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Intentions of Farmers to Renew Productive Agricultural Service Contracts Using the Theory of Planned Behavior: An Empirical Study in Northeastern China

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Abstract: Maintaining stable linkages between farmers and APS service providers is conducive to cutting transaction costs, increasing service organizations' willingness to invest in the long term and motivation to innovate on their own, improving agricultural production and resource use efficiency, and safeguarding farmers' welfare and national food security. The willingness of farmers to renew their contracts is a key factor in long-term APS partnerships. Based on research data from the Northeast region in 2018, this study uses the Theory of Planned Behavior (TPB) to construct a two-stage decision-making framework for the contracting-renewal and to determine how the process influences the formation of willingness. The Heckman two-stage model is applied. The results indicate that the mechanism of farmers' willingness to renew APS is formed in accordance with TPB's conceptual analysis framework with the dual logic of "stimulus" and "constraint". In the first stage, individual and family characteristics have a significant influence on farmers' contracting behavior. In the second stage, three exogenous latent variables, behavioral attitudes, perceived behavioral control, and subjective norms, have a better explanatory role in the formation of farmers' willingness to renew APS. The stronger the perceived control that is generated by farmers during the decision-making process, the more pronounced the behavioral attitudes were, and the stronger the inducement of willingness to renew the service. The findings suggest that governments should strengthen APS outreach and improve the regional economy and natural environment. Overall, this study helps to uncover the farmer's TPB mechanism and provide an empirical basis for how to promote APS development.



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1. Introduction

Food security is a "cornerstone" for the smooth functioning of the political economy, the reduction of hunger, and sustainable development. In the face of the multiple challenges of social and ecological changes, rural areas in developing and less developed countries such as China have been hit by a significant increase in the risk to farmers' livelihoods. The Chinese government is committed to maintaining a stable level of food production, which is an important measure to increase food self-sufficiency and ensure food security [1–4]. The development of the APS industry is related to the improvement of grain production and operation efficiency and the long-term stability of agricultural modernization development [5]. Based on this, the 19th National Congress of the Communist Party of China (CPC), the Ministry of Agriculture and Rural Affairs (MARD) formally wrote "improve the socialized agricultural service system", and since then, China's APS industry has entered a stage of rapid development [6,7]. In 2017, MARD formulated and released the "Guidance on Accelerating the Development of in 2021, the State Council issued the "14th Five-Year Plan for Promoting Agricultural and Rural Modernization", focusing on the development of agricultural socialization services. In the same year, the Guidance of the

Ministry of Agriculture and Rural Affairs on Accelerating the Development of Agricultural Socialization Services required further exploration of the effective paths and methods for agricultural socialization services to lead and support the development of agricultural modernization. In the same year, the Ministry of Agriculture and Rural Affairs released the “Plan for High-Quality Development of New Agricultural Business and Service Subjects (2020–2022)”, which once again emphasized the importance of constantly enhancing the development strength, operational vitality, and driving capacity of agricultural productive service subjects. As a product of the integration of the three industries, the APS industry is embedded in the production chain in the agricultural field, which can not only optimize the structure of production resource utilization, improve the efficiency of production and operation, and promote the integration of small farmers with the development process of modern agriculture [8,9], but also help alleviate the shortage of rural labor and mitigate the problems that are caused by aging in rural areas [10–12]. Therefore, from the very beginning, the development of APS has been a hot issue.

Due to the complexity of the development process of the APS industry [13], the General Office of the Ministry of Agriculture clearly stated in the Guidance on Vigorously Promoting Agricultural Production Trust that was issued in 2017 that rural management departments at all levels should guide service organizations to sign standardized service contracts with farmers, and service organizations whose service quality does not meet the requirements and where the public is not satisfied should be promptly informed and urged to make corrections. On the one hand, since APS are outsourced production link services that are based on crop growth cycle and basic maturation, the decision of farmers to renew their subscription directly determines the stability of the service process [14–16]. Therefore, the healthy and stable development of agricultural modernization can be ensured by maintaining stable relationships among cooperative parties and making the stability and science of production material inputs and cultivation methods the starting point and goal of high-quality development of APS. On the other hand, maintaining a good and robust cooperative relationship can fully mobilize the enthusiasm, initiative, and creativity of service providers, and transform their desire for their own economic benefits into the motivation to promote the construction of agricultural modernization [17]. However, in the research team’s preliminary study of farmers in northeastern China, we unexpectedly found that 95% of farmers used APS, but only 56% were willing to maintain this partnership, and less than 20% of them had long-term cooperation with professional service organizations. Unstable and unregulated APS contractual relationships not only bring “friction” in the transaction process and increase transaction costs, but also are not conducive to long-term investment and large-scale operation of service providers, which is a key obstacle to the high-quality development of APS organizations in China. Therefore, how to encourage farmers to actively adopt APS on the basis of safeguarding farmers’ interests and matching farmers’ needs and willingness has become the focus and difficulty of vigorously promoting the high-quality and efficient development of APS. By tracing the formation mechanism of farmers’ willingness to renew APS, this study can more precisely identify the main factors affecting the stability of cooperative relationships between farmers and service providers, reduce the transaction costs of both parties in the transaction process, and improve the efficiency of cooperation, which is a powerful guarantee for achieving large-scale agricultural production and operation. In addition, a stable contractual relationship will motivate service subjects to improve service quality autonomously and better promote the healthy development of the APS industry.

At present, scholars have conducted in-depth research on the four core issues of “external influencing factors, internal influencing factors, impact on production efficiency and welfare, and group heterogeneity” of farmers’ adoption of APS [18,19]. Specifically, these include individual and family characteristics that affect farmers’ access to APS [20,21], external influencing factors (such as transaction prices, transaction methods and contract styles, institutional policies) [22,23], trust and risk perception [24–26], income distribution [27,28], efficiency improvement, etc. It can be seen from the existing research that the research

results on the acceptance of agricultural productive service groups are very rich and have become a hot-spot in the study of agricultural modernization. The existing research results have provided a good research foundation and reference for this study. However, the existing research still has the following deficiencies. First of all, from the perspective of research, existing studies have focused more on farmers' behavior of contracting for APS, and fewer studies have focused on farmers' contract renewal behavior, ignoring both the psychological process of farmers as limited rational actors in renewing cooperative relationships and the important role of forming stable cooperation in motivating farmers and service providers in both directions. Second, in terms of research content, most of the current studies focus on farmers' motivations, barriers, realization paths, and post-adoption outcomes of accepting APS, and lack in-depth and systematic research on certain levels or specific issues. For example, what are farmers' behavioral decisions to renew contracts after receiving APS and how do they ensure a stable relationship between the two interested parties? What are the influencing factors and mechanisms? There are few existing studies on these specific issues, and there is a lack of systematic theoretical analysis framework. Third, in terms of research methods, most existing studies use traditional statistical analysis methods such as correlation analysis. These research methods can only reflect the external general patterns, but it is difficult to find out the internal causal logic. However, farmers' behavioral decision-making is a complex process. It is necessary to simulate this process by constructing econometric models and to address general issues such as sample self-selection.

In summary, the development of APS has entered a stage of quality-oriented reform. Farmers' decision on the act of renewal plays a crucial role in the standardization, stability, and efficiency of APS. Clarifying the decision-making mechanism of the behavior of farmers' renewal of services is a critical issue that needs to be addressed. Farmer's renewal behavior is a special behavior with a longer interval and non-immediate nature, and the generation of this willing behavior undergoes a complex and diverse psychological process, while being subject to the influence of a variety of external factors. Integrating psychology into the study will have stronger persuasive and explanatory power. Therefore, based on the TPB, this study constructs a theoretical analysis framework of the decision mechanism of farmers' acceptance and willingness to renew the cooperative relationship process of APS, aiming to clarify the influencing factors and measure the degree of their influence. A two-stage model (Heckman) was used to empirically test the theoretical analytical framework through a field study of 982 agricultural farmers in the main grain-producing regions of three northeastern provinces of China. In this model, farmers decisions are assumed to be influenced by behavioral attitudes, subjective norms, and perceived behavioral control, which are influenced by both individual, family, and social characteristics. The study may have two contributions. Theoretically, it can more accurately represent the psychological perceptions and behavioral decision-making processes of small farmers, and provide new research ideas, analytical frameworks, and methodological systems for studying the stabilization and innovation of APS. Practically, this study can provide an empirical basis for improving government policies to support the high-quality development of APS, empowering the agricultural service industry from the supply side, realizing the organic connection between small-scale farmers and modern agriculture, improving food production efficiency, and maintaining national food security on the basis of safeguarding farmers' economic welfare, clarifying production responsibility boundaries, and establishing stable and standardized cooperative relationships.

2. Theoretical Analysis

TPB follows the assumption of limited rationality of actors and explains the general decision-making process of individual behavior from the perspective of information processing [29]. It is one of the most important theories in social psychology about the generation of individual behavior and has become the most famous theory of attitude-behavior relationship in social psychology [30]. Worldwide, academic research that is based on the

TPB framework has been widely applied in environmental sciences, economics, psychology, medicine, sociology, and many interdisciplinary disciplines. For example, Shirahada et al. conducted studies on volunteer behavior, mental health help-seeking behavior, and oral health protection behavior, confirming the important role of elements such as social norms in the process of will formation [31–33]. Due to the close connection between agricultural decision-making and social psychology, numerous agricultural economists and social psychologists have applied the theory of planned behavior to the field of agricultural research. For example, Yang and Damalas et al. have analyzed the process of forming farmers' behavioral intentions such as low-carbon technology adoption and pesticide reduction application and the influencing factors that are based on the TPB framework, and affirmed the important role that is generated by elements such as behavioral attitudes [34–36]. Existing studies have achieved many valuable academic results in various disciplines using the TPB framework, which has laid a solid foundation for this paper to investigate the mechanism of farmers' willingness to renew their contracts. It needs to go through the logical sequence of "external stimulus—sensory control—intention" [37]. Compared with other behavioral theories, such as self-determination theory, deviant behavior theory, and S-O-R theory, TPB's explanation of individual behavior not only considers objective factors that are directly related to farmers' immediate interests, such as perceptual behavioral control, but also incorporates conceptual and psychological non-rational factors, such as farmers' behavioral attitudes and subjective norms, into the framework of decision analysis, which better reflects the assumption of limited rationality of individual behavior, and at the same time also extremely strongly demonstrates the strength of individual attitudes to explain specific behaviors. In this study, contract renewal behavior, as a continuation of contracting behavior, is a manifestation of interterm behavior, which has its own uniqueness. The analysis from a psychological perspective can better "capture" the complex and variable process of farmers' intentions during the contract-renewal period. Therefore, this study attempts to combine the perspectives of economics and psychology based on the analytical framework of TPB, and expects to provide a strong explanation of the formation process of individual behavioral intentions, so that it can reflect the psychological process and influencing factors of farmers' renewal of APS in a comprehensive manner. Based on this, this study constructs a two-stage theoretical analysis framework of "contracting-renewal" of farmers, as shown in Figure 1.

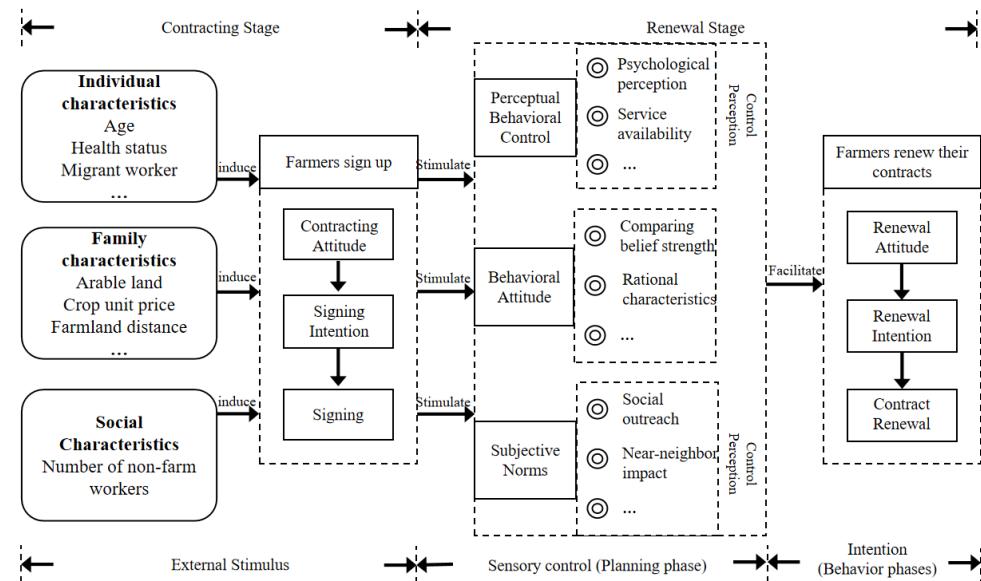


Figure 1. The two-stage theoretical framework of "contract-renewal" in farmers' APS decisions.

2.1. Contracting Stage

First of all, the social information and subjective endowments that are related to APS are stimuli and restrictions on individual cognitive behavior [38,39]. Considering the special characteristics of China's rural human society and information diffusion, etc., it can be divided into two levels. At the macro level, the economic characteristics of the region will have an impact on the decision-making behavior of farmers. At the regional level, the rapid development of secondary and tertiary industries that accompanies urbanization has released signals that the regional labor market is too strong. On the one hand, the increase in labor prices increases the intangible cost of traditional agricultural labor for farmers, while "crowding out" human capital from agricultural production, stimulates farmers' demand and dependence on APS. On the other hand, the "loss" of young labor brings about an aging agricultural workforce, with young laborers moving to higher-paying jobs and older people remaining behind those who are physically unable to take on the workload in the fields, thus stimulating farmers to choose APS that can release labor, which is a key factor for farmers to maintain cooperative relationships. The greater the number of non-farm workers, the greater the "pull" of the secondary and tertiary sectors, and the greater the influx of labor out of agricultural production activities, the more attractive the APS is.

At the micro level, the cognitive behavior of individuals is closely related to their own endowment characteristics and is an important part of the decision-making mechanism that affects the subject. Unlike macroscopic socio-regional economic development characteristics, individual characteristics and family's production and operation at the micro level are an important factor limiting farmers' cognitive ability. Farmers' individual characteristics such as age, gender, education level, health level, and whether they engage in out-of-home work are most closely related to decision-making behavior, and actors with different cognitive preferences and ability levels will make different decisions. Among them, age and education level influence the initial knowledge system and initial cognitive state of decision-makers, while gender and health level influence decision-making behavior from the perspective of risk preference. The lack of labor within the families when farmers go out to work can weaken the behavioral capacity for field management and a range of farming activities, further leading farmers to choose APS and conclude contracts. Family's production operations are characterized by financial and information constraints, which are the basis for decision-makers to adopt specific behaviors. Among others, crop yield per acre, fluctuations in crop output, and annual income are key influences in determining farmers' decisions to develop new production patterns.

2.2. Renewal Stage

As decision-making subjects [40,41], farmers receive external stimuli such as policy promotion, regional economic environment, and market information of APS. They then combine these with their own knowledge, beliefs, and abilities to analyze and judge the quality, effectiveness, and reputation issues of the service, and form their perception and understanding of APS as a form of production and management in the agricultural production chain. Based on a comprehensive consideration of the pros and cons of participating in APS, they form a perception of their attitudes and behavioral intentions. After weighing the pros and cons, they decide whether to accept APS, outsource the disadvantaged part of agricultural production to the service provider, improve their own production efficiency, and continue this cooperative relationship. This cognitive process is inevitably influenced by perceived behavioral control, subjective norms, and behavioral attitudes.

First of all, perceived behavioral control (PBC) is a key factor influencing the process of forming farmers' decision intentions. PBC reflects an individuals' judgment of the resources, opportunities, and abilities that they can control for behavior implementation based on past experiences and opportunities, indicating their own ability to control the effects of behavior implementation, and has a direct effect on behavioral responses. When the individual's PBC has a positive effect on behavioral intention, the greater the likelihood that the individual will perform the behavior. In the renewal stage, farmers first give feedback and collect

information on the contracting stage to measure service quality, service satisfaction, service availability, and service timeliness, and then obtain information on how much control they have to maintain a stable partnership. The higher the satisfaction level and timeliness of the previous stage, and the stronger the connection with the service provider, the more likely the farmers are to form a willingness to renew the APS in this stage. Based on the above analysis, Hypothesis 1 is proposed:

Hypothesis 1. *Perceived behavioral control has a significant positive effect on farmers' willingness to renew their contracts.*

Second, subjective norms (SN) are also a major factor influencing the process of forming farmers' decision-making intentions. SN is the social pressure that is felt by an individual to adopt a certain behavior, and can also be understood as the influence of individuals or groups that have influence on an individual's behavior on the decision to behave in a particular way. Influenced by the typical "kinship society" and "vernacular friendship" traditions in rural China, individual farmers, as members of the village community, are largely influenced by their neighbors' relationships, which can have a significant impact on the process of forming their decision intentions. The better the relationship between farmers and their neighbors and the higher the degree of intimacy, the easier it is to reach a cooperative relationship that manifests itself in the form of mutual help and assistance of a gratuitous nature, which in turn reduces the degree of farmers' need for APS. In rural areas of China, it is common for relatives to rent farm machinery and take care of the land without compensation. Therefore, the higher the degree of neighborly ties, the greater the "crowding out" effect on APS, and the lower the willingness of farmers to renew their contracts. Based on the above analysis, Hypothesis 2 is proposed:

Hypothesis 2. *Subjective norms have a significant inhibitory effect on farmers' willingness to renew their contracts.*

Third, behavioral attitude (BA) is also an important factor influencing the process of farmers' decision-making, which represents the motivational factors of individual behavior, i.e., individuals' cognitive judgment of favoring or disapproving, liking or disliking the target behavior after evaluating its value. The behavior of farmers in pursuit of income is consistent with the decision-making process of limited rational actors that are influenced by perceptions, beliefs, and emotions and the decision-making principle of focusing on the "relative change of wealth with respect to a certain level of desire" under uncertainty. Farmers estimate the gain or loss from adopting a production activity, and this estimate has a direct impact on the persistence of the behavior. The level of payment that is received by the service provider, the achievement of the expected yield, and the clarity of the contract terms all have an impact on the farmer's future earnings, so that the higher the assessment of the expected earnings, the more the farmer's attitude tends to be toward maintaining a cooperative relationship with the service provider. Based on the above analysis, Hypothesis 3 is proposed:

Hypothesis 3. *Behavioral attitudes have a significant positive effect on farmers' willingness to renew their contracts.*

3. Materials and Methods

3.1. Data Sources

In order to test the framework of the two decision-making phases of "contract-renewal", a field survey was conducted during the summer of 2018 in the main grain-producing regions of Northeast China. First, since the 19th National Congress of the Communist Party of China in 2017, the APS industry has entered a rapid development phase, and by the end of 2018, the relevant departments issued successive documents to

urge the development process, and the development of the APS industry in the northeast has taken shape. From 2007 to 2018, the total expenditure on APS in the three northeastern provinces showed a trend of increasing year by year, from USD1.91billion in 2007 to USD4.8billion in 2018, an increase of 151%. Second, northeast China is rich in fertile black soil, mainly including black soil, black calcium soil, white pulp soil, meadow soil, brown soil, and dark brown soil and another six kinds of soil, with a total area of about 1.09 million square kilometers; the eastern European Great Plain black soil area, North America Mississippi River Basin black soil area, and South American Pampas steppe black soil area are called “the world’s four major black soil areas”. The soil organic matter content in the black soil area of Northeast China is high and the tillage conditions are excellent. At present, the northeast black soil area contributes nearly one quarter of the country’s grain production, and the output of commercial grain accounts for one third of the national total, which is the “ballast stone” to ensure national food security. The northeast region’s crops are mainly corn, located in the corn golden planting belt. The growing environment and links of corn are suitable for the use of APS, which is more conducive to large-scale and efficient development. The rise of APS in Northeast China helps alleviate agricultural productive problems such as factor endowment defects and excessive transaction costs and is an effective means to improve the technical efficiency of farmers’ production.

The questionnaire that was used in this research was determined according to the research objectives of this paper, the theoretical analysis framework and the actual situation of the research area. The survey was conducted on a one-to-one basis, with questionnaires divided between farmers and village collectives, and was conducted from August to September 2018. It covered farmer’s individual characteristics, family characteristics, agricultural production and operation, production link situation, APS selection and satisfaction, willingness to renew, and risk preference. The survey was sampled using a stratified sampling method. The sampling implementation steps were as follows. First, typical agricultural production areas such as Harbin City of Heilongjiang Province, Siping City of Jilin Province, and Tieling City of Liaoning Province were selected from 34 provincial administrative regions across China (see Figure 2). Second, considering the different development processes of the out-do APS industry, sample villages were randomly selected in key cities of agricultural production, involving 43 villages in total. Then, farmer representatives were selected in each sample village using a simple random sampling method, involving a total of 1132 farmers. Finally, from March to April 2018, the research team selected Tieling City, Liaoning Province, for a pre-survey, and based on the feedback from the pre-survey process, the questionnaire was revised and improved in a timely manner to form the final questionnaire. In order to ensure the validity of the sample area and sample farmer selection, we actively obtained the support and assistance of the local agricultural departments, such as the Rural Economic Management Station of the Agriculture Commission, and communicated in detail with the contacts of the upcoming research areas in advance.

In terms of questionnaire design, information on the individual characteristics of farmers, family characteristics, information on agricultural production and operation, and farmers’ participation in APS and contractual choices were collected according to the analysis framework. We also divided farmers’ operation methods into self-cultivation, partial linkage services, and full trusteeship services, and provided detailed information on their participation in APS, as well as the price of services in each linkage and the reasons for non-participation. A total of 982 valid questionnaires were finally obtained (67 in Harbin, 160 in Qiqihar, 184 in Siping, 125 in Suihua, 234 in Tieling, and 212 in Changchun). The basic characteristics of the farmers are shown in Table 1.

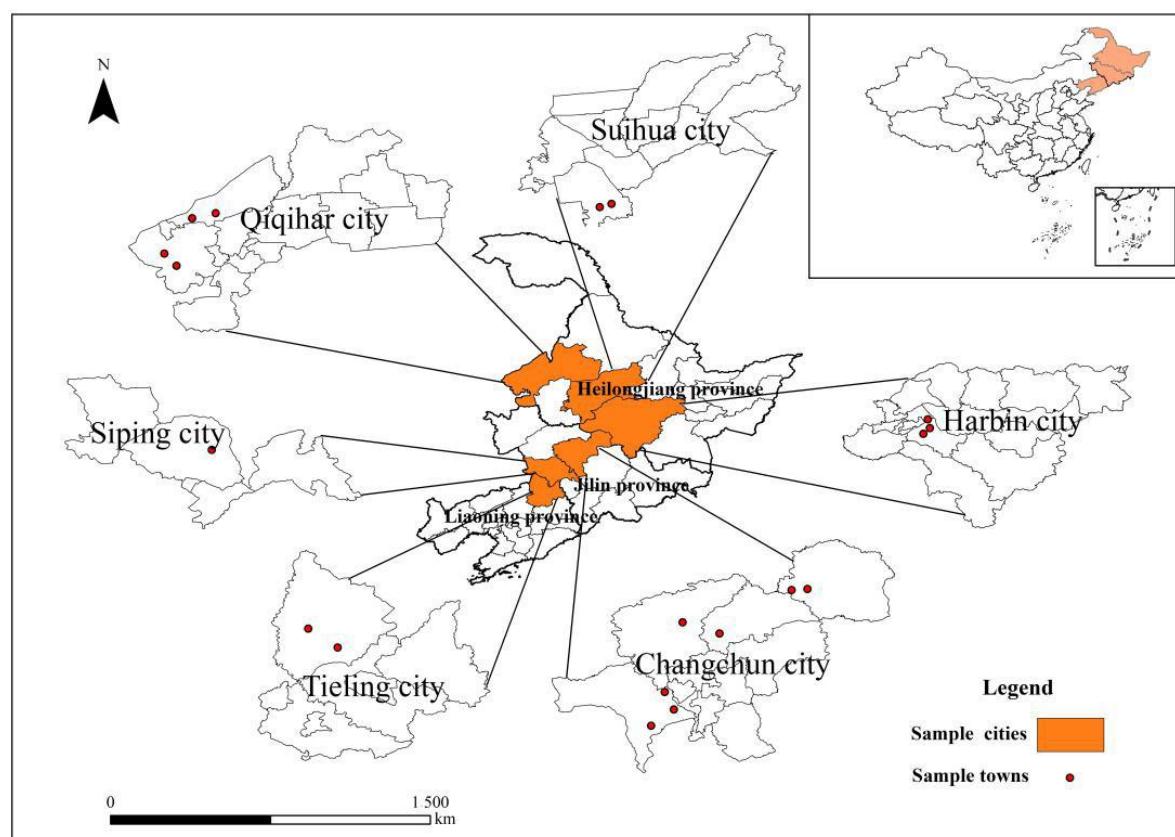


Figure 2. Map of the study area and spatial distribution of the sample villages.

Table 1. Basic characteristics of sample (Unit: farmer, %).

Index	Value	Freq	Prop	Index	Value	Freq	Prop
Gender	Male	931	94.80	Contract situation	Signed	914	93.00
	Female	51	5.20		Unsigned	68	7.00
Age	18–40 years old	76	7.74	Renewal intention	Acceptance	554	56.40
	41–63 years old	661	67.31		Rejection	428	43.60
Education	64–86 years old	245	24.95	Annual net revenue	<CNY50,000	513	52.24
	No degree	133	13.54		CNY50,000–100,000	293	29.84
	Primary school	418	42.57		CNY100,000–150,000	122	12.41
	Secondary schools	426	43.38		≥CNY150,000	54	5.51
Health Status	Bachelor's Degree	5	0.51	Arable land topography	Slope	172	17.50
	Extremely unhealthy	15	1.53		Depression	42	4.20
	Relatively unhealthy	89	9.06		Flat ground	759	77.20
	Ordinary state	119	12.12		Terraces	9	1.10
	Relatively healthy	511	52.04	Agricultural machinery situation	Possess	518	52.70
	Extremely healthy	248	25.25		Not owned	464	47.30

3.2. Research Methods

3.2.1. Heckman Two-Stage Model

The Heckman two-stage model is a two-stage model that was proposed for the problem of seeing only part of the data. Compared with linear correlation analysis and linear regression, the Heckman model can solve the sample selection problem and avoid the bias that is caused by sample self-selection in regression analysis [42–45]. The theoretical framework of “contracting-renewal” of APS in this paper analyzes the relationship between behavioral attitudes (BA), perceived behavioral control (PBC), subjective norms (SN), individual characteristics (IC), and family characteristics (FC) and farmers’ willingness to signing APS (SI) and renew their contracts (RI). Whether or not the study participants in this paper choose to renew their contracts for APS is not the result of random selection. We

can see that gender, education, and age can influence whether or not the study participants choose to renew their contracts, which is consistent with the conditions for using the Heckman two-stage model. Therefore, this study uses the Heckman two-stage model to explore the decision-making mechanism and transmission path of farmers' renewal of APS. The specific form is as follows:

$$SI = \alpha X_{1i} + \mu_{1i} \quad (1)$$

$$SI = \begin{cases} 1, & \text{if } SI^* > 0 \\ 0, & \text{if } SI^* \leq 0 \end{cases} \quad (2)$$

$$RI = \beta X_{2i} + \mu_{2i} \quad (3)$$

$$RI = \begin{cases} 1, & \text{if } SI = 1 \\ 0, & \text{if } SI = 0 \end{cases} \quad (4)$$

The first stage equation in the Heckman two-stage model is a binary probit model, which assumes homoskedasticity of errors [46]. In the second stage of the model, an ordinary least square (OLS) regression equation is estimated to test the effect of the assumed factors on the decision of farmers to renew their subscription to APS. Equations (1) and (2) are the choice equations, which identifies the factors that influence farmers to subscribe to APS, while Equations (3) and (4) are the outcome equations, which identifies the factors that influence farmers to renew their subscriptions to APS. SI and RI are the dependent variables that represent farmers' decisions of "whether to choose" and "whether to renew" APS, respectively. The independent variables X_{1i} and X_{2i} denote "whether to choose" and "whether to renew", respectively; α and β denote the parameters to be estimated; μ_{1i} and μ_{2i} denote the residuals, which are normally distributed; and i denotes the i th sample farmer.

3.2.2. Variable Selection

First, in terms of SN, according to the two-stage framework and the TPB, the decision-making behavior of farmers is affected by the information feedback between neighbors in the village and the flow of information in the society and the market. This external information stimulates farmers' awareness, allows ordinary farmers to have a deeper understanding of APS, and makes them aware of their rights and obligations. Subjective norms can be measured by assessing the degree of community harmony with residents of the same village (SN).

Second, in PBC, farmers associate service providers with their service satisfaction not only in the process of perception and information exchange feedback, but also in the process of deciding whether to renew their contracts. Service satisfaction largely influences farmers' perceptions of this type of production operation and their decisions to renew such services. In deciding whether or not to take an action, farmers assess the consequences (or benefits) of taking an action in a future period in accordance with the results of their experiences in a past period, with satisfaction and service availability being important expressions. The variables that were selected for this study are: service satisfaction (PBC1), service effectiveness (PBC2), timeliness of agricultural services (PBC3), ease of access to services (PBC4), and service waiting time (PBC5).

Third, in the case of BA, farmers' behavioral attitudes directly influence the generation of behaviors. Through the analysis of their own economic status, their own knowledge reserve, and their own cognitive preferences, farmers consider the impact of specific behaviors on themselves in a comprehensive manner. When farmers perceive that they have sufficient ability to adopt a certain behavior or can fulfill a certain expectation, farmers are more likely to choose to adopt this behavior. In this study, behavioral attitudes can be measured by the reasonableness of the service fee that is charged by the agricultural production service provider (BA1), whether the crop yield after receiving the outsourced service provider is higher than their own planting period (BA2), and the degree of knowledge of the contract content (BA3).

Finally, in the case of IC, FC, and SC, the farmer is the actor who makes the decision and the family is the most basic decision unit in the process of purchasing APS. The head of the family often plays an important role in the decision-making of agricultural production, therefore, the individual characteristics of the head of the family also have a non-negligible impact on the decision-making. Individual characteristics can be measured by age (IC1), health status (IC2), work status (IC3), and continued willingness to work in agriculture (IC4). Age affects the physical and cognitive preferences of the labor force, and health status and work status have an impact on the number of family's laborers, which in turn stimulates farmers to choose APS. The stronger the willingness of farmers to continue farming, the lower the interest in APS. Farmers with different family characteristics can have dramatic differences in their perceptions and decisions to purchase and renew services. Family characteristics are reflected in seven main areas: area of cultivated land (FC1), price at which crops are sold (FC2), distance to farmland (FC3), yield per acre (FC4), crop yield fluctuations (FC5), family's income level (FC6), and topography of the cultivated land (FC7). In addition to this, socio-economic characteristics also influence farmers' decision-making processes and the general environment has a significant impact on farming families. In this study, the variable of non-farm employment in the county (SC) was chosen to characterize the socioeconomic characteristics, and non-farm employment can show the attractiveness of secondary and tertiary industries for agricultural labor, which can further stimulate farmers to accept outsourcing services.

The specific model variable descriptions and their statistical descriptions are shown in Table 2.

Table 2. Descriptive statistics of the variables.

Latent Variables	Observed Variables	Description	Mean	Var.	S.D.
Subjective norms (SN)	Assess your level of harmony with the inhabitants	1 = Very Bad; 2 = Bad; 3 = Fair; 4 = Good; 5 = Very good	3.511	1.486	1.219
	Satisfaction assessment of the current content of APS(PBC1)	1 = Very Dissatisfied; 2 = Not Satisfied; 3 = General; 4 = Satisfied; 5= Very Satisfied	3.480	1.553	1.246
	Evaluate the effectiveness of APS(PBC2)	1 = Very Dissatisfied; 2 = Not Satisfied; 3 = General; 4 = Satisfied; 5= Very Satisfied	3.508	1.526	1.235
Perceptual Behavior Control (PBC)	Whether the service provider will provide timely agricultural services (PBC3)	1 = Very Untimely; 2 = Not in Time; 3 = General; 4 = Timely; 5 = Very Prompt	3.523	1.510	1.229
	Whether it is easy to hire the right service provider (PBC4)	1 = Very Difficult; 2 = Not Easy; 3 = General; 4 = Easy; 5 = Very Easy	3.514	1.569	1.253
	The length of time to wait for acceptance of services (PBC5)	1 = Very Long; 2 = Long; 3 = General; 4 = Short; 5 = Very Short	3.480	1.520	1.233
Behavioral Attitudes (BA)	Whether the price of the service is reasonable (BA1)	1 = Very Unreasonable; 2 = Unreasonable; 3 = General; 4 = Reasonable; 5 = Very Reasonable	3.328	1.521	1.233
	Whether the service brings revenue (BA2)	1 = Very Low; 2 = Low; 3 = General; 4 = High; 5 = Very High	2.970	1.252	1.119
	Your level of understanding of the service content and terms (BA3)	1 = Completely Confused; 2 = Not Understood; 3 = General; 4 = Understanding; 5 = Very Well Understood	3.384	1.531	1.237
Individual Characteristics (IC)	Age (IC1)	Years	55.410	106.568	10.323
	Health Status (IC2)	1 = Very Poor; 2 = Poor; 3 = General; 4= Good; 5 = Very Good	3.904	0.865	0.930
	Occupation (IC3)	0 = No; 1 = Yes	0.336	0.223	0.473
	Willingness to Farm (IC4)	1 = Very Reluctant; 2 = Reluctant; 3 = Generally; 4 = Willing; 5 = Very Willing	3.577	0.589	0.767

Table 2. Cont.

Latent Variables	Observed Variables	Description	Mean	Var.	S.D.
Family Characteristics (FC)	Arable land (FC1)	100 Acres	0.442	0.267	0.517
	Crops Price (FC2)	CNY	0.641	0.031	0.177
	Distance to Farmland (FC3)	Km	1.442	2.057	1.434
	Yield Per Acre (FC4)	Ton	0.708	0.034	0.184
	Production Fluctuations (FC5)	Ton	0.257	0.020	0.141
	Income Level (FC6)	1 = Upper; 2 = Medium; 3 = Lower	2.112	0.267	0.516
	Terrain (FC7)	1 = Slope; 2 = Depression; 3 = Flat Ground; 4 = Terraces	2.616	0.606	0.778
Social Characteristics (SC)	Number of non-farm employment in the county	Numbers	14.954	57.479	7.581

4. Results

4.1. Contracting Stage Model Regression Results

Based on StataMP16.0, the Heckman two-stage model was used to estimate the logistic structure of this study. The first stage (contracting stage) involves the application of a probabilistic model in which the dependent variable is the contracting behavior of farmers that are involved in APS. This variable is binary and has a value of 1 if the farmer has a contract for APS and 0 otherwise. Table 3 shows the estimation results of the contracting phase regression model, where a series of indicators are used to measure the degree of model fit. The chi-square index for this model is 53.15, with a *p*-value that is well below the standard 0.05 level (*p* = 0.000) compared to a chi-square distribution with one degree of freedom. Thus, we have accurate and strong evidence to reject the original homogeneity hypothesis and accept the alternative hypothesis that heteroskedasticity is actually present in the residuals of our model of this regression. These estimates suggest that the three explanatory variables that were used in the model are significant for the resulting equation.

Table 3. First stage probit regression for predicting contracting behavior.

Variables	Coefficient	Std. Err.	z	<i>p</i> > z
IC1	0.014 **	0.0069431	2.01	0.044
IC2	−0.020	0.0777422	−0.26	0.794
IC3	−0.059	0.1449048	−0.41	0.683
IC4	−0.215 **	0.0971621	−2.21	0.027
FC1	−0.484 ***	0.1230697	−3.93	0.000
FC2	0.192	0.4120785	0.47	0.642
FC3	−0.025	0.0409714	−0.61	0.539
FC4	0.458	0.3916585	1.17	0.242
FC5	0.176	0.4810298	0.37	0.714
FC6	−0.119	0.1339266	−0.89	0.373
FC7	−0.030	0.0854278	−0.35	0.723
SC	−0.001	0.0097031	−0.07	0.943
Constant	1.797 **	0.8377215	2.15	0.032
Number of total observations				982
Number of censored observations				914
Log-likelihood test statistic				−220.58 ***
Pseudo-R2				0.11

Note: Standard errors are in parentheses; *** significant at *p* < 0.01, ** significant at *p* < 0.05.

IC was significantly correlated with farmers' signing behavior, where age (IC1) was positively correlated and intention to continue farming (IC4) was negatively correlated, both at the 5% level. This implies that the contracting behavior of APS needs to consider not only the stimulation and promotion of external social factors, but also pay more attention

to IC. First, there is a positive relationship between farmers' age (IC1) and contracting APS behavior, i.e., as farmers age increases, their working ability decreases and their physical condition becomes more difficult to support the heavy agricultural production and operation activities. The older the farmer is, the more inclined he is to outsource his farmland and the more likely he is to contract APS. Second, farmers' willingness to continue farming (IC4) has a significant effect on contracting behavior. This indicates that the stronger farmers' willingness to maintain their status as farmers and to complete their agricultural production and operation activities by themselves, the more they tend to maintain their family-type production and operation model, and the weaker they think about signing APS. In addition to this, farmers' family characteristics FC have a relatively strong influence on signing behavior. Among them, arable land area (FC1) is negatively correlated at the 1% level. The larger the area of arable land that is contracted by a farmer, the greater the side evidence that he has a large scale of production operation and the more abundant agricultural production materials he has, including agricultural materials, agricultural machinery, and information channels. Such a farmer with large-scale production has less demand for APS. On the contrary, the smaller the scale of agricultural production, the more scarce the production materials are, and the greater the demand for APS.

4.2. Renewal Stage Model Regression Results

Table 4 shows the estimated results of the OLS regression model for the renewal phase, where a series of indicators are used to measure the degree of fit of the model. The F-index for this model is 24.37, with a *p*-value that is well below the standard 0.05 level (*p* = 0.000) compared to a cardinal distribution with one degree of freedom. Thus, we have accurate and strong evidence to reject the original hypothesis of homogeneity and accept the alternative hypothesis that heteroscedasticity actually exists in the residuals of our model of this regression. These estimates suggest that the six key explanatory variables that were used in the model, as well as the six control variables, are significant for the resulting equation. In this study, propensity score matching was used to test the robustness of the regression results. By comparing the experimental and control groups, this approach reduces the effects of data bias and confounding variables and addresses endogeneity issues that are caused by unobservable sample selection bias. The results of the test are consistent with the previous analysis and the results can be said to be reliable.

Table 4. Results of the second-stage selection estimation (intention of renewal).

Variables	Coefficient	Std. Err.	t	<i>p</i> > t
BA1	0.057 ***	0.0216339	2.66	0.008
BA2	0.072 ***	0.0218874	3.27	0.001
BA3	0.031	0.0229665	1.35	0.178
SN	-0.111 ***	0.022898	-4.85	0.000
PBC1	0.273 ***	0.02707	10.09	0.000
PBC2	0.042	0.0301794	1.39	0.164
PBC3	-0.088 ***	0.0287982	-3.07	0.002
PBC4	-0.051 **	0.0239942	-2.11	0.035
PBC5	-0.027	0.0251995	-1.05	0.293
IC1	-0.002	0.0019667	-0.84	0.402
IC2	-0.032 **	0.0149478	-2.17	0.031
IC3	0.058 *	0.0300559	1.92	0.056
IC4	0.036	0.0264178	1.37	0.171
FC1	0.095	0.093008	1.03	0.305
FC2	0.016	0.0831216	0.19	0.846
FC3	0.011	0.0101574	1.08	0.279
FC4	0.292 ***	0.089909	3.25	0.001
FC5	-0.223 **	0.0931054	-2.39	0.017
FC6	0.012	0.0298563	0.39	0.699

Table 4. Cont.

Variables	Coefficient	Std. Err.	t	$p > t $
FC7	0.049 ***	0.0177759	2.75	0.006
SC	0.008 ***	0.0019289	4.12	0.000
Constant	-0.498 ***	0.1732352	-2.87	0.004
Mills Lambda	0.048	0.4954008	0.10	0.923

Note: Standard errors are in parentheses; *** significant at $p < 0.01$, ** significant at $p < 0.05$, and * significant at $p < 0.1$.

4.2.1. Behavioral Attitudes (BA)

As shown in Table 4, BA has a positive impact on farmers renewing APS, with BA1 and BA2 all significantly at the 1% level ($p < 0.001$), which is the main factor affecting farmers' willingness. This means that the more certain the farmers are of the degree of profit from the results of their actions, the more obvious the willingness to understand, participate in, and continue APS, and the more determined the willingness of families to participate in APS. In the three dimensions of BA, price identity (BA1), and outcome identity (BA2) were all positively correlated with RI, with impact coefficients of 0.057 and 0.072, respectively. It can be seen that BA1 has a great impact on RI, because when farmers consider whether to continue their cooperation with service providers, some questions that are related to expected returns can be answered from the price situation, so as to estimate the cost of agricultural production after participating in the service, and strengthen their willingness to renew. With that comes the impact of service result recognition (BA2). When farmers consider the expected income situation, the higher output that is brought by the service provider to the farmer is included in the scope of decision-making, and the farmer can form an objective and rational judgment on the advantages and disadvantages of APS, and take the initiative to grasp the relevant situation. The content of contract terms for APS (BA3) does not have a significant effect on RI, mainly because farmers are often in a passive position brought about by information asymmetry when contracting for APS, and because farmers are generally not highly educated. Rural areas in China have thick social network relationships and have reached a certain degree of psychological contract, so most of the service contracts are verbal agreements and commitments. Therefore, the degree of farmers' understanding of the terms does not have much influence on the willingness to renew the contract, although such oral contracts are hardly legal in nature and have a high risk. This shows that there is still a lot of room for improvement by the government, agricultural promotion departments, and service providers. Only by ensuring farmers' "written contractual identity" can this translate more effectively into support for APS.

4.2.2. Subjective Norms (SN)

SN significantly affects farmers' willingness to renew contracts for APS (RI) with an influence factor of -0.111 at the 1% level. It indicates that it is an important factor influencing farmers' decision-making. The more harmonious and frequent the communication between farmers and villagers, the wider the channels of access to information and the more complex the content of the information that is received, but the information about APS promotion is limited. Due to the unique interpersonal relationships in rural China, farmers with the same surname or with a certain degree of kinship occupy a larger proportion in the same village. This social network carrying the attributes of kinship not only increases the closeness between villagers, but also increases the degree of cooperative type of agricultural production and business cooperation and mutual support that exists among farmers. It is also more common for relatives, friends, or neighbors to help proxy and tidy up farmland for free, borrow or rent and sell agricultural machinery, and help with crop cultivation, etc. In recent years, as the younger generation grows up, such kinship ties still have an impact on agricultural production and operation nowadays, even though they have been gradually weakened. As a result, this may even weaken farmers' demand for APS and their willingness to continue working with service providers.

4.2.3. Perceptual Behavioral Control (PBC)

PBC has a significant effect on farmers' willingness to continue APS, with PBC1 and PBC3 significant at the 1% level ($p < 0.001$) and PBC4 significant at the 5% level, indicating that PBC is the main factor influencing farmers' willingness. This indicates that the stronger the satisfaction of farmers with the service and the more certain the time, the more pronounced the willingness to understand, participate, and continue the APS. Among the five dimensions of PBC, process identity (PBC1) was positively correlated with RI, with an impact coefficient of 0.273. The efficiency identity (PBC3, PBC34) was negatively correlated with RI, with impact coefficients of -0.088 and -0.051 , respectively. It can be seen that PBC1 has a strong influence on RI, because farmers' perceptions of APS in the past period have a strong impact when considering whether to continue working with the service provider, thus evaluating the agricultural production process after participating in the service and determining their willingness to renew the contract. This is followed by the influence of service process recognition (PBC1). When farmers consider continuing their cooperation for some time in the future, they analyze the professionalism, scientific, and other characteristics of the entire service process. Efficiency recognition (PBC3, PBC34) also has a significant impact on RI, mainly due to natural factors such as farming time, where crops are sown and harvested in the same area with similarities, and the ability of the service provider to increase efficiency and allocate resources rationally without delaying agricultural production is an important consideration for farmers when looking for services, booking services, receiving services, queuing, etc. The shorter the time farmers have to find a service provider, the shorter the turnaround time, the lower the time cost of changing service providers, and the weaker the desire to maintain a stable partnership.

4.2.4. Individual (IC), Family (FC), and Social (SC) Characteristics

IC was significantly correlated with RI, with health status (IC2) being negatively correlated and farmers' work status (IC3) being positively correlated. IC2 was significant at the 5% level and IC3 at the 10% level. This implies that farmers' willingness to renew APS not only needs to consider the influence of external factors, but also needs to pay more attention to IC. Firstly, there is a negative relationship between farmers' health level (IC2) and willingness to renew APS, which means that as farmers' health level increases, their working ability also increases and their willingness to continue to receive custodial services gradually decreases. Secondly, working outside the home (IC3) has a significant effect on RI, indicating that as farmers work outside the home and there is a shortage of labor within the families, their desire for trusteeship services for agricultural production grows and the demand for alternative labor becomes stronger. With the development of urbanization level, the choice of family's head to work outside the home is becoming more prominent, and the demand for service workers is increasing year by year.

As the most basic decision-making unit, the production and operation characteristics of the family have an important impact on RI. Among the variables that were measured by FC, the coefficients of how many pounds per acre (FC4), the difference between the highest and lowest yields in the past five years (FC5), and the topography of cultivated land (FC7) are 0.292, -0.223 , and 0.049, respectively. More specifically, participation in APS currently faces a great deal of uncertainty, so farmers and families need to take some production and business risks. Families with weaker risk-taking capacity are more likely to reject new production and business practices, and FC4 and FC5 are variables that measure farmers' risk-taking capacity. Among them, the less fluctuation of crop yield, the more stable the farmers' operating income, the better the capital turnover, and the more they dare to try or carry out entrustment activities. Arable land topography (FC7) also influences farmers' decisions, with flatter topography being more suitable for machinery operations and easier to find service providers. Therefore, families with gently sloping arable land are more interested in APS.

SC was significantly and positively correlated with RI at the 1% level. This suggests that the willingness to renew APS needs to be stimulated and promoted not only by

external factors but also by socio-economic characteristics. That is, with the emergence and development of industrial and service industries in the region, the “pulling power” of the labor force is increasing, and stimulated by high wages, farmers’ families are losing labor, especially young adults. As a result, farmers are more receptive to APS, especially to stable partnerships, due to their labor disadvantages.

5. Discussion

5.1. Integration with Previous Studies

Research on the issue of agricultural contracting is now mostly focused on farmers' behavior in purchasing APS, farmers signing agricultural orders, and leasing and transferring agricultural land [47–49]. For example, Vicol et al. developed a study on the mechanisms of uneven distribution of power relations in contract farming, revisiting issues that still exist or re-emerge in the academic research literature on contract farming [50]. Similarly, Cole suggests that the role of traders in contract farming inadvertently brings about agricultural extension and infrastructure upgrading that invariably boosts the livelihood levels of farmers in remote areas [51]. Hambloch quantifies contractual violations as secondary agency behavior or daily resistance, and thus examines the detrimental effects of such violations on the maintenance of a stable contractual relationship [52]. Prowse explored the role of contractual change in affecting household welfare using the example of central Malawi [53]. Yoshioka examined what role the strength of collaborative commitment plays in the renewal process of long-term university-industry contracts [54]. Regarding the renewal of contracts, existing studies have not yet turned their attention to the agricultural sector. Compared to the existing literature, this study may have the following marginal contributions. First of all, from the perspective of the study, this study focuses on farmers in Northeast China, who are the basic unit of participation in APS decision-making and the main audience group of the service. Most of the existing studies focus on macroscopic influencing factors of APS development or superficial influencing factors of farmers, ignoring the subtle changes of farmers' psychology and the complete process of decision-making mechanisms. In addition, farmers' cognitive preferences, willingness to participate, and stabilized cooperative relationships are the prerequisites and foundations for the continuous enrichment and development of APS. Second, in terms of research content, the decision-making process of farmers renewing APS is systematically analyzed, the main factors affecting farmers' willingness to renew are identified, and the influencing mechanism between variables at different levels is revealed. In addition, the focus of the study on the willingness to renew the contract broke through the research limitations of the existing literature on the act of contracting only. Maintaining good and stable cooperative relations can not only improve agricultural production efficiency, but also drive service providers to invest in technological innovation. Third, in terms of research methods, this study constructs a logical framework diagram and research path hypothesis based on the two-stage “contract-renewal” and the theoretical framework of planned behavior. The theoretical analysis framework and research assumptions were then demonstrated using field research data. It can provide new research ideas for other related studies on APS.

5.2. Theoretical Implications

The results of the study showed that, first, behavioral attitudes had a significant “stimulating” effect on farmers' motivation to renew their APS. The stronger the farmers' behavioral attitudes, the more inclined they are, the stronger their willingness to renew their contracts. In particular, the value of the coefficient of influence of behavioral attitudes in the regression results is the highest among all the latent variables, which further indicates that farmers' behavioral attitudes have an important influence on the generation of renewal intentions. Those farmers who had access to APS at more reasonable prices and higher returns were more likely to have the idea of renewing their service. The results that were obtained in this study are consistent with the findings of many previous studies that were

based on the TPB framework [55,56]. However, the research perspective of this study is the renewal behavior in the agricultural sector.

Second, this study found that both subjective norms and service immediacy “inhibited” farmers’ willingness to renew their contracts at the 1% significance level. In comparison, the coefficient of influence of subjective norms is greater. This suggests that the closeness of the relationship between farmers and the people around them, who can influence their decisions, is a key factor that weakens farmers’ willingness to renew their subscriptions. This is because close community ties increase unpaid cooperation among farmers, which in turn reduces farmers’ demand for other service providers. In addition, service content satisfaction has a positive effect on farmers’ willingness to renew their contracts. A plausible explanation is that the higher farmers’ satisfaction with the service content, the less willing they are to change service providers or terminate the purchase of APS.

Third, the study verified that the size of the cultivated land has a “disincentive” effect on farmers’ behavior of signing APS. This indicates that farmers with larger acreage have also reached a certain level of business scale, and they have sufficient conditions to own a certain number of agricultural fixed assets, including agricultural machinery. Therefore, their demand for APS is weaker than that of small-scale farmers. In addition, the higher the acreage yield, the poorer the topographic conditions, and the more attractive the secondary and tertiary employment in their area, the greater their need for APS. This indicates that the greater the workload, especially in the harvesting segment where the applicability of agricultural mechanization is higher, the less accessible the farmers are, the more difficult it is to complete the agricultural labor by themselves and, therefore, the more willing they are to renew their APS subscriptions. thus, releasing labor for higher-paying secondary and tertiary production activities.

5.3. Practical Implications

The perspective that was chosen for this study is the willingness of farmers to renew their contracts in APS, and the reason for choosing this direction is China’s current national situation of “big country, small farmers”. The development of APS can bridge the gap between small-scale farmers and agricultural modernization by reducing the gap in agricultural equipment, production technology, and management tools. The research team’s investigation found that the development of APS suffers from an inconsistent degree of contractual standardization and unstable interest linkages. This leads both farmers and service providers to spend a lot of transaction costs each year to find cooperation partners, and how to improve the stability of the contract between the two parties becomes an urgent issue, which is related to the stable development of the APS industry. Our research results show that in the APS partnership, the standardized, systematic, and scientific qualities of the service organization stimulate the farmers’ demand for contract renewal. This suggests that it is not sufficient to continue the partnership only with “contract labor” services. These findings imply that service organizations and governments should focus on optimizing services from a supply-side perspective. Other researchers have argued that farmers’ preferences in terms of price, marketing and payment methods, quality levels, and upfront investment needs influence their contractual choice behavior [57,58].

6. Conclusions

This study constructs a two-stage (contract-renewal) analysis framework in the process of farmers renewal of APS. On the basis of the survey data that were collected in the main grain producing areas of the three northeastern provinces, the Heckman two-stage model is used to study the influencing factors and path mechanism of farmers contract renewal intention from the three dimensions of SN, PBC, and BA.

The main findings of this study are as follows. First, farmers’ behavioral willingness to sign up and renew APS is consistent with the analytical framework of planned behavior theory, and the perceived control process is the main motivation for generating the willingness to renew (RI) with both “stimulus” and “constraint” logic. On the one hand,

the positive influence of behavioral attitudes (BA) and service satisfaction (PBC1) on the willingness to renew reflects the “stimulus” effect, which is an effective system to influence farmers’ decision to renew APS, and farmers’ feedback on the content of APS (PBC1) is the key to enhance the “stimulus” effect. On the other hand, the “constraint” effect is reflected in the neighborhood rapport (SN) and the feedback on the process of acquiring APS (PBC3, PBC34). Second, among the factors influencing the contracting stage, farmers’ contracted acreage had the greatest direct effect on contracting behavior, followed by farmers’ age and willingness to continue farming. In the contract renewal stage, the average crop yield per acre (FC4), topographic characteristics (FC7), and the number of non-farm employment in the area (SC) had the greatest impact on farmers’ willingness to renew their contracts. The farmers’ decision-making process is characterized as being oriented by expected returns and constrained by means of production, geographic characteristics, and risk preferences. Third, driven by the mechanism of “increased perceived control-emphasized behavioral attitude-enhanced stimulus effect-motivated willingness to renew”, farmers’ awareness of APS is increasing. However, the current development of APS is still not standardized, which hinders farmers’ willingness to maintain stable cooperative relationships.

Based on the above findings, this study may yield the following policy recommendations. First, the development of the APS industry in rural China is uneven and inadequate, and how to bring the supply and demand relationship closer to a steady state is an urgent issue to be addressed. Service providers, as rational actors, are not conducive to long-term planning, investment, and technological innovation by engaging in short-term transactions with farmers or frequently changing their customer base. Service providers should not only grasp the market dynamics of service prices, but also do their market due diligence to update farmers’ new demand elements in a timely manner, so that service content diversification and price rationalization can coexist. From the supply-side perspective, we can meet farmers’ diversified and highly efficient service needs, achieve technological innovation and industry chain extension, enhance farmers’ service satisfaction, and promote a stable cooperative relationship between the two parties. Thus, it shortens the time that is spent by farmers in intermediate steps such as finding service providers, negotiating service terms and monitoring services, improves transaction efficiency, and reduces frictional costs in the transaction process. It also incentivizes service providers to continuously improve the technical level of agricultural production and the level of scientific and standardized production.

Second, the influence of “kinship” in rural areas has “crowded out” the development of APS through unpaid mutual aid among farmers. However, this non-contractual form of mutual aid often generates a certain degree of dispute. The lack of necessary legal protection makes it difficult for farmers to defend their rights. Therefore, APS supply organizations should improve the transparency and circulation of service information, develop standardized contract templates, delineate responsibilities and obligations, and enhance scientific rigor. In the process of participating in APS, farmers are in a vulnerable position in terms of information and disputes due to the constraints of their own knowledge level, backward communication equipment, and low information collection level. While rectifying the atmosphere of the service market, the relevant local departments should popularize legal rights education through door-to-door publicity and distribution of manuals, as well as safeguard farmers’ property security and improve the credibility of services.

Third, the government should relax the financial constraints on farmers and increase microcredit services. In considering the contracting and renewal process of APS, farmers are not only cautious about transaction risks, but also constrained by their own financial constraints. This study confirms that farmers with stronger behavioral attitudes are more positive about renewing APS, while their own economic conditions constrain farmers’ decision-making behavior, and the worse their economic conditions are, the lower their willingness to renew APS. Government departments should relax the conditions and lower the threshold to encourage farmers to use various ways to carry out agricultural production

and business activities, so as to reduce their psychological and economic burdens. In addition, the government and relevant departments should strengthen the habitat of villages, arrange roads rationally, encourage the leveling of cultivated land, and promote to farmers to avoid frequent crop changes as much as possible to maintain a stable level of grain production. The secondary and tertiary industries should also be further developed to promote the effective allocation of human capital.

This study also has the following urgent need for improvement. First, when we developed our analysis using the TPB framework, farmers' subjective norms, perceptual behavioral control, and attitudinal intentions were difficult to observe directly because it involved quantifying farmers' psychological processes. Although this study constructs a two-stage theoretical analytical framework of "contract-renewal," further learning is needed to enable a more appropriate expression of willingness formation mechanisms [59–61]. Second, due to time constraints, the selection of the research area for this study remained limited when conducting the fieldwork, although the research team has fully satisfied the typicality and representativeness of the data, one could still expand the scope of the research at a later stage. Since we interviewed three major grain-producing provinces in the survey, the sample size of the survey met the needs of the study and did not affect the accuracy and reliability of the results, and some existing agricultural studies have the same survey area [62–64]. Third, because the research team only started to systematically investigate farmers' APS renewals in 2018, this study used only one year of cross-sectional data, which makes it difficult to reflect more clearly the dynamic change process under the time series. Future follow-up surveys can be conducted to develop further systematic research with panel data. Fourth, APS, as a service functional industry, has a development issue that involves several related subjects, and farmers are only the audience of the service, besides, service providers, farms, agricultural suppliers, government, and other subjects are also involved. This study only analyzes the problem about APS purchase and renewal from the farmers' perspective, and further research will strengthen the study of inter-subject game and other aspects in further research.

In the coming period, in-depth research can be conducted on the following aspects. First, the quantification of farmers' psychological processes should be further optimized by using a more standard form of Likert scale for question optimization, and also by using a randomized intervention experiment that integrates the special nature of different official sensory channels such as pictures, audio, and video to carry out tracking research activities. Second, expand the research area. In addition to the three northeastern provinces of China, Shandong Province as well as the Yangtze River Delta region are typical and important grain-producing bases, and also more suitable for the development of APS industry due to the advantages that are brought by topography and crop types. Therefore, in the next study, the research team can conduct sampling surveys in several large grain-producing bases to observe the dynamic changes in specific behavioral decisions of farmers and service providers, to clarify the heterogeneous effects of regional environmental differences, and to make the link between academic research and national policies closer. Third, a tracking survey is used to conduct multiple periods of research over a continuous period of time. Thus, the data in this field can be systematically mastered and panel data can be formed to lay the foundation for later studies on topics such as dynamic changes in behavioral intentions and deviations between intentions and behaviors. Fourth, in terms of research perspective, the research can be conducted from the perspective of multiple subjects and disciplines, and the research that is related to APS can involve various interdisciplinary disciplines such as economics, psychology, sociology, etc. In the future research, structural equation modeling and system dynamics modeling can be used to analyze various methods in order to achieve the goal of more scientific and accurate identification or prediction of each subject's decision-making behavior, so that the formulation of relevant policies can be more efficient and accurate.

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