of the peanut industry. Compared to the cost data of peanuts in China and the United States, the cost of peanut cultivation in China is 84% higher than that in the United States, and the cost difference is still expanding. Among them, labor cost in China account for about 47.3% of the total cost, while labor cost in the United States account for only 8.7%. The huge production and demand gap in the soybean industry determines that the improvement of China's soybean competitiveness cannot be based on achieving basic self-sufficiency as a prerequisite and goal. To avoid falling into the soybean crisis again, it is necessary to attach great importance to the negative impact of rising labor cost on peanut cultivation, make early plans, and ensure the safety of China's oil supply.

The academic community has conducted extensive research on the impact of labor cost on agricultural production and operation. Mainly focused on factors input structure [0], agricultural technology selection [0], income gap between urban and rural areas [**Erro! Fonte de referência não encontrada.**], and other aspects. Its essence is that agricultural production and operation entities will use relatively cheap and sufficient production factors to replace scarce and expensive production factors [0]. Scholars have validated the effectiveness of the above theory using data from the Chinese agricultural sector, and it is generally believed that the development of agricultural mechanization and socialized services has a labor factor constraint relief effect [0]. However, this viewpoint is more applicable to large field crops such as grain, and coupled with the influence of the national food support policy system, there is an implicit prerequisite in the production process. Once the production process reaches scale, the use of developed agricultural machinery technology or mature agricultural machinery operation service markets can achieve widespread, sustained, and effective substitution of machinery for labor. However, peanuts are a typical labor-intensive crop, and they have fully commercialized characteristics, with their prices largely determined by the market. Unlike general grains, peanuts bloom on the ground, bear fruit underground, and harvest fruits from the soil. They are often planted on slopes, ridges, corners, sandy and windy areas, resulting in complex and difficult mechanical operations, which raises the threshold for introducing alternative technologies. At present, the mechanization level of peanuts lags behind the three main grains, especially in the harvesting process [0]. The reality of peanut production is that while self-purchasing agricultural machinery or purchasing social services to replace labor, there is still a widespread presence of hired workers. Therefore, compared to food crops, peanuts are more susceptible to the impact of rising labor cost. Farmers have three factors of endowment: labor, land, and capital. In the context of increasing labor cost constraints, farmers can also make positive responses by re-optimizing limited land resources. Some scholars have focused on the impact of labor cost on the scale of land management [0], with a focus on discussing crop planting structure adjustments [0]. However, in addition to the choice between different crops, the decision of planting scale farmers also includes the expected planting scale of existing crops, which is the core issue discussed in this article. So, how will farmers choose the scale of peanut planting under the rigid constraint of rising labor cost? Especially, few scholars have provided answers to the question of how the increase in labor cost will affect farmers' expected changes in peanut planting scale. Furthermore, most existing research is based on the assumption of homogeneity among farmers, and there is still insufficient discussion on the impact of different types of farmers.

With the formation of a socialized division of labor system, diversification of business entities has become a fundamental feature of China's modern agricultural management system. Farmers with different operating scales have different livelihood goals, production characteristics, and behavioral logic, which has been recognized by the academic community [0]. Therefore, it is necessary to simultaneously explore the peanut planting decisions of small-scale farmers and identify the logical relationships followed by their respective behaviors. The above three shortcomings provide research space for this article.

In the medium to long term in the future, as long as China's economy maintains stable growth, labor cost will continue to rise. The individual-level production and operation decisions of farmers ultimately affect the moderate-scale operation process in China. Ensuring a certain scale of peanut planting area is the key to ensuring the supply security of China's peanut industry, and is also a prerequisite for promoting peanut production and farmers' income. Based on this, this article uses survey data from 596 peanut growers in 17 provinces across the country to attempt to examine the behavioral logic of small-scale farmers and large-scale farmers along the logical mainline of "rising labor cost → labor resource allocation → peanut planting scale". From the dimensions of willingness to adjust peanut planting area and adjustment scale, the article examines the impact mechanism of rising labor cost on the decision-making behavior of peanut planting scale among farmers with different operating scales. The expected marginal contribution of this article lies in, firstly, placing the increase in labor cost, the allocation of rural labor force, and the scale of land management within a unified analytical framework, enhancing the understanding of the impact of "bounded rationality" of rural behavior on individual business decision-making, and providing a theoretical explanation for achieving optimal allocation of land and labor factors. Secondly, by fully considering the heterogeneity of resource endowments and economic activities of farmers with different operating scales, the economic mechanism and formation mechanism of peanut planting scale adjustment strategies for small-scale farmers and large-scale farmers have been clarified, which to some extent breaks through the limitations of existing literature based on the assumption of homogeneity of farmers. Thirdly, the theoretical hypothesis is empirically tested using the national survey data of peanut growers. The relevant conclusions provide empirical evidence to guide farmers to adjust their peanut planting scale reasonably and promote moderate scale management of peanuts. They have reference values for different types of farmers to implement classified policies and ensure self-sufficiency and oil safety in China.

2. Analytical Framework

Factor prices are a specific manifestation of factor endowments, and the changes in relative prices between factors reflect the scarcity of factors, leading agricultural operators to reconfigure household resource endowments, thereby determining the input and substitution status of different factors. According to the neoclassical theory of farmer behavior, it is assumed that farmer production decisions are based on economic rationality. So, land transfer and moderate-scale operation follow the same decision-making strategy, which is to achieve the optimal allocation of household labor and other factors to obtain the best economic benefits or maximum economic efficiency [0]. For peanut cultivation, the direct reflection of the increase in labor costs is the change in cost-benefit, which indirectly affects the efficiency and direction of factor allocation in household management for farmers. The deep-seated effect lies in moderate scale management under resource constraints, which is essentially balancing the relationship between people and land [0]. Under the same external conditions, the differences like the actors directly determine the differences in their behavioral motivations. There are significant differences in the cost accounting logic of labor input for farmers of different business scales and different family members within a certain farmer, resulting in significant differences among various entities in achieving their own maximum interests and cost minimization, leading to differentiated decision-making behaviors for the scale of flower planting[0]. Next, based on the perspective of household labor force reconfiguration, this article explores the peanut planting scale adjustment strategies for small-scale farmers and large-scale farmers under the constraint of rising labor cost.

For small-scale farmers, the scale of peanut cultivation is relatively small, mainly to meet their own needs, and agricultural activities are completed independently by family members, with less investment in agricultural production. Therefore, the exit cost of peanut cultivation is relatively low, and the adjustment decisions of labor and land factors are more flexible. Although the cost accounting of household-owned labor is not suitable for estimating based on market labor prices, there is also the opportunity cost of household labor. As labor costs rise, there are two explanations for the willingness of small-scale farmers to plant peanuts driven by maximizing profits. One is based on the opportunity cost of agricultural production, farmers weigh between agriculture and non-agricultural industries to adjust labor allocation. Due to the widening income gap between labor factors in the agricultural and non-agricultural sectors, the opportunity cost of engaging in agricultural production continues to

increase. Under the guidance of maximizing household income, rational farmers will spontaneously reduce their farming time and instead increase it until the marginal income of agricultural production labor equals the marginal income of non-agricultural sector labor [0]. The second is based on the labor cost of agricultural production, where farmers balance between land-intensive crops and labor-intensive crops to adjust labor allocation. Different crops have different demands for labor factors, such as land-intensive crops which have relatively low demands for labor quantity and intensity. Therefore, when the input of agricultural production labor exceeds the actual operating capacity of households, farmers can effectively reduce the number of labor inputs and reduce labor intensity by reducing the planting area of labor-intensive crops (such as peanuts) and correspondingly increasing the planting area of land-intensive crops, thereby releasing more labor to go out for employment and obtaining more non-agricultural income. The above two explanations are not completely disconnected. Under the combined effect of rising labor cost, small-scale farmers tend to reduce or maintain the scale of peanut cultivation.

Next, further analyze the potential impact of rising labor cost on the decision-making process for reducing the scale of small-scale farmers. From the perspective of resource allocation, the external market determines the allocation of labor resources in time and space, while the internal division of labor determines the allocation of labor resources in terms of channels. In the part-time labor resource allocation model of half farming and half working, family members often consist of young and middle-aged male laborers (the main labor force) who work locally (in the county and surrounding counties and cities) or go out (in provincial capitals and other large cities) for work, while auxiliary labor forces such as the elderly and women (whose labor opportunity cost is zero) mostly stay at home for farming. When labor costs rise at a low level, non-agricultural income is also relatively low, and the main labor force can come home to help during busy farming hours, combined with auxiliary labor input. The optimal strategy for maximizing household income at this stage is to work outside while balancing agricultural production, increasing income while reducing risks [0]. If it is to adjust the crop planting structure, and the household's labor force can balance the existing crop planting proportion, the situation is similar. At this point, the impact of rising labor costs on the scale reduction of farmers is weakened. When the labor cost increases beyond a certain threshold, the opportunity cost for the main labor force to go home to help or for a small number of workers, change jobs, or hire workers is higher, resulting in a sharp increase in hidden labor costs. The rigid constraint of the disposable labor force in households is strengthened, which will determine the boundary of cultivation scale and greatly reduce the

motivation of farmers to plant peanuts. Especially in situations where the production process is not completely outsourced, farmers always need to complete some aspects of agricultural production on their own, and rigid labor constraints still exist. The essence of part-time production is the spatiotemporal allocation of labor resources in rural households under the condition of inconsistent labor time and agricultural production time. At this point, the impact of rising labor costs on the scale reduction of farmers is enhanced, and farmers will choose to transfer land or adjust the crop planting structure.

For large-scale farmers, agricultural product sales revenue is the main source of household income. In the process of continuously expanding the operating area through land transfer, there are two important changes in the endowment of household factors for farmers: first, a change in the labor structure, shifting from relying mainly on self-owned labor or short-term seasonal employment to relying mainly on hired or long-term employment, which leads to an increase in total labor costs [0]; The second is to improve the level of productive fixed assets and have flexible additional investment, especially by purchasing specialized production equipment such as flower picking machines, drying machines, etc. So, under the dual constraints of contractual relationships (land transfer, employment, etc.) and the high value and specificity of productive investment, it is easy to generate "sunk costs" of rent and "hidden losses" of idle agricultural machinery and equipment. Therefore, the exit cost of peanut cultivation is relatively high, which means that peanut cultivation has a significant inertia, and its production decision-making behavior faces difficulties in turning around due to the difficulty of the ship. Indeed, compared to path dependence, the decision of farmers to plant varieties ultimately depends on maximizing profits. Under unchanged other production conditions, economic crops have greater profit margins than grain crops, and it is not cost-effective for farmers to adjust their crop planting structure. In 2020, the average net profit per mu of the three main grains was 47.14 yuan, while the average net profit per mu of peanuts was as high as 457.06 yuan. Therefore, considering the cost-benefit of production and operation activities comprehensively, under the guidance of cost minimization, large-scale farmers with certain capital strengths tend to expand their business scale to improve the marginal return on land and obtain better agricultural operation returns through the scale effect of peanut planting.

Next, further analyze the potential impact of rising labor cost on the decision to increase the scale of large-scale farmers. The extent to which a large-scale farmer will expand its business scale is determined by the organic composition of its capital, which is influenced by the magnitude of cost changes between labor input and productive investment. When labor

costs rise at a low level, the cost of hiring is lower, and additional investment to replace manual work lacks economic efficiency. That is, the relative price of labor input/productive investment is lower, and labor-intensive production methods have more advantages. Because production operations still rely on hired labor, the increase in labor costs puts pressure on farmers to reduce profits. Therefore, the motivation for farmers to further expand their transfer scale is insufficient, and the promotion effect of rising labor costs on farmers to expand their business scale is quite limited. At this time, the impact of the increase in labor costs on the scale adjustment of farmers is showing a downward trend. When labor costs rise at a high level, the cost of hiring is higher, and the advantage of adding productive investment to replace manual labor becomes more prominent. That is, the relative price of labor input/productive investment is higher, and capital-intensive production methods have more advantages. And as labor costs continue to rise, farmers have a stronger willingness and larger scale to add investment. Because economies of scale can compensate for the production and operation costs brought about by investment in agricultural machinery and equipment, as well as the agricultural land transfer costs caused by scale expansion. Even if the equipment investment and operation scale do not match due to the inseparability of agricultural machinery, farmers can improve asset utilization efficiency and obtain productive social service benefits by providing paid agricultural machinery services. The logic followed by large-scale operation is to reconstruct the connection between labor and capital factors according to the relative changes in factor endowments. At this point, the impact of rising labor costs on increasing the scale of farmers is on the rise, and farmers are more likely to transfer land on a large scale.

Based on the above analysis, incorporating labor resource allocation into the analysis framework is the key to clarifying the decision-making behavior of farmers in planting. Farmers make rational choices based on their comparative advantages in family resource endowments. Specifically, rising labor cost will induce farmers to reconfigure their household labor resources, thereby encouraging them to further optimize their limited land resources. The impact of rising labor cost on the different scales farmers by planting peanuts shows a reverse trend, that is, the impact of rising labor cost on the decision to reduce the scale of small-scale farmers shows a trend of first decreasing and then increasing, and the impact on the decision to increase the scale of large-scale farmers shows a trend of first decreasing and then increasing. Based on this, this article proposes the following research hypotheses:

H1: Rising labor cost has a negative impact on the cultivation of peanuts by small-scale farmers, and there is an inverted U-shaped relationship between labor cost and the reduced area of small-scale farmers.

H2: Rising labor cost has a positive impact on the cultivation of peanuts by large-scale farmers, and there is a U-shaped relationship between labor cost and the increased area of large-scale farmers.

3. Materials and Methods

3.1. Data sources

The data comes from the expert research group of industrial economic positions in the national modern agriculture (peanut) industry technology system. In 2022, the research group conducted a questionnaire survey on peanut growers nationwide, covering 17 provinces, cities, and autonomous regions, including Henan, Shandong, Hebei, Jiangsu, Anhui, Liaoning, Jilin, Shanxi, Xinjiang, Guizhou, Fujian, Sichuan, Jiangxi, Guangdong, Guangxi, Hubei, and Hunan, taking into account both the main and nonmain peanut production areas. The peanut planting area in the province where the sample is located accounts for 95% of the national peanut planting area, and the yield accounts for 96.5% of the national peanut planting area, which can better reflect the national peanut planting situation. Field research relies on various peanut testing stations and adopts a stratified random sampling method. 3-5 sample counties are selected from each city where the testing stations are located, 1-2 sample townships are selected from each sample county, 1-2 sample villages are selected from each sample township, and 5-10 sample farmers are randomly selected from each sample village, ensuring the randomness and reliability of the samples. After later review and organization, 596 valid questionnaires were finally formed, with an effective rate of 98.3%. After calculation, the sample peanut yield is about 525 kilograms per mu, while the peanut yield in the surveyed area is about 510 kilograms per mu, indicating that the sample has good representativeness.

The production and operation areas are the main criterion for characterizing the scale differentiation of farmers. The World Bank defines small-scale farmers as those with a business scale of less than 2 hectares (30 acres); The main data bulletin of the third national agricultural census in 2017 stated that the standard for large-scale households in the planting industry is 100 acres or more. However, at present, the scale of peanut cultivation by Chinese farmers is relatively small, making it difficult to meet the above standards. Therefore, based on actual research and in-depth characterization of the distribution characteristics of farmer

business scale, following the principle of statistical grouping, this article defines small farmers with a planting area less than 25 acres and large-scale households with a planting area greater than or equal to 25 acres. The result of such grouping reflects the production practice of peanut management scale in China. The grouping results show that small-scale farmers account for 66.3% of the total sample size, while large-scale farmers account for 33.7% of the total sample size. The two types of farmers exhibit different production and management characteristics and household livelihood strategies, resulting in a qualitative difference between small-scale farmers and large-scale farmers.

Table 1 reflects the basic situation of the production and operation characteristics of small-scale farmers and large-scale farmers. According to the results of the questionnaire survey, the number of labor force among large-scale farmers is significantly less than that of small-scale farmers, while the peanut planting area of large-scale farmers is significantly more than that of small-scale farmers, and the difference between the two is tested by t-test. From this, it can be seen that the number of self-owned labor force and their respective production and operation scales do not match between small-scale farmers and large-scale farmers. Small-scale farmers have a rich amount of self-owned labor force but their business scale is too small, and the surplus labor force tends to seek more employment opportunities; However, large-scale farmers have a shortage of their labor force, but they need to balance large-scale operations and have to rely on external labor markets to obtain paid employment, including fewer long-term employees and more flexible seasonal employees. Further observation reveals that the phenomenon of large-scale farmers hiring workers is more common, with a larger share of labor costs. Among them, large-scale farmers have more long-term employees, while small-scale farmers have almost no long-term employees. In addition, large-scale farmers have stronger material capital than small-scale farmers, and the average productive fixed investment of large-scale farmers is 7.5 times that of surveyed small-scale farmers. The proportion of labor force engaged in non-agricultural work in small-scale farmers is significantly higher than that of large-scale farmers, indicating that small-scale farmers have a higher level of labor force allocation in the non-agricultural sector, and compared to local employment, going out for employment has become the main choice for non-agricultural labor force in small-scale farmers. Finally, the proportion of agricultural operating income for small-scale farmers is relatively low, and the characteristics of part-time operation are obvious; Large-scale farmers mainly rely on agricultural operating income, with obvious characteristics of specialized and commercialized operations. Through comprehensive analysis, it can be seen that the actual production and operation situation of

small-scale farmers and large-scale farmers under the background of rising labor cost is consistent with the previous theoretical analysis.

Table 1: Characteristics of sample farmers.

Index	Small-scale farmers	Large-scale farmers	Mean difference
Number of household labor (person)	3.26	2.84	0.42***
Peanut planting area (mu)	5.63	43.37	-37.73***
Employee cost proportion (%)	8.54	42.72	-34.17***
Value of productive fixed assets (10000 yuan)	2.46	13.78	-11.32***
Nonfarm household labor proportion (%)	51.40	12.83	38.57***
Proportion of agricultural income (%)	45.03	78.40	-33.38***

3.2. Variable declaration

(1) Dependent variable: Peanut planting adjustment decisions expected by farmers, including willingness and scale of planting area adjustment. In the actual survey questionnaire, farmers' expected willingness to adjust peanut planting area includes three situations: increasing planting area, keeping it unchanged, and reducing planting area. According to the previous description and statistics, the increase in planting area will be assigned a value of 1, while others will be assigned a value of 0.

(2) Core explanatory variable: Labor cost. Previous studies have typically used household labor daily wages and employee wages to measure labor cost [0], but household labor daily wages are calculated based on annual income and are not related to the labor market. Therefore, using employee wages to measure labor cost is more reasonable. However, there are significant fluctuations in the wages of hired workers in peanut cultivation. Firstly, due to the seasonal impact of agricultural production, the demand for labor during the busy farming season is much greater than during the idle farming season, resulting in frequent occurrence of hired workers during the busy farming season; Secondly, due to the significant differences in labor intensity between different planting stages, the amount of labor used in the harvesting stage is significantly higher than in other stages, resulting in significantly

higher wages for employees in the harvesting stage compared to other stages. Taking all factors into consideration, this article selects the wages of peanut farmers during the busy farming season as a proxy variable for labor cost. Specifically, the wages of hired workers are weighted by the amount of labor involved in land preparation, sowing, and harvesting, and are obtained through their weighted average.

(3) Control variables: including the age of household head, educational level, planting area, labor force, machinery service prices, peanut prices, land rent, and alternative crop prices. Farmers often adjust their planting decisions based on the comparative benefits between different crops. The specific calculation formula for the comprehensive price of peanut alternative crops is as follows:

$$P_{s,t-1} = \sum_{i=1}^{s} \left(P_{i,t-1} \times \frac{Q_{i,t-1}}{\sum_{i=1}^{s} Q_{i,t-1}} \right)$$

In equation (1), $P_{s,t-1}$ represents the comprehensive substitute crop price of peanut in period t-1, $P_{i,t-1}$ represents the price of the i-th substitute crop in period t-1, and $Q_{s,t-1}$ represents the yield of the i-th substitute crop in period t-1. There is diversity in the alternative crops for peanuts. Based on the size of the sowing area and the actual possibility of substitution, rice, corn, soybeans, and cotton are selected as alternative crops for peanuts. The comprehensive price of peanut alternative crops is obtained by weighting according to formula (1). The comprehensive substitute crop prices obtained in this way can internalize the price changes per unit area between substitute crops. There are differences in the selection of alternative crops for peanuts in different regions, subject to actual farmer surveys.

The specific variable definition, assignment, and description statistical results are shown in Table 2.

Table 2: Descriptive statistics of variables.

Variable	Unit	Small-scale farmers		Large-scale farmers	
		Mean	SE	Mean	SE
Dependent variables					
Willingness to adjust planting area	Expand=1, Other=0	0.13	0.34	0.69	0.46
Adjustment scale of planting area	mu	-3.33	4.78	19.01	13.60
Core explanatory variable					
Labor cost	yuan/day	182.54	16.91	178.61	19.05
Control variables					
Age	year	56.34	7.64	50.78	7.80
Education level	year	6	3.61	6.81	2.93
Peanut planting area	mu	5.63	4.47	43.37	38.83
Labor input aged 16-65	person	3.26	1.49	2.84	1.28

Mechanical service price	yuan / mu	152.85	14.59	143.13	16.88
Peanut price	yuan / jin	3.92	0.82	4.39	0.76
Annual cost of land transfer	yuan / mu	677.59	178.15	753.23	178.05
Peanut substitute crop price	yuan / jin	1.68	0.17	1.63	0.19

3.3. Model setting

The willingness of farmers to adjust their planting area belongs to a typical binary variable, and the commonly used econometric analysis methods are the Probit model and Logit model. There is no significant difference in the estimation results between the two methods. The difference lies in the different connection functions. The Probit model corresponds to the standard normal cumulative distribution function, while the Logit model corresponds to the logical distribution cumulative distribution function. This article selects the Probit model to analyze the impact of rising labor cost on farmers' willingness to adjust their peanut planting area. The specific model settings are as follows:

$$P(y_i = 1|x) = \phi(\beta_0 + \beta_1 X_1 + \beta_2 Z_i)$$

In equation (2), Φ as a standard normal cumulative distribution function, y_i =1 indicates that farmers choose to increase their planting area, and y_i =0 indicates that farmers choose to keep the planting area unchanged or reduce it. X_1 is the labor cost, and Z_i are the control variables, β_0、β_1 and β_2 are the coefficients to be estimated.

Based on the willingness of farmers with different operating scales to adjust the peanut planting area, the expected adjustment scale of farmers is further taken as the dependent variable, and a multiple regression model is used to analyze the impact of rising labor cost on the adjustment scale of peanut planting area of farmers. The specific expression form is:

$$S_i = \beta_0 + \beta_1 X_1 + \beta_2 X_1^2 + \beta_3 Z_i + \varepsilon_i$$

In equation (3), S_i represents the adjustment scale of peanut planting by farmers. Specifically, small-scale farmers are represented by the expected reduction in the peanut planting area, including the transfer to other farmers and the internal planting of other crops within the household. If it remains unchanged, it is zero; expressed as the expected increase in peanut planting area for large-scale farmers. X_1 is the labor cost, X_1^2 is the square term of labor cost, aiming to test whether the increase in labor cost has a non-linear impact on its adjustment scale; Z_i is the control variable, as above. β_0、β_1、β_2 and β_3 are the coefficients to be estimated, and ε_i is a random perturbation term.

4. Results

4.1. Baseline results

Table 3 presents the estimated impact of rising labor cost on the willingness of farmers with different operating scales to adjust their peanut planting scale. Overall, most of the variables studied in this article have passed the significance test, and the coefficient signs of each variable are consistent with the expected direction of influence.

Table 3: Regression results of the impact of rising labor cost on farmers' willingness to adjust peanut planting.

Variable	Small-scale farmers	Large-scale farmers
Labor cost	-0.0288*** (0.0078)	0.0242*** (0.0067)
Age	0.0660*** (0.0181)	-0.0038 (0.0146)
Education level	0.0209 (0.0361)	-0.0203 (0.0388)
Peanut planting area	-0.0008 (0.0380)	0.0101** (0.0045)
Labor input aged 16-65	0.4692*** (0.0922)	0.0925 (0.0790)
Mechanical service price	-0.0478*** (0.0099)	-0.0085 (0.0065)
Peanut price	1.0322*** (0.1900)	0.4019*** (0.1485)
Annual cost of land transfer	-0.0033*** (0.0008)	-0.0021** (0.0009)
Peanut substitute crop price	-2.4062** (0.9608)	-2.6935*** (0.7900)
Constant	6.6300* (3.4160)	1.5396 (2.3529)
Sample size	395	201
Wald test value	122.67	56.45
Prob > chi2	0.0000	0.0000
Pseudo R^2	0.6588	0.3011

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

4.1.1. The impact of rising labor cost on the willingness of farmers of different operating scales to adjust peanut planting

The estimated results show that the impact of labor cost on the willingness of small-scale farmers to adjust peanut planting is negative, while the impact on the willingness of large-scale farmers to adjust peanut planting is positive, and both have passed the 1% significance test. This result indicates that farmers of different operating scales have different decision-making behaviors when dealing with the increase in labor cost in peanut planting. Small-scale farmers tend to maintain or reduce peanut planting areas, while large-scale farmers tend to increase peanut planting areas. This validates research hypotheses 1 and 2.

Adjustment willingness of small-scale farmers: Due to the lower investment return rate of peanut production compared to the non-agricultural industry return rate, the increase in labor cost will induce farmers to adjust the allocation of labor factors in agriculture and non-agricultural industries. Combining individual comparative advantages and comparing the expected income gap, household labor gradually enters the non-agricultural industry, and the labor force engaged in peanut cultivation decreases under factor endowment constraints, including a dual reduction in both quantity and quality of labor. When the surplus labor supply of households can still meet the labor supply required for peanut production under the existing land management scale, farmers will choose to maintain the current scale. However, when the surplus labor supply of households cannot meet the current labor supply required for peanut production, farmers will choose to reduce the scale of peanut cultivation and rent some land to other farmers to obtain rent; Or adjust the distribution of surplus labor in the agricultural planting structure within households, and switch to crops with lower labor input and higher levels of mechanized or socialized services. Therefore, under the guidance of the goal of maximizing income, small-scale farmers tend to maintain or reduce the scale of peanut cultivation, to release more labor force to engage in non-agricultural industries, obtain more non-agricultural income, or improve the labor productivity of agricultural production.

Adjustment willingness of large-scale farmers: Although increasing employee input and purchasing productive assets can solve the accumulation of labor and capital factors required for significant expansion, they face high exit costs, especially the surge in labor cost. At this point, an effective way to alleviate the impact of rising labor cost is to further expand the scale of operations, so that the input costs of indivisible elements (such as irrigation facilities, agricultural machinery, etc.) can be shared, reducing the fixed cost of unit output, and using economies of scale to increase marginal benefits, making production more profitable. In this process, large-scale farmers are accompanied by obvious production and operation advantages. Firstly, many agricultural preferential policies are tilted towards large-

scale operation entities; Secondly, if there is overcapacity in fixed investment, large-scale farmers can provide paid operational services to small-scale farmers to recover investment costs; Thirdly, land integration facilitates unified operations and effectively reduces production and operating costs. Therefore, under the guidance of profit maximization, large-scale farmers tend to expand the scale of peanut cultivation to reduce unit production costs and obtain scale returns.

4.1.2. The impact of controlling variables on the willingness of farmers with different operating scales to adjust peanut planting

The coefficient symbols of the vast majority of control variables meet expectations. Age has a significant positive impact on the willingness of small-scale farmers to adjust, indicating that the older the head of household, the more inclined they are to expand the scale of peanut cultivation. The possible reason is that the price of peanuts is relatively high, and the planting income is much higher than the three major staple foods. For elderly farmers who lack employment opportunities outside, it is a good choice with low risk and stable income, which can play a "bottom line" role in family livelihood. The planting area only has a significant positive impact on the adjustment willingness of large-scale farmers, indicating that the larger the existing peanut planting scale, the more inclined farmers are to further expand their production and operation. The quantity of labor only has a significant positive impact on the willingness of small-scale farmers to adjust, while the price of mechanical services only has a significant negative impact on the willingness of small-scale farmers to adjust. The possible reasons are consistent with the previous analysis. Small-scale farmers invest in their labor force, with a small scale of productive investment. Mechanized production mainly relies on purchasing agricultural machinery services; The labor input of large-scale farmers is mainly composed of hired workers, and the scale of productive investment is large. Even if purchasing agricultural machinery services, due to the large planting scale and relatively contiguous fields, the labor service prices that need to be paid are relatively low. Whether there are small-scale farmers or large-scale farmers, peanut prices have a significant positive impact on their willingness to adjust, while land rent and substitute crop prices have a significant negative impact on their willingness to adjust. This means that the higher the price of peanuts, the lower the land transfer cost, and the lower the price of alternative crops, the more farmers are inclined to increase the peanut planting area.

4.2. The impact of rising labor cost on the adjustment of peanut planting scale among farmers of different operating scales

Table 4 presents the estimated impact of rising labor cost on the expected adjustment of peanut planting areas for farmers of different operating scales. Overall, most variables have passed the significance test, and the coefficient signs of each variable are consistent with the expected direction of influence. To ensure the reliability of the econometric analysis results mentioned above, the model is estimated and further U-shaped relationship testing is performed using the "utest" command. In this testing method, the original hypothesis is "there is no (inverted) U-shaped relationship", and the alternative hypothesis is "there is (inverted) U-shaped relationship"[0], where small-scale farmers correspond to the inverted U-shaped test and large-scale farmers correspond to the U-shaped test. The utest test results of both small-scale farmers and large-scale farmers models reached a significance level of 1%, indicating that the U-shaped relationship between the labor cost set by the model and the expected adjustment scale of farmers is valid, further confirming the non-linear impact mechanism of rising labor cost on the adjustment decision of peanut planting scale of farmers. The coefficient symbols and significance levels of most control variables are consistent with the estimated results of the peanut planting scale adjustment willingness model of farmers, and will not be further elaborated in the following text.

Table 4: Regression results of the impact of rising labor cost on farmers' peanut planting adjustment scale.

Variable	Small-scale farmers	Large-scale farmers
Labor cost	0.7951*** (0.2946)	-2.8336*** (0.3002)
Labor cost square	-0.0022*** (0.0008)	0.0078*** (0.0008)
Age	0.0753*** (0.0281)	0.0739 (0.0645)
Education level	-0.0589 (0.0563)	-0.0416 (0.1236)
Peanut planting area	-0.2048*** (0.0517)	0.0061 (0.0057)
Labor input aged 16-65	0.0777 (0.1265)	0.1237 (0.2417)
Mechanical service price	0.0021 (0.0137)	0.0308 (0.0232)
Peanut price	0.7273*** (0.2647)	1.3262** (0.5783)
Annual cost of land transfer	-0.0057*** (0.0012)	-0.0047 (0.0039)
Peanut substitute crop price	-11.5157*** (2.0199)	-52.6950*** (3.6054)
Constant	-56.8209** (28.0683)	346.9416*** (29.8064)
Sample size	343	139
R^2	0.4505	0.9305

4.2.1. The impact of rising labor cost on the decision of small-scale farmers to reduce their scale

In the decision-making equation for reducing the scale of small-scale farmers, the coefficient of labor cost is significantly positive, while the coefficient of the square term is significantly negative. This indicates that the effect of labor cost on farmers' expected reduction in area has shifted from negative to positive, indicating an inverted U-shaped relationship between labor costs and the reduced planting scale, further verifying hypothesis 1. Through calculation, it was found that within the range of labor cost<180.7 days * person/yuan, the impact of rising labor cost on the decision-making of small-scale farmers to reduce their scale shows a downward trend; Within the range of labor cost ≥ 180.7 days * person/yuan, the impact of rising labor cost on the decision of small-scale farmers to reduce their scale is on the rise. Under other unchanged conditions, the impact of rising labor cost on the expected reduction of area for small-scale farmers initially decreases and then increases.

When labor cost is at a low level and there is room for increase, that is, in the first half of the labor cost increase, the opportunity cost for the main labor force in households to engage in peanut production is relatively low, and farmers are not willing to give up peanut production on a large scale. Peanuts also have functions such as consumption, oil extraction, and feed production. Choosing to work and engage in agriculture is the most beneficial strategy for families, and such labor allocation decisions can achieve the maximization of total household income. Therefore, the impact of rising labor cost on the reduction of area for small-scale farmers in the left range of the turning point is becoming smaller and smaller.

However, when labor cost exceed a certain threshold and enter a high upward space, the opportunity cost for the main labor force of households to engage in agriculture is higher, especially the relatively high explicit transportation costs and potential implicit unemployment costs. During the actual research process, it was found that the phenomenon of "even if peanuts make money this year, they will no longer be planted next year" is very common. For example, Farmer A is an excellent carpenter who usually follows the decoration team to do decoration in the provincial capital city. A few days ago, I went home to help collect peanuts. Unexpectedly, during this period, the decoration team took on the decoration work, but the "big worker" quota was gone. When I finished collecting peanuts and returned to the decoration team, I could only take the money of a "small worker", which was 150 to

300 yuan different from the daily salary of my colleagues. In addition, going home and having to ask for leave from the boss, tinkering on the road, as well as transportation and food expenses, farmer A feels that it is not only "too troublesome" but also "not worth the loss". This uncertain and intermittent demand for production operations makes it difficult for rural labor to frequently transfer in the labor market for migrant work, resulting in information barriers and high mobility costs. Continuing to plant peanuts does not significantly improve unit area income. Therefore, the increase in labor cost within the range on the right of the turning point has an increasing impact on the reduction of area for small-scale farmers.

4.2.2. The impact of rising labor cost on the decision to increase the scale of large-scale farmers

In the decision-making equation for increasing the scale of large-scale farmers, the labor cost coefficient is significantly negative, and its square coefficient is significantly positive. This indicates that the effect of labor cost on farmers' expected increase in area has shifted from negative to positive, indicating a U-shaped relationship between labor cost and their expanded planting scale, further verifying hypothesis 2. Through calculation, it was found that within the range of labor cost < 181.6 days * person/yuan, the impact of rising labor cost on the decision to increase the scale of large-scale farmers shows a downward trend; Within the range of labor cost ≥ 181.6 days * person/yuan, the impact of rising labor cost on the decision to increase the scale of large-scale farmers shows an upward trend. Under other unchanged conditions, the impact of rising labor cost on the expected increase in area for large-scale farmers first decreases and then increases.

When labor cost is in a low-rising space, that is, in the first half of the labor cost increase, the increase in labor cost is not enough to make increasing productive investment relatively cost-effective. The economic benefits of replacing manual labor with self-purchased agricultural machinery are relatively low, and rational farmers still need to rely mainly on labor input for production operations. The result is that they are more inclined to reduce the scale of transferred farmland to avoid the loss of income caused by the increase in labor cost, The increase in labor cost has a limited impact on farmers expanding their planting scale. Studies have also pointed out that in situations where labor cost rise slowly and agricultural mechanization is low, small farms have higher land production efficiency than large farms[0].

Therefore, the impact of the increase in labor cost within the left range of the inflection point on the increase in the area of large-scale farmers is becoming smaller and smaller.

However, when labor cost exceed a certain threshold and enter a high upward space, the price disadvantage of productive investment compared to labor cost will be completely reversed. It will become more cost-effective to replace manual labor with self-purchased agricultural machinery, and machinery will have a more obvious substitution effect on labor, greatly increasing the profit value of unit labor. As a result, the impact of rising labor cost on expanding the planting scale of farmers will be enhanced, and the willingness of farmers to engage in productive investment will become stronger. Combined with the level of mechanized peanut production, it may trigger the purchase decision of agricultural machinery in the harvesting process, and may also promote the upgrading and replacement of agricultural machinery, that is, the transformation from small machinery to large and medium-sized machinery. The production practice of peanuts has shown that the supply level of agricultural machinery technology in the plowing and sowing stages is relatively high. Most large-scale farmers will choose to purchase their agricultural machinery, but the prices of agricultural machinery related to the harvesting stage are generally high and have strong specificity, and the investment enthusiasm of farmers is significantly low. For example, if purchasing a semi-feed peanut combine harvester, it would require at least 60000-80000 yuan in one-time investment and a longer investment recovery period. In addition, compared to manual work, the production efficiency of medium-sized mechanization can be increased by 60-80 times, and the production efficiency of large-scale mechanization can be increased by more than 120 times, which significantly reduces production costs and improves planting efficiency. Therefore, the increase in labor cost within the range on the right of the turning point has an increasingly significant impact on the increase in area for large-scale farmers.

4.2.3. Further discussion

In summary, the increase in labor cost will induce the reconfiguration of labor resources in rural households, and this induction effect has heterogeneity among farmers, ultimately leading to differences in the expected peanut planting scale among farmers of different operating scales. The increase in labor cost drives small-scale farmers to tend to maintain or reduce peanut planting area, and there is an inverted "U" shaped relationship between labor cost and the reduction of peanut planting area by small-scale farmers; On the

contrary, large-scale farmers tend to increase peanut planting area, and there is a U-shaped relationship between labor cost and the increased area of large-scale farmers. Previous studies have shown that in the face of the sustained and rapid increase in labor cost, the response measures of farmers mainly focus on two aspects: factor substitution that does not change the type of production and product substitution that changes the type of production (or special cases of abandonment and abandonment), often based on the assumption of homogeneity among farmers. However, in reality, labor and land are complementary production factors, and improving land productivity to increase unit area income can also help alleviate the impact of rising labor cost. If land is regarded as a homogeneous factor of production, the rational measure under the constraint of rising labor cost is to flow towards more economically efficient operating areas or entities, achieve moderate scale management of peanuts, and generate economies of scale. In fact, due to differences in land rent (marginal land output) among farmers, land transfer has achieved the reconfiguration of existing land resources among farmers. Based on the above research conclusions, it can be found that cultivated land resources exhibit opposite changes among farmers of different operating scales, which can be regarded as a scale substitution relationship between farmers of different operating scales under rigid constraints of labor costs and without changing the established crop types. It can be foreseen that if labor cost continue to rise, the willingness of small-scale farmers to reduce the scale of peanut cultivation will become stronger, while the willingness of large-scale farmers to expand the scale of cultivation will increase. This forward-looking plan can help promote moderate scale operation of peanuts, fully tap the potential for peanut yield increase, and make them the main force to ensure self-sufficiency and oil safety in China.

4.3. Robustness checks

4.3.1. Instrument variables estimation

Considering that there may be endogeneity issues due to omitted variables or bidirectional causal relationships between the increase in labor cost and the scale of peanut planting by farmers, the instrumental variable method is used to alleviate the interference of endogeneity issues on research conclusions. This article selects non-agricultural employment wages as instrumental variables. On the one hand, rural labor is a scarce resource, and can only make one choice in multiple uses at the same time, resulting in opportunity costs for the

selective allocation of a certain use. Rural non-agricultural employment wages reflect the opportunity cost of labor in agriculture, thus meeting the correlation requirements of instrumental variables; On the other hand, non-agricultural employment wages generally depend on the labor market and are not significantly correlated with other factors that may affect farmers' peanut planting decisions, thus meeting the exogenous requirements of instrumental variables. Non-agricultural employment includes two types: local and migrant workers. To better reflect the heterogeneous impact of different types of non-agricultural employment, this article uses the township scope as the classification standard, selects the average wage of domestic labor force employment and the average wage of migrant labor force employment outside the township scope to measure the agricultural labor cost of local and migrant workers, respectively. Considering the differences in opportunities and income for non-agricultural employment among different labor resources in the labor market, as well as the fact that farmers who have not engaged in non-agricultural employment, the non-agricultural employment wages are calculated at the village level.

Table 5 reports the estimated results of IV Probit and 2SLS. From the results of instrumental variable testing, it can be seen that the F-value in the first stage is much higher than the critical value of 10, indicating that the model does not have weak instrumental variable problems; The Wald test rejected the exogenous null hypothesis at a significance level of 1%. The results of the first stage regression show that the instrumental variable of non-agricultural employment wages has a strong explanatory power for the endogenous variable of labor cost. The second stage regression results show that, after considering endogeneity, the impact of rising labor cost on the scale of peanut planting by farmers is consistent with the analysis results in the previous section, with only differences in coefficient sizes. Therefore, it can be considered that the benchmark regression results are robust.

Table 5: Estimation results of the instrumental variable method.

Variable	Small-scale farmers		Large-scale farmers	
	Adjustment willingness	Adjustment scale	Adjustment willingness	Adjustment scale
Labor cost	-0.1763***	2.7388***	0.1233***	-2.8040***
	(0.0418)	(0.7294)	(0.0249)	(0.3372)
Labor cost square	-	-0.0073***	-	0.0077***
		(0.0019)		(0.0009)
First stage F-value	27.01	38.40	31.48	193.69
Wald test value	17.87***	-	33.31***	-
R^2	-	0.3039	-	0.9305

4.3.2. Heckman two-step method

The decision-making behavior of peanut planting by farmers follows two steps: the first step is to decide whether to adjust the planting, and the second step is to decide how much area to adjust. Therefore, there may be a sample bias of "focusing on results and ignoring selection", which belongs to the problem of self-selection. To accurately analyze the impact of rising labor cost on the scale of peanut planting among farmers, the Heckman two-step method was used to correct sample selection bias and enhance the robustness of its conclusions[0]. The Heckman two-step method requires that the explanatory variables of the two stages have a strict subset relationship, that is, identifying variables that only affect the first-stage model and not the second-stage model. This article selects "planting years" as the identification variable. Peanut planting years are related to the willingness to adjust peanut planting, but they do not have a direct causal relationship with the scale of peanut planting adjustment. At the same time, to avoid the impact of sample selection on the estimation results of this article, the second stage model incorporates the Inverse Mill Ratio (IMR) calculated by the first stage model.

Table 6 reports the Heckman two-step estimation results. For small-scale farmers, the first stage examines the impact of rising labor cost on their tendency to reduce peanut planting willingness. Therefore, the labor cost coefficient is significantly positive, which is consistent with the impact of labor cost in the benchmark regression; The labor cost coefficient in the second stage is significantly positive, and its square coefficient is significantly negative. For large-scale farmers, the first stage examines the impact of rising labor cost on their willingness to expand peanut cultivation, and the labor cost coefficient is significantly positive; The labor cost coefficient in the second stage is significantly negative, and its square coefficient is significantly positive. Therefore, after overcoming possible endogeneity bias, the impact of rising labor cost on the peanut planting scale of farmers with different operating scales is consistent with the benchmark regression. This once again indicates that the above research conclusion is robust, and the impact of rising labor cost on the peanut planting scale of farmers has strong explanatory power and high credibility.

Table 6: Estimation results of Heckman two-step method.

Variable	Small-scale farmers		Large-scale farmers	
	First stage	Second stage	First stage	Second stage
Labor cost	0.3223*	0.6890**	0.2780**	-2.6056***

	(0.1854)	(0.2975)	(0.1298)	(0.3265)
Labor cost square	-0.0008	-0.0019**	-0.0007**	0.0072***
	(0.0005)	(0.0008)	(0.0004)	(0.0009)
IMR	-	-2.1915**	-	2.3567*
Wald test value	263.74***		1421.72***	

4.3.3. Heterogeneity analysis

To further examine the heterogeneity of the inherent relationship between the increase in labor costs and the peanut planting scale of farmers with different operating scales in different groups, group regression was conducted on samples from the main peanut-producing areas and non-main peanut-producing areas to examine the effect of group differences in labor cost increase. The estimated results are shown in Table 7. For small farmers, the impact of rising labor cost on the peanut planting scale of farmers in the main peanut-producing areas is consistent with the benchmark regression, but the impact on the peanut planting scale of farmers in non-peanut-producing areas is not significant. The possible logic is that compared to non-peanut-producing areas, small farmers in peanut-producing areas place more emphasis on peanut cultivation. For large-scale farmers, the impact of rising labor cost on their peanut planting scale is consistent with the benchmark regression; From the perspective of coefficient size, compared with the main peanut-producing areas, the estimated values of labor cost and their square coefficients are smaller in non peanut-producing areas. This means that the impact of rising labor cost on the expansion decisions of non-peanut-producing areas is weaker. This indicates that the impact of rising labor cost under scale differentiation on the scale of peanut planting by farmers has regional heterogeneity.

Table 7: Estimation results of heterogeneity analysis.

Variable	Small-scale farmers in the main peanut-producing areas		Small-scale farmers in non-peanut-producing areas		Large-scale farmers in the main peanut-producing areas		Large-scale farmers in non-peanut-producing areas	
	Adjustment willingness	Adjustment scale	Adjustment willingness	Adjustment scale	Adjustment willingness	Adjustment scale	Adjustment willingness	Adjustment scale
Labor cost	-0.0752*** (0.0170)	2.0923*** (0.7157)	-0.0295 (0.0191)	0.4623 (0.6005)	0.0402*** (0.0117)	-3.4686*** (0.3566)	0.0375** (0.0166)	-3.0595*** (0.3412)
Labor cost square	-	-0.0056*** (0.0019)	-	-0.0013 (0.0018)	-	0.0096*** (0.0010)	-	0.0082*** (0.0009)
R^2	0.7480	0.4973	0.8383	0.4462	0.4100	0.9259	0.3784	0.9663

5. Conclusions

This article uses micro survey data from 596 peanut growers in 17 provinces of China, taking the allocation of labor resources in rural households as the starting point. From the dimensions of willingness to adjust peanut planting area and adjustment scale, it systematically examines the impact and differences of rising labor cost on the peanut planting scale of farmers with different operating scales.

The research results indicate that firstly, there are significant differences in the adjustment direction of peanut planting willingness among farmers of different operating scales due to the increase in labor cost. Specifically, the increase in labor cost has led to an increase in the opportunity cost for small farmers to plant peanuts, and under the guidance of maximizing income, they tend to reduce the planting scale or remain unchanged. On the contrary, with the help of scale operation to obtain economies of scale, scale farmers tend to expand their planting scale under the guidance of cost minimization. Secondly, the impact of rising labor cost on the expected adjustment scale of farmers with different operating scales shows a clear non-linear characteristic. The impact of rising labor cost on the decision of small-scale farmers to reduce their scale first decreases and then increases, with a typical inverted "U" shape characteristic; The impact of rising labor cost on the decision to increase the scale of farmers first decreases and then increases, with a typical U-shaped characteristic. Thirdly, after using the instrumental variable method and Heckman two-step method, the regression results of this study still meet expectations, indicating that the benchmark regression results have strong robustness. Heterogeneity analysis shows that the increase in labor cost has a more significant impact on the scale of peanut planting among farmers in the main production areas. Fourthly, overall, the increase in labor cost has forced farmers to reconfigure their household labor resources, ultimately leading to a polarization of peanut planting scale between small-scale farmers and large-scale farmers, achieving optimal allocation of labor and land resources through moderate scale management. Furthermore, the cultivated land resources exhibit a reverse change pattern among farmers of different operating scales, which can be seen as a scale replacement of small-scale farmers formed by large-scale farmers under the constraint of rising labor cost. Finally, for a long time in the future, the household management of small-scale farmers will still be the basic form of agricultural management in China. Given the livelihood guarantee function of land, the love for land among farmers, and the many beneficial land policies introduced by the country, most small-scale farmers may not transfer all of their land.

Based on this, policy recommendations are proposed: firstly, guide the orderly transfer of land. Innovate compensation mechanisms for rural land withdrawal based on local conditions, specify compensation standards, enrich compensation methods, improve social security and risk prevention mechanisms for land transfer, promote the transfer of land resources to potential large-scale farmers, and achieve long-term stable large-scale operation. Secondly, broaden the channels for non-agricultural employment. Promote the development of the rural labor employment market, ensure that farmers obtain sustained and stable non-agricultural employment income, weaken the economic security function of land for farmers, and enhance the endogenous motivation of farmers to withdraw from land. Thirdly, strengthen the organic connection between small farmers and new business entities. Small farmers are still the fundamental force for the development of agricultural production in China. They can be gradually introduced into the modern agricultural development track through the main body of agricultural cooperation, service-driven agriculture, and policy-driven agriculture. Finally, consolidate the achievements of scale management development. The government should introduce comprehensive support policies to support the development and growth of large-scale farmers and encourage the implementation of agricultural service-scale operations such as joint cultivation and planting, land trusteeship, etc. In short, achieving optimal allocation of labor and land resources for rural households and increasing their total income.

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