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Non-Cognitive Skills and Farmers' Entrepreneurial Performance: Evidence from Chinese Family Panel Studies

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Abstract: Improving the entrepreneurial performance of farmers is conducive to increasing their income, reducing poverty, and securing livelihoods. In the quest for sustainable livelihoods, non-cognitive skills are becoming increasingly significant. Based on data from the 2018 Chinese Family Panel Study, this paper uses the 'Big Five' personality traits and a cross-sectional regression model to construct an indicator system to analyze farmers' non-cognitive skills empirically and determine how these skills affect entrepreneurial performance. The results are as follows: (1) non-cognitive skills that significantly affect farmers' entrepreneurial performance are, in order of influence, openness, extroversion, conscientiousness, and agreeableness. After considering endogeneity and substitution-explained variables, the above conclusions are still robust. (2) Heterogeneity analysis finds that farmers over 40 and those who start their businesses in cities have higher returns on non-cognitive entrepreneurship. (3) The paper confirms that non-cognitive skills improve farmers' entrepreneurial performance through human and social capital effects. Therefore, entrepreneurs should consciously improve their non-cognitive skills by cultivating an enterprising and innovative spirit and social skills. The government's entrepreneurship training for farmers should also focus on setting up courses in non-cognitive skills development to enhance farmers' entrepreneurial literacy and skills.

Keywords: non-cognitive skills; farmers' entrepreneurial performance; human capital effects; social capital effect; CFPS

Citation: Zhang, S.; Zhang, H.; Sargani, G.R.; Liu, Q.; Tang, J.; Zheng, X. Non-Cognitive Skills and Farmers' Entrepreneurial Performance: Evidence from Chinese Family Panel Studies. *Agriculture* **2022**, *12*, 1143. https://doi.org/10.3390/agriculture12081143

Academic Editors: Alvydas Baležentis, Tomas Baležentis and Dalia Štreimikienė

Received: 5 July 2022
Accepted: 28 July 2022
Published: 2 August 2022

1. Introduction

Entrepreneurship, the endogenous driving force behind industrial upgrading and optimal allocation of resources, is a new growth pole for social and economic development [1]. It can lay the necessary production conditions and foundation for industrialization and rural urbanization. As a developing country with a rural population accounting for about 40% of the total population, China has made farmers' entrepreneurship the focus of national entrepreneurship. In a country with a large agricultural population and scarce land resources, farmers not only have to rely on conventional small-scale agricultural production modes to generate revenue but must also become large-scale farmers or contemporary entrepreneurs to seek new forms of employment under industrialization [2]. Therefore, farmers' entrepreneurship is an important means of realizing the transfer of rural surplus labour and promoting the continuous increase of farmers' incomes. Peasant entrepreneurship differs from traditional business practices in that it can provide societal benefits. It not only encourages the expansion of employment and technological advancement in the area, but also significantly contributes to local economic growth and the reduction of rural poverty [3].

Before discussing agricultural entrepreneurship, it is important to define what a farmer is. In nations other than China, the term "farmer" refers to the managers, plan-

ners, and producers of contemporary agricultural companies. As a result, the primary industries in which foreign farmers engage in entrepreneurship are those that are closely related to agriculture, such as plantations, family farms, breeding farms, agricultural production and processing enterprises, and various agricultural professional production cooperatives [4]. In China, farmers are a legal and administrative category, which reflects the institutional division of household registration between rural and urban areas (i.e., household registration) [5]. Specifically, as long as a person has rural household registration, they are still considered farmers even if they no longer reside in rural areas or work in the agricultural sector. As a result, Chinese farmers' entrepreneurial fields are broader, including not only agriculture-related businesses such as planting, breeding, agricultural product processing, and rural tourism, but also non-agricultural fields such as industry, construction, service industry, and so on.

Farmers' entrepreneurship shares many traits with general entrepreneurship, including the identification of business opportunities, the establishment of new organizations, the creation of value, and the role of entrepreneurs. Compared with urban entrepreneurs, Chinese farmer entrepreneurs are a relatively unique entrepreneurial group with their traits. First, Chinese farmer entrepreneurs have a low level of education and generally have the characteristics of insufficient knowledge stock, limited resources and experience, weak risk-taking ability, and management experience [6]. Second, the majority of technologies employed by farmer entrepreneurs are traditional, conventional, simple processes with regional characteristics, with only a few enterprises establishing high-tech bases [6,7]. Third, farmers can obtain capital from a variety of sources, such as personal savings, loans from friends and family, government grants, and financial loans. Few farmer entrepreneurs have successfully raised angel investment or venture capital directly [7]. In this context, most farmers choose small-scale, low-risk and low-income projects when starting a business. Agricultural planting, livestock breeding, and primary product processing are their main choices [8]. However, the market and the natural environment heavily influence these projects, and the market entry threshold is low, resulting in volatile incomes. With insufficient capital market growth and lack of entrepreneurial awareness and competence, learning how to improve farmers' entrepreneurial performance is crucial to sustainable development in rural China.

Entrepreneurial performance reflects the results of entrepreneurship and is the core focus of all entrepreneurial research. The academic research on the entrepreneurial performance of start-ups mainly includes four classical theories: group ecology theory, social cognition theory, resource-based theory, and strategic adaptation theory. These correspond to the four elements of entrepreneurship: entrepreneurs or teams, entrepreneurial opportunities, entrepreneurial resources, and entrepreneurial environment. Group ecology theory holds that entrepreneurial organizations need to be open and adaptable to the environment [9]. Strategic adaptation theory emphasizes that organizations should formulate strategies based on the resources and capabilities they can acquire and possess [10]. Social cognition theory, which holds that entrepreneurs are at the centre of entrepreneurial activities, emphasizes the impact of personal characteristics and entrepreneurial ability on performance [11]. Resource-based theory, which regards enterprises as a collection of resources and capabilities, emphasizes the impact of resource acquisition and enterprise integration on entrepreneurial performance [12].

The four classic theories mentioned above serve as the research foundation for this paper, which studies the entrepreneurial performance of farmers. Prior studies have focused on the impacts of farmers' entrepreneurial performance on the macro, medium, and micro levels. The macro-level includes policy factors, financial credit environment, cultural environment, and other external environmental factors [13–15]; the medium-level includes family income, number of siblings, social network, financial capital, and other family resource factors [16,17]; the micro-level covers human capital, psychological capital, entrepreneurial spirit, entrepreneurial ability, and other personal traits [18–20]. Among all the influencing factors, entrepreneurs are at the core. Their characteristics, motivation,

or ability will not only affect the identification of opportunities and the acquisition and integration of resources in the entrepreneurial environment but also affect the perception of environmental changes and the formulation of corresponding development strategies.

Human capital, as an endogenous variable for individuals to improve productivity, has been proved to have an important impact on the entrepreneurial performance of farmers [21]. However, as compared to other entrepreneurial groups, farmer entrepreneurs have poorer human capital and cognitive ability, but a broader business scope. Faced with a complicated and changing entrepreneurial environment, farmer entrepreneurs need more non-cognitive skills to make up for the lack of human capital.

Non-cognitive skills refer to personality traits, motivation, communication, and interpersonal or social skills, valued in the labor market and other areas of life [22], including motivation, leadership, self-esteem, social skills, perseverance, self-control, attitude, and belief [22–24]. Research has shown that non-cognitive skills can predict numerous adult outcomes, including academic achievement, employment, financial stability, criminal behaviour, and health [25]. However, previous studies have neglected the impact of non-cognitive skills on farmers' entrepreneurial performance. They have assumed it is an innate endogenous variable included in human capital variables such as education, skills, and experience, leading to deviations in estimating human capital parameters.

Therefore, this paper addresses farmers' entrepreneurial performance from the perspective of non-cognitive skills, focusing on whether they significantly impact farmers' performance. How do non-cognitive skills affect farmers' entrepreneurial performance? Does the impact differ between urban and rural areas and different age groups? Are the results still robust after considering endogeneity and substituting expained variables? The answers to the above questions have significant theoretical and practical implications for objectively understanding the mechanism of non-cognitive skills and evaluating their impact on farmers' entrepreneurial performance.

The next section presents the literature review and the research framework of the relationship between non-cognitive skills and farmers' entrepreneurial performance. Section 3 introduces the source of research data, the descriptive analysis of variables, and the methodology selection. The empirical results of the model are presented in Section 4, and Section 5 provides a discussion. Section 6 summarizes our main findings.

2. Literature Review and Research Hypotheses

2.1. Literature Review

Since its invention by Schultz in the 1960s, the human capital theory has played a central role in analysing economic growth and the labour market. It improves labour productivity by improving labour ability, thus contributing to the national economy and personal income [26]. Heckman, Stixrud and Urzua [23] established a new human capital framework with ability as the core, extending the ability category to include non-cognitive skills and breaking the bottleneck caused by different interpretations of traditional human capital theory. Non-cognitive skills were, however, usually defined relative to cognitive ability, referring to those abilities beyond cognitive skills such as calculation, reading, and writing [24]. At the end of the 20th century, as psychologists formed special measurement scales for different personality traits and verified the stability of personality traits under different situations, it became possible to use economic methods to study non-cognitive skills. Research results include Rotter's internal-external control scale [27], Rosenberg's self-esteem scale [28], and the Big Five personality scale [29]. Numerous researchers have widely used the Big Five classification method in these scales.

Much of the literature has focused on the relationship between non-cognitive skills and entrepreneurial performance. Antoncic [30] found that openness and neurological characteristics boosted entrepreneurial performance when building a business. Kader et al. [31] demonstrated through empirical research that farmers' entrepreneurial performance often strongly correlates with their personal characteristics, and farmers with innovative and persevering characteristics are more likely to achieve good entrepreneurial performance.

Slavec et al. [32] demonstrated the utility of entrepreneurial openness in explaining firm performance. Gustina et al. [33] found that the higher the cognitive and non-cognitive skills possessed by the entrepreneur, the higher the profit obtained. Recent literature also analyzes gender differences in the impact of non-cognitive skills on entrepreneurial performance. Koellinger et al. [34] found in a study of 17 countries that one reason there are fewer female entrepreneurs than male entrepreneurs is related to differences in the entrepreneurial spirit between males and females. Brixiová and Kangoye [35] used urban data in Africa to show that in terms of non-cognitive skills, 'tough' female entrepreneurs had better sales performance.

The literature review confirms that the academic community widely accepts the value of non-cognitive skills in entrepreneurship and promotes the role of non-cognitive skills in entrepreneurial choice and performance. However, most of the research has focused on non-agricultural fields. There is still little research on the relationship between non-cognitive skills and the entrepreneurial performance of farmers. As a unique group of entrepreneurs, Chinese farmers have distinct personality traits. Analysing the factors influencing entrepreneurial performance may help solve under-employment and low income among farmers. Solving this problem is necessary to revitalize the rural industry and alleviate poverty.

Based on CFPS 2018 data, this paper draws on the Big Five personality measurement method to analyze the impact of non-cognitive skills on farmers' entrepreneurial performance. Possible contributions are as follows:

- First, the entrepreneurial performance of farmers is taken as the research object. The non-cognitive skills of the new human capital theory are taken as the entry point to solve the problem of the parameter estimation deviation caused by the traditional human capital variables that cover non-cognitive skills.
- Second, it not only analyzes the impact of non-cognitive skills total indicators and different dimensions of personality traits on farmers' entrepreneurial performance but also the heterogeneity of urban and rural areas and age. Further, it discusses the mechanism of non-cognitive skills on farmers' entrepreneurial performance, which constructs a relatively complete theoretical analysis framework.
- Thirdly, because of the possible endogeneity problem and the reliability problem of selecting explained variables, the two-stage least squares method of instrumental variables and substitution of explained variables is used for robustness testing, providing a reference research method for similar research.

2.2. Theoretical Analysis and Research Hypotheses

This paper applies the new human capital theory and resource-based theory to build a theoretical framework for determining the impact of non-cognitive skills on farmers' entrepreneurial performance, as shown in Figure 1. Social cognitive theory and resource-based theory are the more classic entrepreneurial performance theories. Among them, social epistemology believes that the entrepreneur is at the centre of the entire entrepreneurial activity, emphasizing the impact of the entrepreneur's personality and abilities on entrepreneurial performance [11]. Resource-based theory's main contribution is to point out the importance of resources and capabilities to entrepreneurial performance [12]. Both social cognitive theory and human capital theory believe that human capital, such as the education level, health status, or work experience of entrepreneurs, has a strong predictive effect on entrepreneurial performance. However, the new human capital theory believes that the traditional human capital theory does not separate ability from education, leading to parameter estimation errors and confirming that non-cognitive skills are the pre-variables of traditional human capital. Therefore, this study believes that non-cognitive skills are a more fundamental factor in entrepreneurial traits.

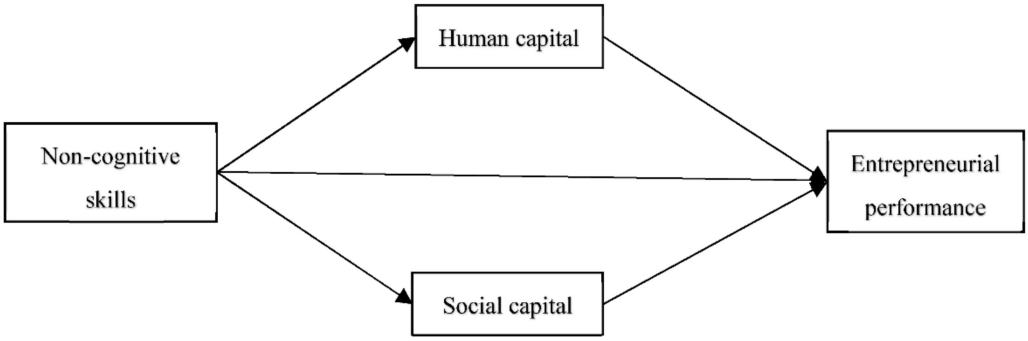

Figure 1. Theoretical framework of non-cognitive skills influencing farmers' entrepreneurial performance.

According to the new human capital theory, non-cognitive skills can improve individual educational human capital and social capital [36,37]. The research shows that human and social capital improve the identification and development of entrepreneurial opportunities [38]. Priyanto and Sandjojo [39] believe that the degree of education affects entrepreneurial performance by transforming it into entrepreneurial ability. Some scholars also believe that the resource limitation of entrepreneurs is the main problem faced by start-ups, and the social capital owned by entrepreneurs is the decisive factor in overcoming this limitation [40]. More importantly, human capital can help entrepreneurs obtain richer knowledge resources, while social capital can provide property resources and relationship resources for entrepreneurs. According to the resource-based theory, acquiring these resources helps entrepreneurs achieve better entrepreneurial performance. In summary, this study believes that non-cognitive skills not only have a direct impact on farmers' entrepreneurial performance but also have an indirect effect through human and social capital.

2.2.1. Direct Influence

Facing the complex and changeable entrepreneurial environment, constant market changes, and increasing communication needs, the non-cognitive skills of farmer entrepreneurs are essential. Many foreign empirical studies have verified the relationship between non-cognitive skills and entrepreneurial behaviour and confirmed that non-cognitive skills have a significant positive effect on individual entrepreneurial tendency and entrepreneurial performance. The research of Rauch and Frese [41] showed that non-cognitive factors such as a sense of achievement, self-confidence, creativity, stress resistance, and autonomous preference boost entrepreneurial decision-making and performance significantly. Chrisman et al. [42] found through a large sample of empirical evidence that entrepreneurial activities and performance are indeed affected by the entrepreneur's autonomy, creativity, and internal control to a certain extent. Slavec, Drnovšek and Hisrich [32] believe that entrepreneurial openness is conducive to improving entrepreneurial performance. Some scholars who have studied the influence of emotional traits on entrepreneurial performance have found that emotional intelligence improves entrepreneurs' resource integration, strengthens their abilities, and enhances their performance overall [43].

The research confirms that farmers with strong non-cognitive skills are better able to seize opportunities and meet challenges. They are more enterprising and can make sustained efforts for their enterprise. They are more willing to contact the outside world and develop social capital, and they carry out their entrepreneurial activities more smoothly. In the face of setbacks, they are more able to maintain a positive attitude. Therefore, farmers with strong non-cognitive skills are more likely to perform better as entrepreneurs. Based on the above analysis, the following hypothesis is proposed:

Hypothesis 1. *Non-cognitive skills have a significant positive impact on the entrepreneurial performance of farmers.*

2.2.2. Indirect Influence

Education is the core element of human capital. Farmers with higher education have better entrepreneurial performance. This is because education not only helps entrepreneurs acquire the knowledge and necessary skills for entrepreneurship but also helps build the social status of entrepreneurs and cultivate their enthusiasm and persistence in entrepreneurship. More importantly, entrepreneurs with high academic degrees have more comprehensive knowledge, which helps them identify entrepreneurial opportunities in complex and changeable environments and make wiser, more rational decisions, contributing to better entrepreneurial performance [38]. The improvement of non-cognitive skills is conducive to improving overall. In theory, non-cognitive skills such as perseverance, self-discipline, and other personality traits help farmers complete their studies. More and more evidence shows that non-cognitive skills not only accumulate education investment and improve the marginal benefits of education, but also significantly predict academic achievement [44]. Therefore, improving non-cognitive skills is beneficial to improving the education level of farmers. Based on the above analysis, the following hypothesis is proposed:

Hypothesis 2. *Non-cognitive skills affect farmers' entrepreneurial performance through human capital.*

Social capital can be defined as the social connections that individuals establish or sustain to maintain their social identity, obtain material assistance, information, emotional support, etc. Research has proved that non-cognitive skills can improve an individual's social capital [37] because individuals with strong non-cognitive skills have strong social skills, which are conducive to broadening their social networks. Individuals in these social networks can provide the resources needed to start a business. Social capital is crucial for entrepreneurs. Specifically, an individual's social capital is often composed of family members, friends, and acquaintances, with the family being a strong relationship that may offer entrepreneurs material capital, technology, experience, and emotional support [35]. However, there are often non-relatives who can provide entrepreneurs with business information, customer resources, and market orders [45]. This social capital is a key factor in improving entrepreneurial performance. Based on the above analysis, the following hypothesis is proposed:

Hypothesis 3. *Non-cognitive skills affect farmers' entrepreneurial performance through social capital.*

2.2.3. Heterogeneous Influence

There are big differences in social, economic, and cultural aspects between urban and rural areas in China. Due to the strong social contextuality of entrepreneurial activities, farmers' non-cognitive skills in urban and rural areas affect entrepreneurial performance differently. Suppose farmers choose to stay in their hometown to start a business. In that case, the rural family relationship capital based on kinship and blood relationships can provide material capital and emotional support for entrepreneurial farmers [46]. Since the family relationship is a strong relationship, maintaining this relationship does not require high non-cognitive skills of entrepreneurial farmers.

In contrast, farmers who choose to start businesses in cities face a relatively unfamiliar social, economic, and cultural environment, which means that their social capital is mainly based on the relationship between friends and colleagues. Although this can give entrepreneurs access to client resources, market orders, and business information [45], it is necessary for urban farmers to have strong non-cognitive abilities to establish or sustain this relationship and to boost entrepreneurial performance. Therefore, farmers who start businesses in cities tend to be more entrepreneurial when they possess greater non-cognitive skills. Based on the above analysis, the following hypothesis is proposed:

Hypothesis 4. *The impact of non-cognitive abilities on the entrepreneurial performance of farmers is significantly different in urban and rural areas.*

Farmers of different ages have different non-cognitive abilities, and their understanding and tolerance of entrepreneurship differ, thus affecting entrepreneurial performance. First, starting a business is not a spur-of-the-moment decision. It requires long-term planning, scientific decision-making ability, and sufficient courage and responsibility, which many young farmers do not have. Second, when entrepreneurship encounters temporary difficulties, older farmers are more stable and rigorous than younger farmers and are more motivated to face adversity. Age also affects the breadth of the social network of entrepreneurial farmers [47]. With increasing age, entrepreneurs develop strong social skills, become more mature in dealing with the world, and show stronger extroversion and a more pleasing personality. All these factors are conducive to improving the entrepreneurial performance of farmers. Based on the above analysis, the following hypothesis is proposed:

Hypothesis 5. *The effect of non-cognitive skills on the entrepreneurial performance of farmers has significant age differences.*

3. Data, Models, and Variables

3.1. Data Sources and Processing

The data used in this paper come from the Chinese Family Panel Studies (CFPS) data of 2018, implemented by the Institute of Social Science Survey of Peking University. Research topics cover economics, education, employment, population migration, health etc. The sample data cover about 16,000 households in 25 provinces (autonomous regions and municipalities), and the sampling frame covers more than 95% of the population; therefore, the data have the characteristics of wide coverage and strong representativeness. In terms of the sampling method, a multi-stage stratified sampling strategy was adopted, and comprehensive quality control measures were implemented with the help of computer-assisted interview technology. Two measures were taken to ensure the quality of the survey data. First, a random sampling inspection was carried out on the samples visited, in which audio inspection covered one-third. Second, all interview samples of interviewers who may have had interview problems were checked.

Because the research object was the entrepreneurial performance of farmers, the original data were processed as follows. First, agricultural household registration data were selected from the personal data. Secondly, the data employed by others were removed from the personal data of agricultural household registration, and own family data were retained; finally, some data with an obvious abnormality or missing main variables were deleted, obtaining a total of 838 valid samples.

3.2. Variable Selection

This paper divides all variables into three categories: explained variable, core explanatory variables, and control variables.

3.2.1. Explained Variable

This paper takes entrepreneurial performance as the explained variable. There are objective and subjective methods for evaluating entrepreneurial performance. The objective method is mainly an indicator measured by the objective data of entrepreneurship, including indicators such as entrepreneurial profit [48], the rate of increase in the sale [49], return on sales [50], and employee growth rate [51]. Among these, most scholars are accustomed to using entrepreneurial profit to measure entrepreneurial performance. The subjective method refers to the evaluation of entrepreneurial farmers on entrepreneurship to increase income, improve the quality of life, and meet career development. Many scholars used different dimensions of entrepreneurial satisfaction indicators to measure entrepreneurial performance [52]. Based on data availability, first, entrepreneurial profit was used as an

objective indicator to measure entrepreneurial performance and empirically analyze the impact of non-cognitive skills on farmers' entrepreneurial performance. Then, the subjective index of entrepreneurial satisfaction was used to replace the explained variable for a robustness test to ensure the reliability of the selected explanatory variable.

3.2.2. Core Explanatory Variables

Scholars have primarily developed the Big Five personality model, the self-esteem scale, and the internal-external control scale for measuring non-cognitive-ability indicators. Because the self-esteem scale and the internal-external control scale cannot completely cover all personality traits, the dimensional division of the Big Five personality structure can be applied to different cultures while maintaining high stability [53]. As a result, the Big Five personality structure is more commonly used in empirical research on non-cognitive skills. Tupes and Christal [54] conducted personality research and proposed the first five personality traits in 1961. Later, in the 1980s, McRae and Costa discovered very similar personality traits in people from various backgrounds, cultures, and languages, so they developed a relatively consistent concept in the personality narrative model. They proposed a Big Five personality model that covered extroversion, openness, conscientiousness, emotional stability, and agreeableness [29].

The focus of this paper is farmers' entrepreneurial performance and the Big Five personality scale's 'openness' (which stands for innovative thinking), 'conscientiousness' (which stands for achievement, motivation, and effort), and 'emotional stability' (which stands for optimism and pressure resistance) have a considerable impact on farmers' entrepreneurial behaviour and outcomes. Furthermore, the Big Five personality traits of 'extroversion' and 'agreeableness' boost social capital and promote entrepreneurial performance in a 'relational' environment like China. Therefore, referring to the Classic Personality Scale of Costa and Mccrae [29], and combining it with the relevant items in the CFPS questionnaire, the index system of farmers' non-cognitive skills is constructed from the five dimensions of strictness, agreeableness, extroversion, openness, and emotional stability. See Table 1 for details.

Table 1. Items corresponding to "Big Five personality" in CFPS.

Big Five Personality	Subdivided Personality Characteristics	Items Corresponding to CFPS
Conscientiousness	Orderliness	The neatness of the respondents' clothes
	Achievement striving	In today's society, hard work pays off
		Wealth reflects personal achievement
	Cautiousness	Trust in strangers
Agreeableness	Altruism	The importance of not being hated
	Compliance	Importance of intimacy with a spouse
		Trust in neighbors
Extroversion	Activity	Evaluation of your personal relationship
	Gregariousness	The importance of not being alone
	Positive emotions	The importance of having fun in life
Openness	Attitude towards traditional values	The importance of procreation
	Innovation	Being original and generating new ideas
Emotional stability	Anxiety	I don't think life can go on
	Depression	I feel depressed
	Vulnerability	I feel sad I find it hard to do anything

Among them, conscientiousness reflects an individual's achievement motivation and whether they are focused, rigorous, and organized. It is measured by three dimensions: orderliness, achievement striving, and cautiousness. Extroversion reflects the individual's interest and tendency to participate in the external world, and is measured by three dimensions: activity, gregariousness, and positive emotions. Agreeableness measures whether a person easily cooperates with others, and the degree of tolerance and trust in others, and is measured by two dimensions: altruism and compliance. Openness reflects whether an individual has curiosity, imagination, and an innovative spirit, as well as the degree of acceptance of new things, and is expressed by two dimensions: attitude towards traditional values and innovation. Emotional stability reflects the individual's optimism, self-confidence, and pressure resistance, and is measured by three dimensions: anxiety, depression, and vulnerability.

Each of the five major indicators corresponds to more than two sub-indices, including self-evaluation indicators and others' evaluation indicators. Therefore, the corresponding CFPS questionnaire items have different scoring systems. To facilitate the aggregation of the indicators of different scoring systems, all the sub-indicators are dimensionless treatment, and then the weights are calculated by the coefficient of variation method, and finally, the five indicators and the total indicators of non-cognitive skills are summed up.

3.2.3. Control Variables

To avoid the influence of other factors on the explained variable, the control variables were set from the two levels of individuals and families by referring to the research results of previous scholars. The control variables at the individual level include the entrepreneur's age, marital status, working hours, and workplace. The working hours and workplace are represented by the entrepreneur's working time per week and whether the entrepreneur starts a business in the city. The control variables at the household level include self-owned housing and self-owned land. Self-owned housing and self-owned land are expressed by the number of houses owned by entrepreneurs' families and whether they are allocated collective land, respectively.

3.3. Model Selection

3.3.1. Baseline Regression Model

Since the selected data were from CFPS in 2018, and the explained variable is continuous, this paper uses a cross-sectional regression model to test empirically the impact of non-cognitive skills on farmers' entrepreneurial performance.

$$EP_{\mathrm{i}} = \alpha_0 + \beta_0 NS_{\mathrm{i}} + \gamma_0 Control + \varepsilon_i \quad (1)$$

In Formula (1), Y_i and NS_i represent entrepreneurial performance and non-cognitive skills, respectively. Control is the control variable; α_0 is the constant term; β_0 is the coefficient of non-cognitive skills; γ_0 is the coefficient of the control variable; and ε_0 is the random error term.

3.3.2. Mediating Effect Model

According to the theoretical analysis, farmers' non-cognitive skills may affect entrepreneurial performance through human capital and social capital. Baron and Kenny's (1986) method [55] is used to test the mediating effect of human capital and social capital. It builds the mediating effect model as follows:

$$EP_i = \alpha_1 + \beta_1 NS_i + \gamma_1 Control + \varepsilon_{1i} \quad (2)$$

$$Mediation_i = \alpha_2 + \beta_2 NS_i + \gamma_2 Control + \varepsilon_{2i} \quad (3)$$

$$EP_i = \alpha_3 + \beta_3 NS_i + \lambda Mediation_i + \gamma_3 Control + \varepsilon_{3i} \quad (4)$$

Among them, EP_i, NS_i, and Mediation represent entrepreneurial performance, non-cognitive skills, and mediating variables, respectively; α_1, α_2, and α_3 are constant terms; β_1, β_2, and β_3 are coefficients of non-cognitive skills; γ_1, γ_2, and γ_3 are the coefficients of control variables; λ is the coefficient of the mediating variable; and ε_{1i}, ε_{2i}, and ε_{3i} are random error terms. The test steps of the mediation effect are:

(1) Perform regression analysis on Formula (2); if β_1 is significant, then proceed to the next step.
(2) Perform regression analysis on Equations (3) and (4); if both β_2 and λ are significant, the mediating effect is significant.
(3) Finally, confirm whether it is a complete mediation or a partial mediation. If β_3 is not significant, it is a complete mediation effect, and if β_3 is significant and less than β_1, it is a partial mediation effect.

3.4. Descriptive Statistics

Variables and descriptive statistics are defined in Table 2. The maximum value of entrepreneurial performance measured by entrepreneurial profit was CNY 700,000, the minimum value CNY 500,000, the average value CNY 47,040, and the standard deviation CNY 68,540. Because the standard deviation was much larger than the average value, the entrepreneurial performance data were winsorized by 5%. After winsorizing, the average value was CNY 43,390 and the standard deviation CNY 38,900. The maximum value of entrepreneurial performance measured by entrepreneurial satisfaction was 4.8, the minimum value 1.6, the average value 3.655, and the standard deviation 0.596. Non-cognitive skills are a continuous variable measured by the Big Five personality scale, with the minimum value 0.295, the maximum value 1.4, the average value 0.563, and the standard deviation 0.102. Among the non-cognitive skills of farmers, conscientiousness, emotional stability, agreeableness, openness, and extroversion were ranked in the order of mean scores. The average age of farmers in the whole sample was 44; the average length of education was 7.675 years; the average number of self-owned housing was 1.253; and the average working hours per week was 56.517 h.

3.5. Endogenous Problems

According to the regression results of the benchmark model, non-cognitive skills have a significant positive impact on the entrepreneurial performance of farmers. Still, the above regression equation may have endogenous problems such as missing variables and bidirectional causality. On the one hand, factors that are non-observable or difficult to measure (appearance, risk appetite, family environment) may affect farmers' non-cognitive skills and entrepreneurial performance. On the other hand, entrepreneurial performance may affect farmers' non-cognitive skills because farmers will purposefully improve non-cognitive skills to obtain or maintain a high level of entrepreneurial performance. Farmers with high entrepreneurial performance need to develop more extensive social capital, which puts forward higher requirements for non-cognitive skills. To solve the endogeneity problem mentioned above, this paper used the Wang and Zhang (2019) method and other scholars for reference [56]. It used the average non-cognitive skills of the interviewees in the same area as an instrumental variable for parameter estimation. The inherent logic is that a region's economic development, customs, and social culture will affect individuals. The stronger the average non-cognitive skills within a region, the higher the individual's non-cognitive skills, which meets the relevance requirements of instrumental variables. However, the individual's non-cognitive skills cannot affect the average non-cognitive skills of the region, which is in line with the exogenous hypothesis of instrumental variables.

Table 2. Variable list and descriptive statistics.

Variable	Variable Name	Definition	Mean	SD	Min	Max
EP_1	Entrepreneurial profit	After deducting costs, how much is the after-tax net profit of your self-employed or private enterprises in the past 12 months	4.704	6.854	−50	70
EP_2	Entrepreneurial satisfaction	The arithmetic means of entrepreneurial farmers' satisfaction with the five dimensions of income, safety, environment, promotion, and overall	3.655	0.596	1.6	4.8
NS	Non-cognitive skills	Comprehensive indicators of the five dimensions of "Big Five Personality"	0.557	0.040	0.050	0.237
$C_{onscientiousness}$	Conscientiousness	Comprehensive indicators calculated by orderliness, cautiousness, and achievement striving	0.152	0.037	0.036	0.262
$A_{greeableness}$	Agreeableness	Comprehensive indicators calculated by altruism and compliance	0.169	0.042	0.015	0.297
$E_{xtroversion}$	Extroversion	Comprehensive indicators calculated by activity, gregariousness, and positive emotion	0.146	0.041	0.000	0.274
$O_{penness}$	Openness	Comprehensive indicators calculated by innovation and attitude towards traditional values	0.136	0.039	0.020	0.281
$E_{motional}$	Emotional stability	Comprehensive indicators calculated by anxiety, depression, and vulnerability	0.141	0.028	0.020	0.180
H_{ousing}	Self-owned housing	Number of houses owned by families (sets)	1.253	0.695	0	6
L_{and}	Self-owned land	If a family is allocated collective land, it is assigned 1; otherwise, it is assigned 0	0.816	0.388	0	1
$W_{ork\text{-}time}$	Working hours	Respondents' working hours per week (hours)	56.517	25.957	1	155
$W_{ork\text{-}place}$	Workplace	Assign a value of 1 for starting a business in the city; Assign a value of 0 for starting a business in the country	0.561	0.497	0	1
A_{ge}	Age	Respondent's age (years)	44.109	11.107	19	82
$M_{arriage}$	Marital status	1 for married; 0 for other cases	0.945	0.228	0	1
$E_{ducation}$	Education	Years of education	7.675	3.918	0	16
$S_{ocial\text{-}capital}$	Social capital	Take a logarithm after summing up the monthly expenses of " expenses on favors and gifts ", " post and telecommunication expenses" and "dining out expenses"	6.714	0.674	5.70	7.70

4. Result

4.1. Total Sample Regression Results

Since the explained variable farmers' entrepreneurial performance was a continuous variable, the study used the OLS model for basic regression. Table 3 shows the estimated results for the impacts of the non-cognitive skills on farmers' entrepreneurial performance. In Model (1), only farmers' entrepreneurial performance and non-cognitive skills were added into the model. In Model (2), farmers' entrepreneurial performance, non-cognitive skills and control variables were added into the model. In Models (3–7), five sub-indicators of non-cognitive skills and farmers' entrepreneurial performance were added into the model.

As shown in Table 3, the coefficient of non-cognitive skills in Models (1–2) was significant at the level of 5% and was greater than zero, which meant that non-cognitive skills significantly and positively affected farmers' entrepreneurial performance. Specifically, if non-cognitive skills increase by 1%, entrepreneurial performance will increase by 3.30%. Thus, Hypothesis 1 is confirmed. In addition, it can be seen that in Models (3–7) the coefficient of influence of openness, conscientiousness, extroversion, and agreeableness were 10.164, 6.991, 7.718, and 6.708, significant at the level of 5%. The coefficient of influence of emotional stability was 8.613, which passed the significance test of 10%.

Table 3. Non-cognitive skills and farmers' entrepreneurship performance: the results of benchmark regression.

Variable	OLS Models for Farmers' Entrepreneurship Performance						
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
NS	4.757 ***	3.299 **					
	(1.516)	(1.454)					
A_{ge}		−0.028 **	−0.029 **	−0.029 **	−0.029 **	−0.029 **	−0.030 **
		(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
$M_{arriage}$		0.544	0.609	0.624	0.624	0.602	0.573
		(0.611)	(0.619)	(0.621)	(0.620)	(0.615)	(0.604)
H_{ousing}		1.114 ***	1.131 ***	1.130 ***	1.126 ***	1.126 ***	1.130 ***
		(0.200)	(0.202)	(0.203)	(0.202)	(0.204)	(0.203)
L_{and}		−0.637 *	−0.680 *	−0.688 *	−0.693 *	−0.687 *	−0.690 *
		(0.376)	(0.377)	(0.377)	(0.377)	(0.376)	(0.378)
$W_{ork\text{-}time}$		0.013 ***	0.013 **	0.013 ***	0.013 **	0.013 ***	0.014 ***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
$W_{ork\text{-}place}$		0.875 ***	0.885 ***	0.881 ***	0.886 ***	0.878 ***	0.901 ***
		(0.262)	(0.262)	(0.262)	(0.262)	(0.261)	(0.263)
$C_{onscientiousness}$			6.991 **				
			(3.248)				
$A_{greeableness}$				6.708 **			
				(3.161)			
$E_{xtroversion}$					7.718 **		
					(3.235)		
$O_{penness}$						10.164 ***	
						(3.442)	
$E_{motional}$							8.613 *
							(4.423)
Cons.	1.691 **	1.087	1.866	1.819	1.820	1.565	1.775
	(0.839)	(1.454)	(1.263)	(1.284)	(1.242)	(1.215)	(1.275)
Observation	838	838	838	838	838	838	838
R^2	0.013	0.091	0.090	0.090	0.092	0.095	0.089

(1) All results are marginal effect; (2) ***, ** and * represent the significance level of 1%, 5% and 10% respectively, and those in brackets are (robust) standard errors. The following table is the same.

Additionally, in terms of control variables, age, self-owned housing, self-owned land, working time, and working place significantly affect the entrepreneurial performance of farmers. In contrast, marital status has no significant statistical significance.

4.2. Test of Intermediary Effect

4.2.1. Human Capital Effect

To test the mediating effect of education level, the years of education in the CFPS data of 2018 are selected as the measurement index. The results are shown in Table 4. First, we regressed explanatory variables and explained variables. The relationship between non-cognitive skills and farmers' entrepreneurial performance (Model 8) shows a significant relationship ($p < 0.05$), indicating that non-cognitive skills are an important predictor of farmers' entrepreneurial performances. The relationships met the Condition 1 of the mediation effects test. Second, we regressed non-cognitive skills onto farmers' education level (Model 9). The relationship between non-cognitive skills and farmers' education level was found to be significant ($p < 0.01$), which met Condition 2 of the mediation effects test. Finally, we regressed both non-cognitive skills and education levels onto farmers' entrepreneurial performance (Model 10). The coefficient of non-cognitive skills in Model 10 was significant at the level of 5% and was greater than that in Model 8, indicating that education level as a mediator partly mediated the relationship between non-cognitive skills and farmers' entrepreneurial performance. Thus, Hypothesis 2 is confirmed.

Table 4. Test of intermediary effect of non-cognitive skills influencing farmers' entrepreneurial performance.

Variable	EP_1	$E_{ducation}$	EP_1	$S_{ocial\text{-}capital}$	EP_1
	Model 8	**Model 9**	**Model 10**	**Model 11**	**Model 12**
NS	3.299 **	3.384 ***	3.060 **	0.416 *	2.796 **
	(2.27)	(1.288)	(1.457)	(0.247)	(1.380)
$E_{ducation}$			0.070 **		
			(0.035)		
$S_{ocial\text{-}capital}$					2.146 ***
					(0.198)
Control variables	yes	yes	yes	yes	yes
Cons.	1.087	10.509 ***	0.349	6.268 ***	−12.839 ***
	(1.454)	(1.234)	(1.429)	(0.193)	(1.739)
Observation	838	838	838	838	838
R^2	0.091	0.103	0.096	0.029	0.218

***, ** and * represent the significance level of 1%, 5% and 10% respectively, and those in brackets are (robust) standard errors.

4.2.2. Social Capital Effect

To test the mediating effect of social capital, the "expenses on favors and gifts", "post and telecommunication charges" and "dining out expenses" in the CFPS data of 2018 were selected as indicators to measure social capital. The total social capital index is obtained by adding the total monthly expenditure of the three indicators and taking the logarithm. The results are shown in Table 4. The above mentioned non-cognitive skills have a significant impact on farmers' entrepreneurial performance. Then, we regressed non-cognitive skills onto farmers' social capital (Model 11). The relationship was significant ($p < 0.1$), indicating that farmers' non-cognitive skills promote the expansion of social capital. Finally, we regressed both non-cognitive skills and social capital onto farmers' entrepreneurial performance (Model 12). The coefficient of non-cognitive skills in Model 12 was significant at the level of 5% and was greater than that in Model 8, showing that social capital partially mediates non-cognitive skills and farmers' entrepreneurial performance. Thus, Hypothesis 4 is confirmed.

4.3. Results of Heterogeneous Effects

Table 5 lists the heterogeneous results of non-cognitive skills affecting farmers' entrepreneurial performance. It can be seen from Model 13 that the coefficient of non-cognitive skills was significant at the level of 1% and was greater than zero, indicating that non-cognitive skills significantly and positively affect the entrepreneurial performance of farmers who enter the city. However, the result of Model 14 shows that the impact of non-cognitive skills on the entrepreneurial performance of farmers who start their businesses in rural areas was insignificant. Thus, Hypothesis 4 is confirmed.

Models 15 and 16 display age heterogeneity results. It can be seen that the coefficient of non-cognitive skills was positive and significant at the level of 1%, indicating that non-cognitive skills have a significant positive impact on the entrepreneurial performance of farmers whose ages are more than 40 years old. For entrepreneurial farmers under the age of 40, non-cognitive skills have no significant impact on entrepreneurial performance. Thus, Hypothesis 5 is confirmed.

Table 5. Non-cognitive skills and farmers' entrepreneurship performance: regression results of heterogeneity.

Variable	City	Rural	Over 40 Years Old	Under the Age of 40
	Model 13	Model 14	Model 15	Model 16
NS	6.632 ***	−0.941	3.720 **	2.705
	(2.010)	(1.994)	(1.720)	(2.546)
A_{ge}	−0.017	−0.047 ***	−0.028	−0.008
	(0.018)	(0.017)	(0.021)	(0.049)
$M_{arriage}$	1.539 *	−0.728	1.415 ***	−0.687
	(0.806)	(0.823)	(0.502)	(1.240)
H_{ousing}	1.060 ***	1.128 ***	1.322 ***	0.916 ***
	(0.246)	(0.323)	(0.271)	(0.283)
L_{and}	−1.074 **	0.548	−0.720	−0.546
	(0.452)	(0.690)	(0.493)	(0.578)
$W_{ork\text{-}time}$	0.017 **	0.011	0.011 *	0.018 **
	(0.007)	(0.007)	(0.006)	(0.009)
$W_{ork\text{-}place}$			0.668 **	1.100 **
			(0.325)	(0.441)
Cons.	−1.086	4.552 **	0.099	1.714
	(1.958)	(2.048)	(1.900)	(2.761)
Observation	458	380	512	326
R^2	0.109	0.072	0.107	0.072

***, ** and * represent the significance level of 1%, 5% and 10% respectively, and those in brackets are (robust) standard errors.

4.4. Robustness Test

4.4.1. Endogeneity Test

Two-stage least squares (2SLS) were used for the endogeneity test in this paper. The results are shown in Table 6. The regression coefficient of the first stage was significantly positive, indicating that the average non-cognitive skills have a significant positive impact on the individual's non-cognitive skills. According to the weak instrumental variable test, the F values of the first stage regression test were 61.126, which far exceeded the threshold of the 10% bias level (16.38), indicating that there is no weak instrumental variable problem. The regression coefficient of the second stage was positive and significant at the level of 1%. This result proves the reliability of the preceding conclusion; that is, non-cognitive skills have a significant role in promoting farmers' entrepreneurial performance.

Table 6. 2SLS regression results of non-cognitive skills.

Variable	The First Stage	The Second Stage
NS		18.327 ***
		(5.679)
Instrumental variable	0.862 ***	
	(5.679)	
Cons.	0.086	−7.645 **
	(0.067)	(3.434)
Control variable	Yes	Yes
Gragg-Donald Wald F statistics	61.126	
Observation	838	838

*** and ** represent the significance level of 1% and 5% respectively, and those in brackets are (robust) standard errors.

4.4.2. Replace the Explained Variable

In order to test the reliability of entrepreneurial profit as an explained variable, the subjective index of entrepreneurship satisfaction is used to replace entrepreneurial profit for robustness tests. Entrepreneurship satisfaction includes five dimensions: income satisfaction, safety satisfaction, environmental satisfaction, promotion satisfaction, and overall sat-

isfaction. The Likert scale is used to measure each item, among which 1 = very dissatisfied, 2 = relatively dissatisfied, 3 = general, 4 = relatively satisfied, and 5 = very satisfied. Entrepreneurship satisfaction takes the arithmetic average of five items. The regression results of replacing explained variables are shown in Table 7. It can be seen from Model (17) and Model (18), whether the control variables are considered or not, that the regression coefficients of non-cognitive skills are all positive and significant at the level of 1%. This shows that it is robust to choose "entrepreneurial profit" as the evaluation index of entrepreneurial performance.

Table 7. Regression results from replacing explained variables.

Variable	Y_2	Y_2
	Model 17	**Model 18**
NS	0.766 ***	0.841 ***
	(0.218)	(0.221
Cons.	3.228 ***	3.289 ***
	(0.126)	(0.193)
Control variable	No	Yes
Observation	838	838
R^2	0.014	0.042

*** represent the significance level of 1%, and those in brackets are (robust) standard errors.

5. Discussion

This paper used the Big Five personality scale to construct an index system of non-cognitive skills based on CFPS 2018 data. It empirically analyzed the effect and mechanism of non-cognitive skills on farmers' entrepreneurial performance to provide some theoretical and practical guidance for improving farmers' entrepreneurial performance.

5.1. Theoretical Significance

The results show that, first, non-cognitive skills significantly and positively affect farmers' entrepreneurial performance after controlling for other variables. The higher the farmers' non-cognitive skills, the better the entrepreneurial performance. In particular, the influence coefficient is the largest among all explanatory variables, which means that farmers' non-cognitive skills have a great influence on entrepreneurial performance—that is, farmer-entrepreneurs who are more aggressive, socially capable, innovative, and emotionally stable are more likely to succeed. The result of this study is consistent with many prior findings based on data from other countries [33,41]. However, this paper used the Big Five personality scale to analyze the scale's impact on farmers' entrepreneurial performance.

Second, this study found that conscientiousness, agreeableness, extroversion, and openness all improved the entrepreneurial performance of farmers at a significance level of 5%. The impact coefficient of openness is the largest, indicating that openness is the most important quality farmers should have. This is because openness enables farmers to adapt to new technologies and changing environments and to develop innovative strategies and business plans [30,57]. In addition, conscientiousness has a positive effect on entrepreneurial performance. A possible explanation is that perseverance, firm will, self-discipline, rigour, and orderliness characterize farmers who have high self-discipline [58]. Therefore, they have a stronger goal orientation and firmer entrepreneurial will to encourage them to strive constantly for better entrepreneurial performance.

Meanwhile, extroversion and agreeableness have a beneficial effect on farmers' entrepreneurial performance. This indicates that farmers with high extroversion and agreeableness are more willing to take the initiative to contact the outside world, are better at socializing, and know how to make others feel positive emotions, all conducive to developing social networks and helping entrepreneurial activities run smoothly. Finally, the positive impact of emotional stability on farmers' entrepreneurial performance passed the 10% significance test because farmers with stable emotions and strong tolerance are more

likely to have leadership qualities and are more able to maintain a positive attitude in the face of difficulties.

Third, the research verified the mediating effect of human educational and social capital in non-cognitive skills and farmers' entrepreneurial performance. It confirmed that farmers with high non-cognitive skills have higher education levels and more social capital, helping them obtain higher entrepreneurial performance. On the one hand, farmers with strong human and social capital can better identify opportunities, obtain resources and adjust strategies in a changing environment [40,59]. On the other hand, non-cognitive skills can significantly improve individual education level and social capital, furthering entrepreneurial performance. This mechanism provides theoretical and empirical support for non-cognitive skills to improve entrepreneurial performance and provides a reference for the government to formulate policies.

Finally, the research performed a heterogeneity analysis. The result shows that non-cognitive skills significantly improve the entrepreneurial performance of farmers who move to the city but not the entrepreneurial performance of farmers in the countryside. Farmers who choose to start their own businesses in cities face relatively unfamiliar social, economic, and cultural environments. In addition to dealing with the 'new innovation disadvantage', migrants also face severe 'foreign disadvantage' in starting a business in the city [60]. As a result, the original social capital based on blood or kinship cannot provide resources for their business. They are required to improve their non-cognitive skills to obtain the various resources they need for the survival or development of their enterprises, while farmers who start businesses in rural areas do not have this pressure. The regression results of age heterogeneity show that non-cognitive skills improve the entrepreneurial performance of farmers aged over 40 but not the entrepreneurial performance of farmers under 40. A possible explanation is that non-cognitive skills have greater malleability over longer stretches of the life cycle than cognitive skills. This occurs partly because new aspects of non-cognitive skills emerge with maturity and can be influenced [22]. Soto and John [61], who conducted research using British data, found that the elderly have a higher level of agreeableness and conscientiousness than middle-aged and young people. Soto et al. [62], who studied subjects from several English-speaking countries and regions, found that extroversion and openness decreased only between the ages of 10 and 20. Extroversion then showed a flat curve, while openness slowly increased. Lucas and Donnellan [63] confirmed that appropriate human nature positively correlates with age. Therefore, the older farmer entrepreneurs have a high level of non-cognitive skills, which is helpful to obtaining good entrepreneurial performance.

5.2. Practical Significance

In the face of the overall poor performance of farmers' entrepreneurship, this study, based on the new human capital theory, analyzed the impact and mechanism of farmers' entrepreneurship performance from the perspective of non-cognitive skills. It provides some enlightenment on management of farmers' entrepreneurship practice and government entrepreneurship policy design.

First, farmer entrepreneurs should focus on developing their own non-cognitive skills, particularly fostering their enterprising and innovative spirit and social skills. However, non-cognitive skills alone are not enough to achieve excellent performance. Farmer entrepreneurs should convert non-cognitive skills into higher human and social capital to improve entrepreneurial performance.

Second, while many nations have made non-cognitive skills a part of their educational objectives, China's education system and labour market have not paid much attention to them. Given the importance of these skills, the government should concentrate on developing non-cognitive skills at all levels of the educational system and training farmers in entrepreneurship. Scientifically setting up courses in aspects that have a high return rate (such as innovation, extroversion, conscientiousness, and agreeableness) improves entrepreneurial literacy and ability.

Third, because of the heterogeneity analysis results, the government should focus on training farmers in non-cognitive skills, based on considering the differences between urban and rural areas and age, to improve entrepreneurial performance.

5.3. Limitations

This study has the following limitations. First, since the Chinese household survey data only began measuring non-cognitive skills in 2018, this study only uses the cross-sectional data of CFPS 2018, which cannot reflect the development process of longitudinal dynamics. Therefore, after the release of CFPS 2020, further research can be carried out with the panel data. Secondly, due to the data limitations, this study did not explore how non-cognitive skills can further affect entrepreneurial performance through entrepreneurial processes such as opportunity identification, resource acquisition and integration, enterprise operation, and management. Qualitative research in this area can be carried out in the future.

6. Conclusions

Based on the new human capital theory and related theories of entrepreneurial performance, this study analyzed the impacts of non-cognitive skills on the entrepreneurial performance of farmers. Specifically, the robust model verified that non-cognitive skills significantly promote the entrepreneurial performance of farmers. From the dimensionality perspective, conscientiousness, agreeableness, extroversion, and openness improved farmers' entrepreneurial performance at a significance level of 5%. The intermediary effect test found that non-cognitive skills affect farmers' entrepreneurial performance through human, educational, and social capital. Finally, the entrepreneurial return of farmers with non-cognitive skills was higher in urban areas than in rural areas, and the entrepreneurial return of farmers over 40 was higher than that of farmers under 40.

This finding also has some enlightening implications for farmers in other countries who wish to launch profitable ventures. In nations other than China, farmers are referred to as agricultural laborers, and their entrepreneurial fields have expanded from traditional agriculture to agricultural business diversification. For example, some American farmers not only run huge farms but also work as distributors of agricultural production supplies or agricultural gear and equipment. British farmers also engage in entrepreneurial operations in the field of farm leisure tourism, in addition to traditional agricultural production such as planting and breeding. Faced with diverse entrepreneurial activities and a more complicated entrepreneurial environment, farmers must not only improve agricultural production technologies and managerial capabilities, but also non-cognitive skills such as extroversion, agreeableness, openness, and conscientiousness. Our findings show that improving non-cognitive abilities can enhance human capital and social capital, which can assist farmer entrepreneurs to recognize opportunities and access resources, thereby improving entrepreneurial performance. As a result, the research conclusion of this paper not only provides conclusive evidence about the influence of non-cognitive ability on entrepreneurial performance, and adds to the body of knowledge on entrepreneurial economics, but also enables schools, governments, and entrepreneurs to better comprehend the increasingly significant role of non-cognitive skills in the field of entrepreneurship.

Author Contributions: Conceptualization, S.Z., H.Z. and X.Z.; methodology, H.Z. and G.R.S.; formal analysis, S.Z. and J.T.; writing—original draft preparation, S.Z. and Q.L.; writing—review and Editing, S.Z., G.R.S. and H.Z.; funding acquisition, X.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the National Social Science Foundation of China, grant numbers: 19CSH029.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available and can be found from China Family Panel Studies. The sources of data are described in Section 3.1.

Acknowledgments: The authors extend great gratitude to the anonymous reviewers and editors for their helpful review and critical comments.

Conflicts of Interest: All authors declare no conflict of interest.

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