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Perceived Organizational Support, Inter-Temporal Choice, and Farmer Conservation Tillage Adoption

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Abstract: To solve the problem of the insufficient driving force and low adoption rate of conservation tillage adoption and to enhance the effect of industrial organization in influencing technology diffusion, this paper explored the relationship and the mechanism of perceived organizational support and inter-temporal choice in the adoption of conservation tillage by using micro-research data from 725 melon farmers in the Shaanxi and Shanxi provinces in China and by applying the experimental economics method to obtain the inter-temporal choices of the farmers. This paper also analyzed farmers' risk preferences' moderating effect on the relationship between inter-temporal choice and conservation tillage. Additionally, it examined the impact of perceived organizational support on the differentiation of different conservation tillage technologies. The study found that perceived organizational support significantly contributes to adopting zero tillage and minimum tillage, and water-saving irrigation. Perceived organizational support was not conducive to farmers' adoption of furrow and ridge tillage. The impact of perceived organizational support on technology adoption is heterogeneous, depending on the differences in the size of the family's cultivated land. The inter-temporal choice of farmers significantly impedes the adoption of conservation tillage. The increase in risk preference helps alleviate the hindering effect of inter-temporal choice on farmers' adoption of conservation tillage. Perceived organizational support can promote the adoption of conservation tillage by reducing farmers' inter-temporal choices. Inter-temporal choice is an essential mechanism by which perceived organizational support affects the adoption of conservation tillage. Compared with the existing studies, this paper incorporates the technology-attribute-induced inter-temporal choice of farmers into the impact analysis framework and considers the relationship between perceived organizational support, inter-temporal choice, and the adoption of conservation tillage and the mechanism of its action. The findings of the study provide a theoretical basis for the enrichment of incentive mechanisms for the adoption of conservation tillage, which is of great significance for the improvement of the tool for the integration of small farmers in developing countries into the industrial activities of the new agricultural business central bodies and for promoting the diffusion of conservation tillage in agriculture.

Keywords: perceived organizational support; inter-temporal choice; conservation tillage; risk preference

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1. Introduction

The implementation of conservation tillage not only improves soil structure, increases soil organic matter, improves crop yields, and cuts agricultural costs [1], but it also has the environmental benefits of reducing greenhouse gas emissions, lowering energy consumption, and curbing the degradation of arable land [2]. Conservation tillage could contribute to the improvement of soil properties and maize yield in developing countries [3], which is of great significance for accelerating the green transformation of agriculture and the sustainable use of arable land. Most farmers in Bangladesh want to adopt conservation tillage technologies, while about 79% would like to pay for it [4]. Agricultural green development is integral to China's comprehensive rural revitalization strategy, economic and social green change, and constructing a beautiful China. It is an inevitable choice to improve agriculture's sustainability and competitiveness and achieve environmentally friendly production methods [5]. Document No. 1 of the Central Committee of China in 2021 emphasized "promoting green development of agriculture, implementing the national black land protection project, and promoting conservation tillage model". Promoting conservation tillage is the main method for implementing the strategy of "hiding food on land and food on technology". Encouraged by the central government and local governments at all levels, the promotion and application of conservation tillage in China have achieved specific results, with an area of 122.43 million mu (8,162,000 ha) in 2019, but overall, this only accounts for 6.05% of China's total arable land area, which is far lower than the application area of 40–70% in the U.S., Canada, Australia, Brazil, Argentina, and other countries. These technologies are not widely adopted by the farmers. Small and fragmented landholdings, a lack of financial resources among smallholder farmers to invest in conservation tillage, limited risk-bearing capacity, lack of proper training to operate the machines, and poor levels of market integration are all barriers to smallholder farmers adopting the technology [6,7]. Accordingly, the adoption rate of conservation tillage could be lower, making the promotion of the methods difficult.

Several scholars have studied the influencing factors of farmers' adoption of conservation tillage and individual characteristics (such as farmers' education level, risk preference, ecological cognition), household endowments (such as income level, cultivation scale), environmental factors (such as soil type), and government compensation affecting farmers' adoption behavior of conservation tillage [8–12]. Wollni et al. (2010) [13] empirically analyzed the effect of organic agricultural markets on conservation tillage adoption and found that market demand expansion has an inducing impact on farmers' conservation tillage adoption. Nazu S B et al. (2022) [4] assessed the willingness to pay (WTP) for adopting conservation tillage in terms of individual and co-operative payment systems using the primary data collected from 320 wheat farmers in Bangladesh. Nazu S B et al. (2022) [4] found that economic rewards are the essential factor influencing the adoption of conservation tillage technology by farmers, in addition to providing training among farmers and operators, providing credit support, and making machines and spare parts available in the nearest markets, which would also contribute to the adoption of conservation tillage. Yujie S et al. (2022) [14] discuss the factors affecting the adoption of conservation tillage technology by economically dominant, resource dominant, and socially dominant farmers. Yujie S et al. (2022) [14] found that land fragmentation degree can inhibit economically dominant farmers' adoption of conservation tillage technology. Social relations can positively influence resource dominant farmers. The share of non-farm income will positively impact socially dominant farmers. Mazumder M S U et al. (2023) [15] surveyed people directly or indirectly involved in conservation tillage in west and northwest Bangladesh. Mazumder M S U et al. (2023) [15] found that farmers' education qualifications, training experience, and knowledge regarding conservation farming practices significantly affected the adoption effect of conservation tillage. Meanwhile, because conservation tillage has inter-temporal agricultural technological attributes, some scholars have studied it from the perspective of technological attributes. Some scholars have noticed the substantial heterogeneity in farmers' choice of technologies with different attributes and thus studied farmers' technology choice by technology attributes [16–18]. Most of the existing literature selected a salient attribute of technology as an identifying feature to be studied, while Zheng Xuyuan et al. (2018) [19] categorized technologies in terms of the two-dimensional attributes of factor input intensity and technological risk and explored the impact of technology attributes on agricultural technology selection bias. Xu Zhigang et al. (2018) [20] analyzed the inter-temporal choice characteristics of straw incorporation.

Studies have confirmed the critical impact of industrial organizations on conservation tillage adoption by farmers. While helping small-scale farmers identify the agricultural production technologies with competitive advantages, industrial organizations can effectively reduce the cost of technology adoption, reduce uncertainty, and promote the precise match between technology adopters and the market. Nazu S B et al.'s (2022) [4] study on the willingness to pay for adopting conservation tillage in terms of individual and co-operative payment systems of wheat farmers in Bangladesh found that co-operatives formed based on farmers' WTP can promote the adoption of conservation tillage by reducing the cost of conservation tillage for farmers. L. Asprooth, M. Norton, and R. Galt (2023) [21] researched how participation and forms of engagement in the farmer network of the formal organization Practical Farmers of Iowa (PFI) are associated with the adoption of conservation practices. L. Asprooth, M. Norton, and R. Galt (2023) [21] found that PFI supports farmers in adopting conservation tillage technologies by providing information, resources, encouragement, confidence building, and reinforcement. Formal networks in PFI, which build relationships by providing face-to-face learning opportunities, are essential for conservation tillage promotion. Narrod et al.'s (2009) [22] study on the quality and safety of agricultural products in Kenya and India found that to satisfy developed countries' requirements for the quality and safety of farm products, organizations can effectively promote the adoption of green agricultural production technologies, such as conservation tillage, by farmers and enhance their attractiveness to consumers. Abebaw and Haile (2013) [23] empirically analyzed the factors affecting the adoption of farming technologies in Ethiopia through the propensity score matching method. The results proved that industrial organization significantly positively affects farmers' adoption of fertilizers and pesticides. Cheng Jiexian and Zheng Shaofeng (2018) [24] found that farmer self-organization can increase the adoption of green agricultural production technologies, such as quality control technologies in kiwifruit. Naziri et al. (2014) [25] conducted a survey of 60 vegetable production co-operatives in Vietnam and found that co-operatives, which provide technical guidance to their members, can produce vegetables with lower pesticide residues. Based on the above analysis, existing scholars have conducted many studies on the reasons for the low adoption rate of conservation tillage and the lack of adoption incentives. Nevertheless, they have neglected the influence of inter-temporal choices of farmers in adopting technology, which makes it difficult to effectively explain the "low adoption rate of economically and ecologically win–win conservation tillage" [26]. The ecological benefits brought by conservation tillage, such as soil quality improvement and prevention of arable land degradation, and the economic benefits, such as increased production and income, were not apparent then. It takes a specific period for the technology-related benefits to take effect, and the benefit cycle is long, which is a typical inter-temporal agricultural technology [27]. Compared to single-period agricultural technologies, farmers' conservation tillage adoption is more complex [20], requiring the consideration of trade-offs between the costs and benefits of technology adoption at different time nodes, revealing apparent inter-temporal choice behavior. In addition, most inter-temporal choice decisions are made in some risk scenarios [28]; the attitude toward risk plays a vital role in conservation tillage adoption with uncertain returns [29]; and risk aversion will reduce the rate of technology adoption and affect the diffusion of new technologies [30]; therefore, risk preferences may influence farmers' technology adoption inter-temporal selection behavior. At the same time, the implementation of conservation tillage inter-temporal agricultural technology brings economic and ecological benefits, and as an environmental good with the attributes of both private and public goods [31], the positive externality of the environmental benefits brought by technology adoption cannot be fully internalized [32], and "free-rider" behavior occurs [33], which will inhibit farmers' willingness to adopt conservation tillage and reduce their potential demand for technology adoption. In the absence of non-market interventions, farmers are not incentivized to adopt conservation tillage through market mechanisms, ultimately leading to low adoption of conservation tillage. Industrial organizations (such as agricultural co-operatives, enterprises, and technical associations), which are important mainstays of the construction of a modern rural industrial system [34], play a crucial role in realizing the organic convergence between small farmers and modern agriculture—improving the accessibility of relevant technologies through technical guidance, information consulting, and supply of elements and enhancing farmers' knowledge of technology attributes [35]—reduce the cost of technology adoption, mitigate the risk of technology adoption, and improve the expectation of technology benefits [36], so that farmers can "internalize" the positive externality of the benefits of technology adoption, thus accelerating the application of conservation tillage inter-period agricultural technology and providing a new path to incentivize the adoption of technology by farmers.

In summary, the current research on adopting conservation tillage focuses on the impact of farmers' risk perception, land operation characteristics, policy support, and other factors. It pays insufficient attention to farmers' inter-temporal choices caused by the inter-temporal attributes of the technology. It needs to analyze the impact of industrial organizations on the diffusion of technology in the interface between small farmers and modern agriculture from the perspective of the participation of the agricultural industry chain. The above provides room for further research in this paper. Given this, this paper measures farmers' inter-temporal choice behavior based on micro-research data from 725 melon farmers in the Shaanxi and Shanxi provinces in China, explores the impacts and mechanisms of perceived organizational support and inter-temporal choice on farmers' adoption of conservation tillage, and considers the moderating role of risk preference in it. The possible contributions of this paper are mainly as follows. First, this paper proposes to use a hyperbolic time-discount model to measure farmers' time-discount rate, to visualize farmers' technology adoption inter-temporal choice preferences, which are not easy to observe and describe, and to explore the impact of farmers' inter-temporal choices induced by the attribute characteristics of inter-temporal agricultural technologies on the adoption of conservation tillage. Second, this paper focuses on the role played by industrial organizations in the process of convergence between small farmers and modern agriculture, explores the role played by perceived organizational support in farmers' technology adoption inter-temporal choice, and reveals the influence relationship between perceived organizational support, inter-period selection, and farmers' adoption of conservation tillage to enrich the research on the influencing factors of farmers' technology adoption.

2. Theoretical Analysis and Research Hypotheses

American psychologists Eisenberger et al. (1986) [37] proposed the concept of organizational support based on the theory of organizational support formed by social exchange, norms of reciprocity, and organizational personification, which is used to measure an organization member's perceived holistic view of the organization—including the degree of importance of their contribution, concern for their interests, and trust—and is also called perceived organizational support. The perceived organizational support theory suggests that when members of an organization feel material help, emotional trust, value recognition, and other aspects of support from the organization, the members will increase their commitment to the organization, loyalty and contribution to the organization's goals, and enhance the degree of effort and efficiency to help the organization complete the business objectives in order to return the perceived organizational support better. We analyze the relationship between perceived organizational support and farmers' adoption of conservation tillage technologies from both the demand and supply sides. From the demand side, consumer demand for high-quality agricultural products, such as organic products and branded agriculture, is expanding with the upgrading of the agricultural product consumption market. The transformation and upgrading of demand have induced farmers to adopt new agricultural conservation tillage technologies to produce high-quality agricultural products, gain access to high-value product markets, and thus obtain more significant agricultural production gains. From the supply side, China's rural science and technology supply are mainly based on the government's public agricultural technology services, which makes it challenging to meet the demand for agricultural technology of small-scale farmers in decentralized operations. Agricultural industrial organizations integrate small farmers into their industrial chain through market-oriented agricultural technology services, drive farmers to realize the modernization of agricultural production, and then gradually become effective suppliers of rural science and technology services. Perceived organizational support can promote the linkage between farmers and the agricultural industrial organization and stimulate farmers to develop a strong sense of responsibility for developing the industrial organization. They will put more effort into helping the development of the industrial organization. Based on the studies of Eisenberger et al. (1986) [37] and Ling Wen Quan et al. (2006) [38], this paper divides perceived organizational support into three dimensions: institutional, instrumental, and emotional support.

2.1. Direct Impact of Perceived Organizational Support on Conservation Tillage Adoption

Farmers perceive the support of agricultural industrialized organizations in agrarian production as stemming from institutional, instrumental, and emotional support. First, agricultural industrialized organizations establish stable production and marketing relationships and standardized benefit distribution relationships with farmers by providing them with institutional support, such as joint product certification, unified branding, and unified management. In addition, agricultural industrial organizations motivate farmers to improve product quality and produce high-quality products through external benefit incentives and organizational constraints [39]. Institutional support helps farmers gain access to high-end markets and price spillovers [13], solves market access problems, and improves farmers' returns on output. The associated benefits inspire farmers to adopt technology to improve the quality of their farmland and motivate them to adopt conservation tillage. Second, agricultural industrial organizations bring material, information, and technology assistance to farmers by providing high-quality inputs, timely market information, training in new technologies, and other support tools. Instrumental support helps farmers enhance their information acquisition ability, break information barriers, alleviate risk-averse attitudes to technology adoption due to lack of information [40], and reduce transaction costs and risks in relevant links. Instrumental support helps farmers achieve the optimal allocation of production factors and product quality improvement. Instrumental support can improve farmers' potential demand and ability to apply new technologies [41], increasing the probability of farmers adopting cost-saving and efficiency-enhancing conservation tillage technologies. Third, agricultural industry organizations emotionally support farmers through care, recognition, and value emphasis. When farmers perceive care and help from the organization and are satisfied with the organization, this emotional support builds an internal constraint monitoring mechanism for farmers [42], which strengthens the level of trust and emotional commitment of farmers to the organization [43]. Farmers will put in more effort to meet organizational requirements, driving farmers to adopt conservation tillage techniques to comply with the organization's standardized production requirements. Based on this, this paper proposes the following hypothesis H1.

Hypothesis 1 (H1): *Perceived organizational support positively affects farmers' adoption of conservation tillage.*

2.2. Direct Impact of Inter-Temporal Choice on Conservation Tillage Adoption

Inter-temporal choice refers to how individuals compare costs and benefits at different points (especially present and future) and make choices [44]. In inter-temporal choice, individuals often underestimate future returns and overestimate current returns, preferring to choose immediate returns, and their estimated value of future returns decreases over time. This psychological phenomenon is called time discounting, which is the core of inter-temporal choice [45]. The larger the time-discount rate, the faster the subjective value of delayed rewards is discounted over time, and the more individuals tend to choose small and immediate rewards. When farmers make agricultural technology choices, they need to consider not only their endowment constraints but also the technical characteristics related to their endowment characteristics and technological risk attributes [19]. Conservation tillage is a cross-period agricultural technology compared to single-period agricultural technology. The benefits of current technology investment occur in multiple future periods, and the effectiveness requires a certain amount of time. The technology has a long cycle of action, slow effectiveness, and is greatly affected by external factors, resulting in high uncertainty of benefits [27]. Farmers will compare the expected future benefits of the technology (i.e., discounting future benefits for the current period) with the current investment cost to make adoption decisions [20]. Therefore, the inter-temporal choice of farmers when balancing current and future expected benefits may affect their adoption of conservation tillage inter-temporal agricultural technology. When farmers have a higher time-discount rate, they strongly prefer current earnings, and the marginal utility of current earnings is higher than that of future earnings. When deciding to adopt conservation tillage inter-temporal agricultural technology, they will discount its future earnings for the current period at a lower present value and subtract the current technology adoption cost based on the lower present value. The net present value will be lower. Therefore, farmers have a low tendency to adopt conservation tillage inter-temporal agricultural technology [20]. On the contrary, when farmers have a low time-discount rate, they strongly prefer future earnings, and the marginal utility of future earnings is higher than that of current earnings. When deciding to adopt conservation tillage inter-temporal agricultural technology, they will discount its future earnings for the current period at a higher present value and subtract the current technology adoption cost based on the higher present value. The net present value will be higher. Farmers may be inclined to adopt conservation tillage inter-temporal agricultural technology. Based on this, this paper proposes the following hypothesis H2.

Hypothesis 2 (H2): *Inter-temporal choice negatively affects farmers' conservation tillage adoption.*

2.3. Indirect Effects of Perceived Organizational Support on the Adoption of Conservation Tillage through Inter-Temporal Choice

First, agricultural industry organizations provide farmers with institutional support, such as production standards, quality certification, brand sharing, and contract norms. According to the principle of reciprocity, farmers will commit to the organization after feeling the institutional support of the organization. This kind of pre-commitment as a self-control strategy can help farmers eliminate in advance the options, which induce individuals to choose immediate benefits in future decisions in inter-temporal choice to resist the temptation of current benefits [46]. This pre-commitment can help farmers reduce the time-discount rate and give more weight to expected returns, guiding farmers in adopting conservation tillage inter-temporal agricultural techniques to produce high-quality agricultural products, which meet organizational requirements. Second, farmers' benefits of adopting conservation tillage mainly occur in the future, and they make inter-temporal choice decisions under a risk framework. Farmers perceive the technical information, market information, expert guidance and training, and other instrumental support provided by the agricultural industry organization and its information exchange with other organization members. These instrumental supports help enhance information acquisition capacity, mitigate factor allocation inefficiencies due to information asymmetry, and reduce their subjective and objective risk perceptions of adopting new technologies in the future. As risk perception decreases, the growth rate of the time-discount rate weakens, buffering the increase in the time-discount rate due to time lengthening [47]. Farmers with lower time-discount rates are more likely to choose future benefits in the trade-off between current and future benefits, pushing them to adopt conservation tillage, whose returns occur in the future. Third, agricultural industry organizations' care, respect, and attention will stimulate positive emotions, such as trust, hope, and gratitude, among farmers [48]. These positive emotions influence subsequent decision making by changing the cognitive assessment of farmers during the decision-making process, which in turn affects the subsequent decision making or has a direct subtle effect on the decision-making behavior of farmers afterward. Positive emotions, such as gratitude and hope, increase farmers' cognitive flexibility to engage in higher levels of thinking and become more patient in inter-temporal choice [49]. As a result, farmers focus not only on immediate gains and losses but also on long-term outcomes and more integratively compare total returns now and in the future. Patient farmers have a lower time-discount rate, a more robust future orientation, and a willingness to choose more significant returns realized after a specific time. At this time, farmers may choose conservation tillage inter-temporal agricultural technology to reward the emotional support given by the organization. Based on this, this paper proposes the following hypothesis H3.

Hypothesis 3 (H3): *Perceived organizational support positively affects farmers' conservation tillage adoption by influencing farmers' inter-temporal choice.*

2.4. The Moderating Effect of Risk Preferences in the Impact of Inter-Temporal Choice on Conservation Tillage Adoption

People make inter-temporal choices under risk scenarios [28]. Since the adoption of conservation tillage is affected by various factors, such as market, technology, and climatic conditions, the benefits of adoption are uncertain. Therefore, adopting conservation tillage is an inter-temporal choice under risk scenarios. The risk decision-making behavior of farmers under uncertainty scenarios is affected by the degree of risk preference [50]. Therefore, farmers' risk preferences will affect the inter-temporal choice of conservation tillage under risk scenarios. When farmers have a low-risk preference, they are unwilling to take future risks, believe that the risks are more significant than expected returns, and are "short-sighted" about future returns. Farmers will tend to choose current benefits with greater weight. Farmers with a higher time-discount rate will have a smaller present value when converting future benefits into current benefits. At this time, farmers may have a wait-and-see attitude toward adopting technologies with high-income uncertainty and therefore have a low tendency to adopt conservation tillage inter-temporal agricultural technologies. On the contrary, when farmers have a high degree of risk preference, they may choose to take future risks and then tend to choose future returns. Farmers with a lower time-discount rate have a higher present value of converting future earnings into current earnings. At this time, they may adopt technologies with high earnings uncertainty. Therefore, there is a higher tendency to adopt conservation tillage inter-temporal agricultural technology. Based on this, this paper proposes the following hypothesis H4.

Hypothesis 4 (H4): *Risk preference plays a positive moderating role in the process of inter-temporal choice influencing conservation tillage adoption.*

This paper incorporates perceived organizational support, inter-temporal choice, risk preference, and farmers' adoption of conservation tillage into the same analytical framework (see Figure 1). This paper tests the direct effect of perceived organizational support and inter-temporal choice on conservation tillage adoption and the indirect effect of perceived organizational support on technology adoption through inter-temporal choice. Moreover, the paper explores the moderating role of farmers' risk preferences in the impact of inter-temporal choice on conservation tillage adoption to provide a new perspective for accelerating the diffusion of conservation tillage.

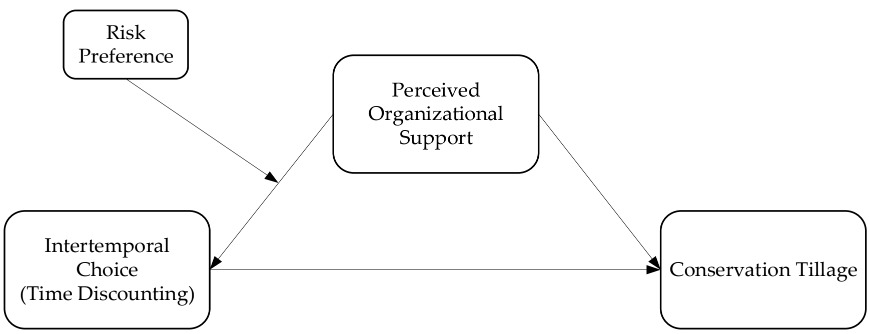

Figure 1. Theoretical analysis framework diagram.

3. Materials and Methods

3.1. Research Methods

3.1.1. Logit Model

To examine the effect of perceived organizational support and inter-temporal choice on farmers' conservation tillage adoption, the dependent variable Y_i denotes farmers' conservation tillage adoption (1 = adopted, 0 = not adopted), resulting from binary discrete choice. This study used a binary Logit model for empirical estimation, constructed in the following model form:

$$Y_i^* = \beta_0 + \beta_1 X_i + \delta_i \tag{1}$$

$$Y_i = \begin{cases} 1, \ Y_i^* > 0 \\ 0, \ Y_i^* \leq 0 \end{cases} \tag{2}$$

In Equation (1), Y_i^* is an unobservable latent variable representing farmers' decision to adopt conservation tillage. X_i is a matrix of independent variables (including perceived organizational support, inter-temporal choice, risk preference core independent variables, and control variables, such as head of household characteristics, family business characteristics, and regional environment characteristics). β_0, β_1 represent the coefficients to be estimated, and δ_i is a random disturbance term assumed to follow a logistic distribution. In Equation (2), Y_i is an observable explicit variable representing farmers' conservation tillage adoption behavior. If $Y_i = 1$, farmers adopt the technology; if $Y_i = 0$, farmers do not adopt the technology.

The Logit model uses a logistic probability distribution function of the form

$$P(y|x) = \frac{e^{(\beta_0 + \beta_1 X_i)}}{1 + e^{(\beta_0 + \beta_1 X_i)}} \tag{3}$$

Equation (3) represents the probability of adoption of conservation tillage by farmers.

$$\frac{P}{1-P} = \frac{P(y=1|x)}{P(y=0|x)} = e^{(\beta_0 + \beta_1 X_i)} \tag{4}$$

Equation (4) is the opportunity ratio, which represents the ratio of the probability of a farmer adopting conservation tillage to the probability of not adopting conservation tillage.

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_i \tag{5}$$

Equation (5) is the logarithmic chance ratio.

3.1.2. A Test of Mediating and Moderating Effects

This paper uses stepwise regression analysis to test the mediating role of inter-temporal choice and the moderating effect of risk preference. Although scholars have questioned the stepwise regression method due to its low testing power, if it can obtain significant results, this means there is no problem with low testing power [51]. Based on this, the specific model design is as follows:

$$Y = a_1 X + \mu_1 \tag{6}$$

$$M = b_1 X + \mu_2 \tag{7}$$

$$Y = a_2 X + b_2 M + cV + dMV + \mu_3 \tag{8}$$

X, Y, M, and V denote perceived organizational support, conservation tillage adoption, inter-temporal choice, and risk preference. a_1, b_1, a_2, b_2, c, and d are the coefficients to be estimated, and μ_1, μ_2, μ_3 is the random disturbance term. Equation (6) is consistent with the benchmark regression model in this paper. If the coefficients of X in Equations (6) and (7) are both significant and the coefficients of X and M in Equation (8) are also both significant, but the absolute value of a_2 is smaller than the absolute value of a_1, this indicates that there is a partially mediated effect of inter-temporal choice. If the coefficient of M in Equation (8) is significant, but the coefficient of X is not, this indicates that there is a fully mediated effect of inter-temporal choice. In addition, if the coefficient d of the interaction term between M and V in Equation (9) is significant, this indicates that risk preference plays a moderating role in the relationship between inter-temporal choice and farmers' adoption of conservation tillage. The formula for the proportion of influence of the mediating role is as follows:

$$\varphi = \frac{b_1 \times b_2}{a_1} \tag{9}$$

3.2. Data Sources

As an important economic crop in the northern region, melon planting mainly involves zero tillage and minimum tillage, water-saving irrigation, furrow and ridge tillage, straw incorporation, and many other critical conservation tillage techniques. It belongs to the vital promotion industry of the agricultural conservation tillage model, in addition to food crops. The data used in this article come from the field household survey of melon growers gathered by the project team in the Yanhu District, Yuncheng City, Shanxi Province, and Yanliang District, Xi'an City, Shaanxi Province from October to November 2020. For the following three reasons, we selected melon growers in the Yanliang District of Xi'an and the Yancheng Yanhu District of Yuncheng City as the research subjects for conservation tillage technology. First, the Yanliang District of Xi'an City and the Yanhu District of Yuncheng City are located in the Loess Plateau region of China. The Loess Plateau is a vital soil erosion control area and land resource protection area in China, with severe soil degradation, nutrient deficiency, weak regeneration, susceptibility to erosion, fragile ecological environment, and an urgent need to improve the agroecological environment and land quality. Second, melon cultivation includes several key conservation tillage technologies, such as no tillage and less tillage, water-saving irrigation, integrated pest and disease control, and straw stubble mulching. The Yanliang and Yanhu Districts are located in the northwest and north-producing areas of the four major melon-producing regions in China, and the "Yanliang Melon" has obtained the Geographical Indication of Agricultural Products from the Ministry of Agriculture. Third, the research area of agricultural professional co-operatives, leading enterprises, technical associations, and other new agricultural industrial organizations is developing relatively fast, playing an essential leading role in the development of the melon industry.

Using a combination of stratified random sampling methods, two sample areas—the Yanliang District in Xi'an City and the Yanhu District in Yuncheng City—were first selected for the research, and then, 3 townships were randomly selected in each district, 4–5 administrative villages were randomly selected in each township, and 20–30 farming households with communication ability were randomly selected in each village. During the field research process, the researchers used a combination of research questionnaires and one-on-one interviews with farmers to collect data. To improve the questionnaire's relevance, credibility, and completeness and reduce the impact of regional differences on the research results, we conducted a pre-survey before the formal research, and on this basis, the questionnaire was further revised and improved. The research questionnaire mainly contained household head characteristics, family business characteristics, technology adoption status, agricultural and industrial organizations' participation, perception of perceived organizational support, inter-temporal choice, and risk preferences.

In this research, we interviewed a total of 741 melon farmers. After eliminating invalid samples with missing key variables or outliers, a final valid sample of 725 households was obtained, with a sample validity rate of 97.84%, of which 363 households (or 50.07%) were from Shaanxi, and 362 households (or 49.93%) were from Shanxi. The proportion of the sample involved in agricultural enterprises was 62.35%; the proportion involved in farmers' professional co-operatives was 24.16%; and the proportion involved in agricultural technology associations was 13.49%.

3.3. Variable Descriptions

3.3.1. Conservation Tillage Adoption

Technology adoption results from a combination of factors, such as technology attributes, environmental constraints, and characteristics of the adopting group. Noting the substantial heterogeneity in farmers' choice of technologies with different attributes, some scholars have studied farmers' technology choice behavior by technology attributes [19]. Conservation tillage refers to soil and water conservation measures, and it is a modern farming technology system, which includes zero tillage and minimum tillage, contour tillage, furrow and ridge tillage, straw incorporation, and water-saving irrigation. The research group found in the field research that farmers usually adopt conservation tillage, such as zero tillage and minimum tillage, water-saving irrigation, furrow and ridge tillage, plastic film mulch, organic fertilizer application, and integrated pest management in growing melons, and the first three technologies have a significant effect on improving the quality of arable land and reducing the risk of pest and weed infestation. The first three technologies play an essential role in improving the quality of arable land, reducing soil erosion, storing water, and retaining moisture, and have a high degree of randomness in the adoption of melon planting technologies by farmers in the two regions. In this paper, three representative technologies—namely no tillage and minimum tillage, furrow plowing, and water-saving irrigation—were selected to study the impact of perceived organizational support on farmers' technology adoption and the heterogeneity in the impacts on different technologies. This paper chooses the binary assignment method commonly used in technology adoption to conduct the study, which assigns a value of 1 if the farmer adopts conservation tillage and a value of 0 if the farmer does not adopt conservation tillage. Table 1 shows the adoption of conservation tillage by sample farmers.

Table 1. Adoption of conservation tillage by sample farmers (N = 725).

Conservation Tillage	Sample Statistics	Percentage (%)
Zero tillage and minimum tillage	527	72.69
Water-saving irrigation	205	28.28
Furrow and ridge tillage	593	81.79

3.3.2. Perceived Organizational Support

According to the aforementioned theoretical analysis, based on the perceived organizational support research questionnaire developed by Eisenberger et al. (1986) [37] and referring to the study of Ling Wen Quan et al. (2006) [38], the questionnaire was adjusted and optimized to measure perceived organizational support from three dimensions: institutional support, instrumental support, and emotional support. Table 2 shows the specific meanings and statistical characteristics of the indices.

This paper uses exploratory factor analysis to measure perceived organizational support. The reliability coefficient (Cronbach's α) of the tool support variables is 0.9133; that of institutional support is 0.9332; that of emotional support is 0.6503; and that of organizational support perception is 0.7001. This indicates the feasibility of the questionnaire measurement method. First, the KMO value of the perceived organizational support measure is 0.92, and the chi-square value of Barelett's test of sphericity is 7624.31 (sig = 0.000), which indicates that the perceived organizational support measure is suitable for factor analysis. Second, to confer specific economic meanings to the factor analysis results, this paper applies principal component analysis to extract the three common factors with eigenvalues greater than 1, and the cumulative variance contribution rate is 85.50%. Among them, the variance contribution rate of public factor 1 (institutional support) is 43.14%; the variance contribution rate of public factor 2 (instrumental support) is 31.03%; and the variance contribution rate of public factor 3 (emotional support) is 13.33%. Finally, the following formula calculates the factor scores for each sample dimension.

$$F_j = \beta_{j1}X_1 + \beta_{j2}X_2 + \cdots + \beta_{jp}X_p,\ j = 1, 2, 3 \quad (10)$$

where F_j is the score value of the jth public factor of sample farmers; X_p is the measurement variable of perceived organizational support included in this dimension; and $\beta_{j1} \backsim \beta_{jp}$ is the corresponding weight of each measurement variable. Finally, the variance contribution of each public factor is used as weights to calculate the perceived organizational support of sample farmers, which is calculated using the following formula.

$$\text{Perceived organizational support} = 0.419 * F_1 + 0.302 * F_2 + 0.279 * F_3 \quad (11)$$

Table 2. Core independent variable indicator measures and descriptive analyses.

Variable	Indicator Name		Variable Description	Average Value	Standard Deviation
Perceived Organizational Support	Institutional Support	Agricultural Contracts	Organizations, such as co-operatives and enterprises, have contracts or agricultural orders with the farmer: 1 = No; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.055	1.361
		Production Standards	Organizations, such as co-operatives and enterprises, set the standards of agricultural production for the farmer: 1 = None; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.179	1.364
		Certified Trademarks	Organizations, such as co-operatives and enterprises, provide the farmer with "three products and one label" services and trademarks: 1 = None; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.206	1.392
		Sales Services	Organizations, such as co-operatives and enterprises, provide the farmer with marketing services: 1 = None; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.316	1.384
	Instrumental Support	Agricultural Material	Organizations, such as co-operatives and enterprises, provide the farmer with the agricultural material they need for production: 1 = None; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.560	1.365
		Market Information	Organizations, such as co-operatives and enterprises, provide the farmer with market information: 1 = None; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.585	1.352
		Technical Guidance	Organizations, such as co-operatives and enterprises, provide the farmer with agricultural training and technical guidance: 1 = None; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.746	1.400

Table 2. *Cont.*

Variable	Indicator Name		Variable Description	Average Value	Standard Deviation
		Financial Support	Organizations, such as co-operatives and enterprises, provide the farmer with financial support or loan guarantees: 1 = None; 2 = Rarely; 3 = Generally; 4 = Many; 5 = Frequently	2.091	1.350
	Emotional Support	Respectful	Organizations, such as co-operatives and enterprises, respect the various decisions the farmer makes in melon production: 1 = Very Disrespectful; 2 = Disrespectful; 3 = Average; 4 = Respectful; 5 = Very Respectful	3.472	0.801
		Trusted	Organizations, such as co-operatives and enterprises, trust the farmer very much: 1 = Very Distrustful; 2 = Distrustful; 3 = Average; 4 = Trustful; 5 = Very Trusting	3.417	0.782
		Attention	Organizations, such as co-operatives and enterprises, give the farmer guidance and help when they have problems in production: 1 = Never; 2 = Not Concerned; 3 = Generally; 4 = Concerned; 5 = Very Concerned	3.483	0.948
		Credibility	Organizations, such as co-operatives and enterprises, have committed fraud in the distribution of agricultural inputs or the purchase of products: 1 = Strongly Disagree; 2 = Disagree; 3 = General; 4 = Agree; 5 = Strongly Agree	2.250	1.092

3.3.3. Inter-Temporal Choice

Based on the previous theoretical analyses, this paper measures farmers' temporal discounting to characterize inter-temporal choice through an experimental economics approach, and the key to measuring temporal discounting lies in calculating the temporal discounting rate. Existing studies have obtained the discounting rate through experimental situations, requiring respondents to choose a delayed reward with the same subjective value as an immediate reward [45] and then calculate the difference between the delayed and immediate rewards (known as the indifferent point) to obtain a discounting rate. Currently, matching and choice are the primary methods to determine the indifferent point. In contrast, the choice method has a higher predictive power for inter-temporal choice than matching. The choice method requires subjects to choose between options to determine their indifferent point. The main methods commonly used to determine the indifferent point are the dynamic multiple staircase and fixed sequence titration. Rodzon et al. (2011) [45] found no significant difference in predicting the indifferent point between these two methods. The fixed sequence titration only changes the size of the delayed reward (or immediate reward) while fixing the size of the immediate reward (or delayed reward). It is widely used due to its easy-to-understand and operational advantages. Therefore, this paper uses fixed sequence titration to design an experimental protocol to determine the indifferent point and calculate the respondents' temporal discounting rate.

Referring to McClure et al.'s (2004) [52] experimental design scheme for inter-temporal choice, we designed a set of inter-temporal choice questionnaires in conjunction with the study in this paper. In this study, we rewarded all the respondents who participated in the inter-temporal choice experimental game to motivate them to complete the experiment seriously and reduce the measurement error of inter-temporal choice. The specific experimental scheme of inter-temporal choice in this study is as follows.

Imaginary Scenario 1: The farmer participates in a lottery and draws a free redemption voucher. Now, the farmer has two options: exchange the voucher for CNY 100 on the spot or exchange the voucher for some other amount of money three months later. Please choose between Option A and Option B, corresponding to the following five options (Table 3).

Table 3. Experimental program of inter-temporal selection by farmers (I).

Group Number	Number of Questions	Options A	Options B	Responsive
1	Option 1	Exchange CNY 100 now	Exchange CNY 120 after three months	
	Option 2	Exchange CNY 100 now	Exchange CNY 150 after three months	
	Option 3	Exchange CNY 100 now	Exchange CNY 200 after three months	
	Option 4	Exchange CNY100 now	Exchange CNY 300 after three months	
	Option 5	Exchange CNY 100 now	Exchange CNY 600 after three months	

Imaginary Scenario 2: The farmer participates in a lottery and draws a free redemption voucher. Now, the farmer has two options: exchange the voucher for USD 100 on the spot or exchange the voucher for some other amount of money six months later. Please choose between Option A and Option B, corresponding to the following five options (Table 4).

Table 4. Experimental program of inter-temporal selection by farmers (II).

Group Number	Number of Questions	Options A	Options B	Responsive
2	Option 6	Exchange CNY 100 now	Exchange CNY 120 after six months	
	Option 7	Exchange CNY 100 now	Exchange CNY 150 after six months	
	Option 8	Exchange CNY 100 now	Exchange CNY 200 after six months	
	Option 9	Exchange CNY 100 now	Exchange CNY 300 after six months	
	Option 10	Exchange CNY 100 now	Exchange CNY 600 after six months	

Imaginary Scenario 3: The farmer participates in a lottery and draws a free redemption voucher. Now, the farmer has two options: exchange the voucher for USD 100 on the spot or exchange the voucher for some other amount of money one year later. Please choose between Option A and Option B, corresponding to the following five options (Table 5).

Table 5. Experimental program of inter-temporal selection by farmers (III).

Group Number	Number of Questions	Options A	Options B	Responsive
3	Option 11	Exchange CNY 100 now	Exchange CNY 120 after one year	
	Option 12	Exchange CNY100 now	Exchange CNY 150 after one year	
	Option 13	Exchange CNY 100 now	Exchange CNY 200 after one year	
	Option 14	Exchange CNY 100 now	Exchange CNY 300 after one year	
	Option 15	Exchange CNY 100 now	Exchange CNY 600 after one year	

This study constructed three inter-temporal choice experimental programs, each with five paired options. Each set of options includes a smaller immediate reward (Option A) and a larger delayed reward at a specific time in the future (Option B). The three sets of experimental plans are three independent choice situations, and the delay times of delayed rewards are three months, half a year, and one year, respectively. When executing each set of experimental plans, the researcher introduces the experimental situation to the respondents and informs them there is no right or wrong choice. In order of program number, the researcher asks the respondents to choose between options A and B in each group while ensuring that the respondents understand the context. When the respondent's choice changes from immediate reward to delayed reward (or from delayed reward to immediate reward), the respondent's last immediate reward (or delayed reward) is their indifference point. According to the hyperbolic model, calculate the time-discount rate:

$$k = (A/V - 1)/D \tag{12}$$

where k denotes the temporal discounting rate; A denotes the delayed reward; V denotes the immediate reward; and D denotes the delay time (in this paper, the month unit is 3, 6, and 12, respectively). After obtaining the temporal discounting rate for each group of experiments, we calculate the arithmetic mean of the temporal discounting rate k in the three groups of experiments to obtain the final temporal discounting rate characterizing the inter-temporal choice variable, which takes the value range of 0~1.

3.3.4. Risk Preference

This paper draws on the idea of Menapace et al. (2016) [53] scholars to obtain the degree of risk preference based on farmers' attitudes toward return uncertainty and designs the following question to measure farmers' risk preference: "If you have an asset, what type of investment project would you prefer to choose?". Farmers have to choose from the following options: "1 = stable return project without any risk; 2 = lower risk lower return project; 3 = average risk average return project; 4 = high risk high return project". Among options 1–4, the farmer's choice of option 1 means that they are an extreme risk averter, and the farmer's choice of option 4 means that they prefer extreme risk.

3.3.5. Control Variables

Based on the research of Qiu Huanguang et al. (2020) [50] and considering the internal characteristics and external factors affecting the adoption of technology by farmers, this paper selects factors including the characteristics of the household, family characteristics, and characteristics of the regional environment as the control variables, which may affect the adoption of conservation tillage by farmers. Table 6 shows the specific meaning and descriptive analysis of the indicators.

Table 6. Description of variables and descriptive statistics.

Variable Name	Variable Description	Average Value	Standard Deviation	Minimum Values	Maximum Values
Explained Variables					
Zero Tillage and Minimum Tillage Adoption	1 = Farmers adopt zero tillage and minimum tillage 0 = Not adopted	0.727	0.446	0	1
Furrow and Ridge Tillage Adoption	1 = Farmers adopt furrow and ridge tillage 0 = Not adopted	0.818	0.386	0	1
Water-Saving Irrigation Adoption	1 = Farmers adopt water-saving irrigation 0 = Not adopted	0.283	0.451	0	1
Core Explanatory Variables					
Perceived Organizational Support	Farmers' perceived level of organizational support (factor analysis score)	0	0.576	−1.006	1.335
Inter-Temporal Choice	They are calculated based on the experimental design scheme, with values in the range 0–1	0.238	0.259	0.033	0.833

Table 6. *Cont.*

Variable Name	Variable Description	Average Value	Standard Deviation	Minimum Values	Maximum Values
Risk Preference	If you have an asset, what type of investment project would you prefer to choose? 1 = Stable return project without any risk; 2 = Lower risk lower return project; 3 = Average risk average return project; 4 = High risk high return project	3.081	0.951	1	4
Control Variables					
Age	The age of head of household, in years	52.193	8.788	20	84
Education Level	Years of education as head of household, in years	8.04	2.577	0	16
Health	Health status of head of household: 1 = Always Sick; 2 = Fair; 3 = Very Good	2.767	0.49	1	3
Cultivation Experience	Years of cultivation by household head, in years	25.890	11.230	1	66
Labor	The number of household labor force, in numbers	3.328	0.976	1	6
Labor Experience	Whether family members have worked outside the home: 1 = Yes; 0 = No	0.665	0.472	0	1
Land	Farmers' agricultural cultivation area, in mu	15.617	10.744	2	120
Agricultural Income Share	Household agricultural income/annual household income of farm households, in CHY	0.678	0.266	0.120	1
Mechanization	Evaluation of the degree of mechanization of household agricultural production: 1 = Very Bad; 2 = Bad; 3 = General; 4 = Better; 5 = Very Good	3.357	0.986	1	5
Market Convenience	Distance of the farmer's home from the market, in li	4.248	3.326	0	20
Technology Demonstration Village	Whether the farmer's village is a technology demonstration village: 1 = Yes; 0 = No	0.177	0.382	0	1

4. Results

4.1. Impact of Perceived Organizational Support on Conservation Tillage

Table 7 reports the effect of perceived organizational support on adopting different conservation tillage techniques. Columns (1)–(3) examine the effect of perceived organizational support on farmers' adoption of zero tillage and minimum tillage, furrow and ridge tillage, and water-saving irrigation, respectively. Based on the results, it is clear that the support provided by agricultural industrial organizations, as perceived by the farmers, significantly affects their adoption of conservation tillage. However, there is variability in the effect of perceived organizational support for different technologies, and Hypothesis H1 is tested. As shown in Columns (1) and (3), the perceived organizational support has a significantly positive effect on farmers' adoption of zero tillage and minimum tillage and water-saving irrigation, which suggests that enhanced perceived organizational support will promote farmers' adoption of both zero tillage and minimum tillage and water-saving irrigation. On the one hand, agricultural industry organizations provide institutional support for farmers, such as product certification, contract signing, and contract management. They encourage them to adopt conservation tillage, which improves cultivated land quality, by providing market access opportunities and price premiums. On the other hand, agricultural industry organizations provide farmers with instrumental support, such as agricultural training and scientific and technological information, to reduce the factor constraints faced by farmers in the adoption of zero tillage and minimum tillage and water-saving irrigation and to improve the ability to optimize the allocation of factors of production. The technical training and assistance provided by agricultural industry organizations alleviate the need for more information on the adoption of water-saving irrigation technologies by farmers, enhance their ability to access information, reduce the perception of technical risks, and facilitate their adoption of conservation tillage. Finally, agricultural industry organizations provide emotional support, such as care and respect for farmers' production, enhance farmers' trust and recognition of the organization, increase the level of farmers' emotional commitment to the organization, and motivate farmers to adopt conservation farming techniques to produce high-quality products in return for the organization. As shown in Column (2), the perceived organizational support hurts farmers' adoption of furrow and ridge tillage, which indicates that enhancing perceived organizational support could not be conducive to farmers' adoption of furrow and ridge tillage. The above effect is observed because furrow and ridge tillage and traditional irrigation, such as flood irrigation, are complementary techniques. Moreover, the perceived organization support promotes farmers' adoption of efficient water-saving irrigation, such as drip irrigation, which replaces traditional irrigation and reduces farmers' demand for corresponding furrow and ridge tillage. Thus, the perceived organizational support reduces their demand for adopting furrow and ridge tillage.

Table 7. Effect of perceived organizational support on the adoption of different attributes of conservation tillage.

Variable	**Adoption of Conservation Tillage**		
	(1) Zero Tillage and Minimum Tillage	**(2) Furrow and Ridge Tillage**	**(3) Water-Saving Irrigation**
Perceived Organizational Support	0.62 *** (0.195)	−1.214 *** (0.199)	0.822 *** (0.167)
Risk Preference	1.338 *** (0.123)	0.426 *** (0.132)	0.404 *** (0.111)
Age	0.005 (0.015)	−0.039 ** (0.017)	0.031 ** (0.014)
Education Level	0.021 (0.04)	−0.037 (0.048)	0.033 (0.04)
Health	0.103 (0.217)	−0.601 ** (0.296)	0.129 (0.222)
Cultivation Experience	−0.035 *** (0.012)	0.05 *** (0.012)	−0.034 *** (0.01)
Labor	0.234 ** (0.109)	−0.08 (0.128)	−0.018 (0.105)
Labor Experience	−0.369 (0.315)	0.327 (0.377)	−0.183 (0.272)

Table 7. *Cont.*

Variable	Adoption of Conservation Tillage		
	(1) Zero Tillage and Minimum Tillage	(2) Furrow and Ridge Tillage	(3) Water-Saving Irrigation
Land	−0.01 (0.01)	−0.047 *** (0.015)	0.037 *** (0.013)
Agricultural Income Share	0.058 (0.559)	−3.164 *** (0.985)	1.521 *** (0.583)
Mechanization	0.029 (0.111)	0.165 (0.123)	0.037 (0.092)
Market Convenience	−0.066 ** (0.029)	−0.096 *** (0.036)	0.132 *** (0.028)
Technology Demonstration Village	−0.476 * (0.261)	1.199 *** (0.401)	−0.746 *** (0.284)
Constant	−2.747 ** (1.247)	6.248 *** (1.839)	−5.773 *** (1.338)
Sample Pseudo R^2	725 0.255	725 0.317	725 0.191

Note: *, **, and *** indicate that the explanatory variables are significant at the 10%, 5%, and 1% levels for the explained variables.

The coefficient of risk preference variable in the control variable is significant and positive. This indicates that the more risk the farmers prefer, the more they are willing to adopt conservation tillage for higher expected returns, which is in line with the results of the study by Gao Yang and Niu Ziheng (2019) [40]. The age and health status of the household head have a significantly adverse effect on the adoption of furrow and ridge tillage. This effect is observed because furrow and ridge tillage is a labor-intensive technology. The older the age of the head of household, the poorer their health condition, the less convenient it is for them to engage in manual labor, and the less likely they are to adopt furrow and ridge tillage. The age of the household head has a significantly positive effect on the adoption of water-saving irrigation. This effect is observed because farmers are more aware of the cost–benefit ratio of the whole industry, and the traditional water irrigation cost is high. In order to reduce the cost of technology adoption, farmers tend to adopt water-saving irrigation, which is consistent with the results of Qiu Huanguang et al. (2020) [50]. Cultivation experience significantly affects the adoption of zero tillage and minimum tillage and water-saving irrigation, indicating that farmers with fewer years of cultivation tend to adopt zero tillage and minimum and water-saving irrigation. The above effect may be observed because the longer the years of cultivation, the more farmers benefit from the experience accumulated in traditional cultivation and are reluctant to adopt new cultivation technologies readily. In contrast, the fewer the years of cultivation, the more farmers are prone to accepting new cultivation technologies to achieve improved production efficiency and increased incomes. Land has a significantly positive effect on adopting water-saving irrigation, indicating that the more significant the cultivated area, the more farmers tend to adopt water-saving irrigation. There are two possible reasons, as follows. On the one hand, water-saving irrigation is a knowledge-intensive technology, requiring a higher management technology for farmers. Farmers with more extensive cultivated area have a relatively high management level. They can better understand the knowledge related to the adoption of technology and grasp and apply water-saving irrigation. On the other hand, farmers with more extensive cultivated area can better take advantage of the economies of scale by adopting water-saving irrigation technology [54] and are thus more willing to adopt water-saving irrigation technology, which is consistent with the findings of Qiu Huanguang et al. (2020) [50]. Land significantly negatively affects furrow and ridge tillage adoption, indicating that the smaller the cultivation area, the more farmers adopt furrow and ridge tillage. The above effect may be observed because furrow and ridge tillage is a labor-intensive technology. The larger the cultivated area owned by farmers, the more labor they need to invest in adopting furrow and ridge tillage, the higher the cost of adoption, and the weaker their willingness to adopt it. Agricultural income share has a significantly negative effect on furrow and ridge tillage adoption and a significantly positive effect on water-saving irrigation adoption. The above effects may be observed because agricultural income is the primary source of income for farmers with a larger share of agricultural income. In order to pursue efficient agricultural productivity to increase income, farmers will tend to adopt new efficient agricultural technologies, such as water-saving irrigation, rather than relatively traditional technologies, such as furrow and ridge tillage. Market convenience hurts the adoption of zero tillage and minimum tillage, as well as furrow and ridge tillage. The above effects indicate that the closer farmers are to the market, the easier it is to obtain the machinery needed for zero tillage and minimum tillage, and furrow and ridge tillage from the market, which helps farmers adopt these two technologies, which is consistent with the findings of Yu Yonghong and Han Hongyun (2012) [55]. Market convenience has a positive effect on water-saving irrigation adoption. The above effect may be observed because water-saving irrigation technology is a knowledge-intensive technology. Farmers far away from the market have easier access to technology-related information and knowledge provided by public agronomic services and are more likely to adopt water-saving irrigation technologies under agronomic experts' field guidance and training.

4.2. The Impact of Inter-Temporal Choice on Conservation Tillage Adoption and the Moderating Effect of Risk Preference

Table 8 shows the test results for the influence of inter-temporal choice on the adoption of conservation tillage technology. As shown in Columns (4)–(6), inter-temporal choice significantly negatively affects the adoption of conservation tillage technology. The larger the farmer's time-discount rate, the less likely farmers are to adopt no tillage and less tillage, furrow and ridge tillage, and water-saving irrigation technologies, and Hypothesis H2 is verified. Conservation tillage is an inter-temporal agricultural technology. Compared with single-period agricultural technology, the ecological and economic benefits will be realized in many future periods, and the technology's effect will take a long time to be realized, with a high degree of uncertainty. Farmers will compare current inputs with future benefits when adopting conservation tillage technology. When farmers have a significant temporal discounting rate and prefer current returns, they will discount the future benefits of conservation tillage for the current period at a lower present value and obtain a smaller net present value. Farmers will perceive lower future returns from adopting conservation tillage, reducing their willingness to adopt conservation tillage. When farmers have a low temporal discounting rate and prefer future returns, they will discount the future benefits of conservation tillage for the current period at a higher present value and obtain a more extensive net present value. Farmers will perceive higher future returns from adopting conservation tillage, which promotes the adoption of conservation tillage.

Table 8 shows the results of the moderating effect of risk preference in the pathway of inter-temporal choice affecting conservation tillage adoption. As shown in Table 8, the cross-term between inter-temporal choice and risk preference has a significantly negative effect on conservation tillage adoption, and risk preference plays a negative moderating role in inter-temporal choice affecting conservation tillage adoption. The above effects indicate that when farmers' risk preference is high, the hindering effect of farmers' inter-temporal choice on their adoption of conservation tillage is weakened, and when farmers' risk preference is low, the negative relationship between farmers' inter-temporal choice and conservation tillage is strengthened, and Hypothesis H4 is verified. Combined with the theoretical analysis, when farmers' risk preference is higher, their ability to bear potential risks is more vital. They are more willing to adopt conservation tillage with a certain degree of risk, which helps alleviate the negative effect of inter-temporal choice on conservation tillage and increases the possibility of farmers adopting it. When farmers' risk preference is low, their ability to bear potential risks is weaker. They are less willing to adopt conservation tillage due to fear of risk, which strengthens the negative effect of inter-temporal choice on conservation tillage and weakens the possibility of farmers adopting it.

Table 8. Impact of inter-temporal choice on conservation tillage adoption and the moderating effect of risk preference.

Variable	Adoption of Conservation Tillage		
	(4) Zero Tillage and Minimum Tillage	**(5) Furrow and Ridge Tillage**	**(6) Water-Saving Irrigation**
Inter-Temporal Choice	−1.120 *** (0.113)	−0.220 ** (0.159)	−0.596 *** (0.137)
Risk Preference	1.145 *** (0.142)	0.079 (0.144)	0.248 ** (0.113)
Inter-Temporal Choice × Risk Preference	−0.098 * (0.102)	−0.483 *** (0.108)	−0.383 *** (0.100)
Age	0.008 (0.017)	−0.049 *** (0.018)	0.037 *** (0.014)
Education Level	0.057 (0.046)	−0.051 (0.050)	0.058 (0.038)
Health	0.018 (0.218)	−0.649 ** (0.298)	0.053 (0.216)
Cultivation Experience	−0.038 *** (0.013)	0.067 *** (0.014)	−0.041 *** (0.011)
Labor	0.150 (0.118)	−0.138 (0.139)	−0.057 (0.106)
Labor Experience	−0.427 (0.358)	0.526 (0.355)	−0.276 (0.274)
Land	−0.001 (0.010)	−0.048 *** (0.016)	0.043 *** (0.013)
Agricultural Income Share	0.171 (0.645)	−3.519 *** (0.910)	1.588 *** (0.565)
Mechanization	0.129 (0.112)	−0.061 (0.116)	0.177 * (0.092)
Market Convenience	−0.054 * (0.030)	−0.088 ** (0.038)	0.145 *** (0.028)
Technology Demonstration Village	−0.203 (0.299)	1.108 *** (0.370)	−0.587 ** (0.284)
Constant	0.939 (1.389)	9.138 *** (1.770)	−5.247 *** (1.286)
Sample	725	725	725
Pseudo R^2	0.369	0.324	0.197

Note: *, **, and *** indicate that the explanatory variables are significant at the 10%, 5%, and 1% levels for the explained variables.

4.3. Indirect Effects of Perceived Organizational Support on the Adoption of Conservation Tillage through Inter-Temporal Choice

Table 9 reports the test results, where it can be observed that perceived organizational support facilitates the adoption of conservation tillage by influencing farmers' inter-temporal choice. The results in Column (7) of Table 9 show that the effect of perceived organizational support on inter-temporal choice is significantly negative, indicating that perceived organizational support significantly mitigates inter-temporal choice and reduces the temporal discounting rate of farmers. The effect of risk preference on inter-temporal choice is significantly negative, indicating that farmers with high-risk preference have a more vital ability to bear future risks, believe that the expected return is greater than the risk, and are more inclined to choose future returns, and they will obtain a higher present value when converting future returns into current returns, reducing their temporal discounting rate.

Table 9. Impact of Perceived Organizational Support and inter-temporal choice on conservation tillage adoption.

Variable	OLS (7) Inter-Temporal Choice	Adoption of Conservation Tillage (Logit Model) (8) Zero Tillage and Minimum Tillage	(9) Furrow and Ridge Tillage	(10) Water-Saving Irrigation
Perceived Organizational Support	−0.049 *** (0.015)	0.465 ** (0.230)	−1.447 *** (0.226)	0.764 *** (0.170)
Inter-Temporal Choice		−4.178 *** (0.434)	−2.558 *** (0.480)	−1.412 *** (0.433)
Risk Preference	−0.096 *** (0.011)	1.211 *** (0.138)	0.153 (0.117)	0.302 ** (0.118)
Age	0.000 (0.001)	0.006 (0.017)	−0.041 ** (0.017)	0.031 ** (0.014)
Education Level	0.004 (0.004)	0.052 (0.046)	−0.022 (0.050)	0.041 (0.040)
Health	−0.014 (0.020)	0.029 (0.222)	−0.704 ** (0.303)	0.079 (0.224)
Cultivation Experience	0.001 (0.001)	−0.037 *** (0.014)	0.052 *** (0.013)	−0.034 *** (0.010)
Labor	−0.022 ** (0.010)	0.165 (0.118)	−0.152 (0.135)	−0.048 (0.109)
Labor Experience	0.007 (0.030)	−0.401 (0.356)	0.395 (0.390)	−0.168 (0.270)
Land	0.001 (0.001)	−0.002 (0.009)	−0.046 *** (0.017)	0.039 *** (0.012)
Agricultural Income Share	−0.009 (0.055)	0.042 (0.637)	−3.441 *** (0.983)	1.520 *** (0.576)
Mechanization	0.009 (0.010)	0.087 (0.118)	0.159 (0.124)	0.052 (0.094)
Market Convenience	0.005 * (0.003)	−0.055 * (0.030)	−0.084 ** (0.038)	0.143 *** (0.028)
Technology Demonstration Village	0.058 ** (0.024)	−0.259 (0.296)	1.344 *** (0.399)	−0.686 ** (0.288)
Constant	0.518 *** (0.120)	−1.531 (1.433)	8.367 *** (1.844)	−5.133 *** (1.355)
Sample	725	725	725	725
R-squared	0.146			
Pseudo R^2		0.374	0.356	0.203

Note: *, **, and *** indicate that the explanatory variables are significant at the 10%, 5%, and 1% levels for the explained variables. Since the inter-temporal choice variable takes values in the range of 0–1 as a continuous variable—which is unsuitable for the logit model—this paper selects OLS regression in order to analyze the effect of perceived organizational support on inter-temporal choice.

The results in Columns (8)–(10) show that the coefficient of inter-temporal choice is significantly harmful, and the coefficient of perceived organizational support is still significant. The above results indicate that the mechanism of action of perceived organizational support in promoting the adoption of conservation tillage by influencing farmers' inter-temporal choice does exist. This mechanism explains 33.02%, 10.32%, and 8.42% of the total effect of perceived organizational support, affecting the adoption of zero tillage and minimum tillage, furrow and ridge tillage, and water-saving irrigation, respectively. Hypothesis H3 is verified. On the one hand, agricultural industrial organizations provide farmers with institutional support, such as production standards and trademarks. Farmers form a commitment to the organization after perceiving its support. This pre-commitment helps farmers consider the expected benefits of the technology in their technology adoption decisions and reduce the temporal discounting rate by assigning a more significant weight to it, guiding farmers to adopt conservation tillage inter-temporal agricultural technologies. On the other hand, agricultural industrial organizations provide farmers with instrumental support, such as market information and technical guidance. Instrumental support enhances farmers' ability to obtain information and alleviates the inefficient allocation of production factors due to lack of information. Instrumental support reduces the perception of technological risk, helps minimize farmers' temporal discounting rate, and helps farmers adopt conservation tillage, whose benefits will be realized in the future. Finally, emotional support from the agricultural industrial organization, such as respect and attention to the farmers' production, will stimulate farmers' recognition and appreciation of the organization. These positive sentiments implicitly enhance farmers' ability to think, make them more patient when facing immediate and long-term benefits, reduce the temporal discounting rate for farmers, and thus motivate them to adopt conservation tillage, which will bring long-term benefits.

4.4. Difference Analysis

Households with different cropland sizes differ in resource endowments (e.g., land, capital, knowledge), resulting in heterogeneity in their factor allocation, business management, technology adoption, and other behaviors [20]. Therefore, does this scale variability affect the role of perceived organizational support and inter-temporal choice in farmers' conservation tillage adoption? For this reason, this paper divides farmers into large-scale and small-scale farmers based on the size of cultivated land in the actual research. It tests the differential response of farmers to perceived organizational support and inter-temporal choice affecting the adoption of conservation tillage. Since 96.55% of small-scale farmers in the research adopted furrow and ridge tillage, only two technologies—zero tillage and minimum tillage and water-saving irrigation—were selected for heterogeneity analysis. Table 10 reports the group differences in the effect of perceived organizational support on the adoption of conservation tillage. For large-scale farmers, the perceived organizational support positively affected the adoption of zero tillage and minimum tillage, and water-saving irrigation. For small-scale farmers, the effect of perceived organizational support was insignificant, suggesting that the effect of perceived organizational support on the adoption of conservation tillage is related to the size of the land. On the one hand, this is because large-scale farmers have more vital management ability than small-scale farmers, and they can better apply the support provided by agricultural industry organizations to promote the adoption of conservation tillage. On the other hand, this is because of the economy of scale effect of technology adoption. Large-scale farmers have high returns from technology adoption; their willingness to adopt technology is strong; and the marginal enhancement effect of perceived organizational support on their technology adoption is greater than that of small-scale farmers. The effect of inter-temporal choice on farmers' conservation tillage was not affected by differences in cropland size, and inter-temporal choice was present in all farmers' technology adoption. However, there were cluster differences in the effect of inter-temporal choice on farmers' water-saving irrigation adoption. Farmers' adoption of water-saving irrigation has high input costs and uncertainty regarding the benefits of technology adoption. Large-scale farmers are risk-resistant; therefore, the negative impact of inter-temporal choice on farmers' adoption of water-saving irrigation is smaller than that of small-scale farmers. For large-scale farmers, a higher share of agricultural income in total household income implies a better degree of agricultural specialization, and therefore, a more vital willingness to adopt advanced water-saving irrigation for high returns. In contrast, for small-scale farmers, whose household incomes are lower, a higher share of agricultural income indicates a higher degree of vulnerability of the household's livelihoods and a weaker resilience to risk, thus preventing their willingness to adopt advanced water-saving irrigation for high returns.

Table 10. Differences in the impact of perceived organizational support and inter-temporal choice on conservation tillage.

Variable	(11) Large-Scale Group Zero Tillage and Minimum Tillage	(12) Small-Scale Group Zero Tillage and Minimum Tillage	(13) Large-Scale Group Water-Saving Irrigation	(14) Small-Scale Group Water-Saving Irrigation
Perceived Organizational Support	0.779 ** (0.304)	−0.207 (0.402)	0.865 *** (0.196)	0.680 (0.547)
Inter-Temporal Choice	−4.557 *** (0.576)	−3.469 *** (0.738)	−1.074 ** (0.450)	−12.958 *** (4.573)
Risk Preference	1.565 *** (0.186)	0.576 ** (0.238)	0.29 ** (0.125)	0.907 ** (0.417)
Age	0.017 (0.023)	−0.006 (0.031)	0.052 *** (0.017)	−0.064 * (0.035)
Education Level	0.056 (0.057)	0.049 (0.080)	0.051 (0.045)	0.110 (0.114)
Health	0.102 (0.297)	0.089 (0.326)	0.289 (0.295)	−0.783 (0.516)
Cultivation Experience	−0.032 ** (0.016)	−0.052 * (0.030)	−0.037 *** (0.011)	0.004 (0.029)
Labor	0.157 (0.146)	0.297 (0.219)	0.024 (0.127)	−0.576 * (0.310)
Labor Experience	−0.427 (0.457)	0.540 (0.657)	−0.003 (0.303)	−0.994 (0.845)
Land	0.005 (0.011)	−0.138 (0.132)	0.025 ** (0.012)	0.392 ** (0.157)
Agricultural Income Share	0.500 (0.867)	1.153 (1.026)	2.830 *** (0.698)	−4.085 ** (1.601)
Mechanization	0.102 (0.147)	0.083 (0.223)	−0.046 (0.109)	0.533 * (0.277)
Market Convenience	−0.100 *** (0.038)	0.048 (0.059)	0.155 *** (0.034)	0.103 (0.072)
Technology Demonstration Village	−0.722 ** (0.357)	0.738 (0.700)	−0.641 * (0.333)	−1.285 * (0.780)
Constant	−3.602 * (1.962)	−0.311 (2.364)	−7.542 *** (1.622)	1.258 (3.404)
Sample	522	203	522	203
Pseudo R^2	0.468	0.251	0.214	0.305

Note: *, **, and *** indicate that the explanatory variables are significant at the 10%, 5%, and 1% levels for the explained variables.

4.5. Robustness Test

In order to further test the robustness of the results of the above empirical analysis, this paper conducts a robustness test on the regression results from Columns (8)–(10) in Table 9 by adjusting the sample size. We classify the participation of farmers in research on agricultural industrial organizations into two types: formal participation (signed contract) and informal participation (no signed contract). In this paper, we select the farmers who formally joined an agricultural industrial organization for the robustness test with an adjusted sample size. Table 11 reports the regression results of the effects of perceived organizational support and inter-temporal choice on adopting conservation tillage after adjusting the sample size. Except for the non-significant positive effect of perceived organizational support on the adoption of zero tillage and minimum tillage, the regression results shown in Table 11 are the same as those in Columns (8)–(10) in Table 9, and the study's findings are robust.

Table 11. Robustness test for the effect of perceived organizational support and inter-temporal choice on conservation tillage adoption.

Variable	(15) Zero Tillage and Minimum Tillage	(16) Furrow and Ridge Tillage	(17) Water-Saving Irrigation
Perceived Organizational Support	0.239 (0.471)	−1.142 *** (0.401)	1.153 *** (0.312)
Inter-Temporal Choice	−3.669 *** (0.980)	−4.281 *** (0.903)	0.483 (0.699)
Risk Preference	1.532 *** (0.249)	−0.056 (0.198)	0.389 ** (0.161)
Age	0.015 (0.030)	−0.085 *** (0.029)	0.047 * (0.025)
Education Level	0.009 (0.098)	0.138 (0.097)	0.065 (0.085)
Health	0.613 (0.496)	−1.170 ** (0.555)	0.048 (0.526)
Cultivation Experience	−0.043 * (0.023)	0.094 *** (0.022)	−0.028 * (0.016)
Labor	0.148 (0.221)	−0.458 ** (0.202)	0.088 (0.185)
Labor Experience	−0.327 (0.581)	0.405 (0.598)	−0.749 * (0.442)
Land	0.004 (0.014)	−0.03 (0.022)	0.034 (0.024)
Agricultural Income Share	1.765 (1.425)	−4.745 *** (1.689)	1.423 (1.22)
Mechanization	0.194 (0.243)	0.043 (0.218)	−0.046 (0.171)
Market Convenience	−0.012 (0.059)	−0.259 *** (0.06)	0.201 *** (0.048)
Technology Demonstration Village	−0.422 (0.518)	2.102 *** (0.568)	−1.116 *** (0.400)
Constant	−6.017 * (3.246)	12.646 *** (3.668)	−6.203 ** (2.715)
Sample Pseudo R^2	249 0.457	249 0.445	249 0.281

Note: *, **, and *** indicate that the explanatory variables are significant at the 10%, 5%, and 1% levels for the explained variables.

5. Discussion

This study explains the influence of perceived organizational support and inter-temporal choice on farmers' adoption of conservation tillage at the theoretical level. This paper finds that industrial organizations' provision of institutional, instrumental, and emotional support promotes farmers' adoption of conservation tillage, while farmers' inter-temporal choice hinders their adoption of conservation tillage. This study also explores the mediating role of inter-temporal choice in the relationship between perceived organizational support and conservation tillage adoption and finds that the perceived organizational support influences farmers' inter-temporal choice through the formation of pre-commitment, the reduction in risk perceptions, and the stimulation of positive emotions, which indirectly affects conservation tillage adoption. In addition, this study explores the moderating role of risk preference in the relationship between inter-temporal choice and conservation tillage adoption by incorporating risk preference and finds that farmers' risk preference mitigates the hindering effect of inter-temporal choice on conservation tillage adoption. Finally, this study examines the difference between perceived organizational support and inter-temporal choice in conservation tillage adoption by farmers on different scales. This study finds that perceived organizational support promotes the adoption of zero tillage and minimum tillage, and water-saving irrigation by large-scale farmers more significantly than by small-scale farmers and that there are differences in the impacts of inter-temporal choices on the adoption of conservation tillage among farmers with different cropland sizes.

The driving effect of industrial organizations on farmers' adoption of green agricultural technologies is consistent with the findings of many scholars [24,25], and the conclusion that joining industrial organizations promotes farmers' adoption of green agricultural technologies validates the findings of Chen Wei-Qiang and Ma Pengchao (2023) [41]. This study explores the specific mechanism by which the perceived organizational support influences the adoption of conservation tillage. It concludes that perceived organizational support promotes the adoption of green agricultural technologies by mitigating the role of farmers' inter-temporal choice hindrance. Chen Wei-Qiang and Ma Pengchao (2023) [41] concluded that co-operative support can influence smallholder farmers' quality control behaviors via three mediating channels: strengthening the cognition, increasing the willingness, and enhancing the capacity. Different from the findings of Chen, Wei-Qiang, and Ma, Pengchao (2023) [41], we refine perceived organizational support into institutional support, instrumental support, and emotional support and also introduce farmers' inter-temporal choice to explore the impact and mechanism of perceived organizational support on green agricultural technology adoption. This study finds through the heterogeneity test that there is variability in the role of perceived organizational support in promoting the adoption of green agricultural technologies by farmers with heterogeneity in size, which also verifies the findings of Xu Zhigang et al. (2018) [20]. The above findings suggest that industrial organizations strengthening the support for small farmers and playing the role of industrial organizations in promoting technology adoption should be the focus of policy choices.

This paper differs from previous studies in its selection of the indicators influencing green agriculture technology adoption. The selection of indicators for previous studies on the factors influencing the adoption of green agricultural technologies was primarily based on individual characteristics, household endowment, and environmental factors. In order to obtain a basic common sense distinguishing it from past studies, we introduce farmers' inter-temporal choice decision making based on the study of the impact of organizational support provided by industrial organizations on technology adoption. In this paper, we explore the effects of perceived organizational support and inter-temporal choice on conservation tillage and investigate the mechanism of perceived organizational support indirectly affecting conservation tillage technology through inter-temporal choice. At the same time, this paper also explores the moderating effect of risk preference in the influence of inter-temporal choice on the adoption of conservation tillage technology. Further, it clarifies the direction of promoting the adoption of conservation tillage technology.

Of course, this study still has some flaws and limitations. First, we collected all the data in the paper through a questionnaire survey of farmers. Although this method is often used in related research and is widely accepted by academics, this manner of collecting data may leave out some more detailed and profound information, and there may be some systematic bias. The paper uses cross-sectional data, which may not be suitable for analyzing inter-individual differences and time-varying effects. In future research, we can correct the systematic bias by obtaining multifaceted data through questionnaire surveys of both farmers and industrial organizations. We can study the effects of individual differences and time variation by obtaining panel data. Second, the study mainly focuses on the effects of perceived organizational support and inter-temporal choice on whether farmers adopt conservation tillage. Moreover, other possible effects—such as the willingness to pay for conservation tillage technology and the effect on the degree (duration) of adoption of conservation tillage technology—are the focus of future research. The control variables studied in this paper are limited. We did not focus on the effects of the proportion of family supervision cost to total labor cost, the proportion of high yielding area, the proportion of irrigated area covered by canals, tanks, as well as wells, agricultural expenditure by local government, and women reservations as factors. In future studies, we will enrich the control variables to achieve completeness. Finally, future research should focus on the adoption of conservation tillage for different crops by farmers in more regions to provide adequate guidance for the adoption of conservation tillage by farmers in different regions.

Nevertheless, this study describes the effects of perceived organizational support and inter-temporal choice on farmers' adoption of conservation tillage. This study analyzes how perceived organizational support indirectly affects farmers' adoption of conservation tillage through inter-temporal choice. The above study provides some theoretical references and a factual basis for giving full play to industrial organizations to drive farmers and better promote the promotion and diffusion of agricultural conservation tillage. In the context of developing modern agriculture, improving the mechanism for small farmers to integrate into the industrial activities of new agricultural management subjects, enhancing their perception of perceived organizational support, and stabilizing farmers' expectations of long-term gains from inter-temporal agricultural technologies through agricultural insurance policies to reduce their inter-temporal selection preference for technology adoption can be the direction of future industrial-organization-driven development of farmers.

6. Conclusions and Implications

Based on 725 micro-research data from melon farmers in the Shaanxi and Shanxi provinces in China, this study empirically examines the relationship and path of influence of perceived organizational support and inter-temporal choice in farmers' adoption of conservation tillage. The findings of this paper are as follows. First, the perceived organizational support significantly affects farmers' adoption of conservation tillage, which positively promotes capital-intensive and knowledge-intensive technology adoption but is detrimental to adopting labor-intensive technology. This difference may be observed because agricultural industry organizations mainly provide the support for factors of production, such as the agricultural capital and machinery, product standards and norms, and market access qualifications, which cannot alleviate the labor constraints farmers face in cash crop production. Second, inter-temporal choice significantly hinders farmers' adoption of conservation tillage, and risk preference plays a significantly negative moderating role in the relationship between inter-temporal choice and farmers' technology adoption. Compared with farmers with lower risk preferences, farmers with higher risk preferences are able to mitigate the hindering effect of inter-temporal choice on technology adoption. Third, the perceived organizational support partially affects conservation tillage adoption through a mediating mechanism, which reduces farmers' inter-temporal choice, and inter-temporal choice explains part of the effect of perceived organizational support on technology adoption.

The research in this paper helps improve the understanding of the impacts of agricultural industrial organizations and inter-temporal choice on adopting conservation tillage. It also has important policy implications.

First, new agricultural management subjects should be actively encouraged to form an organic link with farmers in the whole industrial chain to enhance small farmers' ability to develop modern agriculture at their scientific and technological levels. On the one hand, local governments should increase the policy support for new agricultural management subjects in infrastructure construction, tax exemptions and reductions, inclusive finance, and preferential agricultural capital. Local governments should encourage and guide new agricultural management subjects to form agricultural production and marketing docking, brand joining, base building, and other agricultural production consortiums with the surrounding farmers to comprehensively enhance the ability of industrial organizations to bring farmers to help farmers. On the other hand, local government should improve the industrial organization of farmers' production and operation of the drive channels and means of support in the protection of agricultural priority supply basis; it should focus on enhancing the purchase orders, production norms, "three products and one standard" sharing, and other high-value links of support through market high price premium to induce farmers to adopt conservation tillage effectively.

Second, establishing a cost–benefit balanced realization mechanism for inter-temporal agricultural technology will stabilize farmers' expectations of the long-term benefits of conservation tillage and reduce their inter-temporal choice preference for technology adoption. Given the characteristics of conservation tillage, with high eco-efficiency and multiple periods of benefit appearance, local governments should increase the intensity of subsidies for farmers' initial investment in technology, reduce the cost pressure of technology adoption by farmers, and promote farmers' willingness to adopt economic and ecological "win–win" technologies and the duration of their adoption. At the same time, local governments should encourage new agricultural management subjects to sign long-term order purchase and technical service agreements with farmers to guarantee farmers' long-term returns during the technology adoption period and stabilize the multi-period balanced realization of investment returns in farmers' technology adoption. Local governments can reduce the discount rate of farmers' inter-period returns on agriculture through agricultural insurance, reducing farmers' preference for an inter-temporal choice for conservation tillage and ultimately enhancing farmers' capacity for modern agricultural development through technology adoption.

Third, the government should reduce the potential risks to farmers' adoption of conservation tillage and eliminate the subjective psychological risks before adopting the technology. The agricultural technology promotion department should establish agricultural technology demonstration bases in conjunction with new agricultural management subjects, relying on the bases to carry out long-term integrated demonstration and technology promotion of conservation tillage. Demonstration and popularization will enable the surrounding farmers to form an objective and reasonable cognition of the practical operation, elemental investment, potential risks, and benefits of the new technology application and further enhance the farmers' willingness to adopt the technology. At the same time, the neighborhood effect promotes farmers to actively understand the content of the organizational support provided by industrial organizations, to maximize the establishment of a conducive environment for the adoption of farmers' conservation tillage, to eliminate the subjective risk formed by the asymmetry of information prior to the adoption of the technology, and to enhance the level of risk preference of the farmers for the new high-yield agricultural technology and to ultimately achieve the adoption of the new technology.

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