

Income Effect of E-commerce Adoption Behavior of Navel Orange Farmers in Southern Jiangxi Province

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Abstract: With the continuous development of e-commerce in rural areas, the income effect of e-commerce has become a hot topic. Based on this background, this paper investigated the e-commerce adoption of navel orange farmers in southern Jiangxi Province, obtained 68 farmers' micro-data, and analyzed the income increasing effect of e-commerce adoption behavior by using multiple T-test and multiple regression analysis. It is found that the planting income and total household income of farmers who participate in e-commerce are higher than those who do not adopt e-commerce, and the adoption behavior of farmers has a significant and positive impact on their own income. In addition, factors such as education level, entrepreneurial experience, work experience, gift expenditure, network and logistics accessibility of navel orange growers in southern Jiangxi have a greater impact on the adoption behavior of e-commerce, which in turn affects the income increase effect of e-commerce and promotes the income increase of navel orange growers. In view of this, the paper puts forward some feasible suggestions such as improving the e-commerce infrastructure in the concentrated area of navel orange cultivation in southern Jiangxi Province, strengthening the publicity of the benefits of e-commerce, enabling farmers to have a deeper understanding of e-commerce, strengthening the introduction of e-commerce professionals, and improving the education mechanism of e-commerce in the area of navel orange cultivation.

Keywords: Electronic commerce Gannan navel orange Income effect.

1. Introduction

In recent years, along with our transportation and Internet infrastructure, it has greatly accelerated the development of e-commerce in our country. After the outbreak of the new coronavirus epidemic, e-commerce has ushered in a golden period of development with its unique advantages, and live delivery has become a new form of e-commerce, and the market scale of e-commerce has been further expanded. According to data released by the Ministry of Commerce, by the end of 2020, China's rural online retail sales reached 1.79 trillion yuan, an increase of 8.9%, of which, China's agricultural products online retail sales reached 415.89 billion yuan, an increase of 26.2%. With the implementation of the rural revitalization strategy, e-commerce plays an important role in accelerating agricultural industrialization and digital development. At the same time, the development of e-commerce of agricultural products has become an important support point for farmers' income increase and agricultural revitalization.

Since the 19th National Congress, in the context of the implementation of rural revitalization, the development of e-commerce in rural areas has been paid more and more attention by the state. In January 2018, the "Opinions of the CPC Central Committee and The State Council on the Implementation of the Rural Revitalization Strategy" issued by The State Council clearly pointed out that rural revitalization needs to vigorously develop e-commerce. In September of the same year, The State Council issued Opinions of the Central Committee of the Communist Party of China and The State Council on Implementing the Strategy of Rural Revitalization, which clearly proposed to promote the development of rural industries through e-commerce and provided policy support for the application and development of e-commerce in rural areas [1]. These policies have played

an important role in strengthening the construction of rural e-commerce infrastructure, promoting the construction of "rural e-commerce service stations" and "Taobao villages". By the end of 2020, the Internet penetration rate in rural areas of China has reached 55.9%, and rural logistics service sites have basically covered all rural areas of China. In addition, since the 19th National Congress, the central "No. 1 document" has emphasized the development of e-commerce in rural areas for four consecutive years to promote the integrated development of urban and rural areas.

Nowadays, the application of e-commerce is gradually popular in rural areas of China, and some farmers even change the traditional sales model of agricultural products, and set online sales as the first choice. So what factors have led them to adopt e-commerce? What are the effects of e-commerce adoption by small farmers? Can adopting e-commerce boost farmers' incomes? These are all worthy of our in-depth study.

2. Literature References

With the further development of the Internet economy, researches on e-commerce and related issues have gradually increased in the academic circle. According to existing literature, scholars have significant differences in the object, content and conclusion of research on this issue.

From the perspective of the research objects, there are two main characteristics: First, micro-small farmers are studied to study the income increase effect after micro-farmers adopt e-commerce behavior. For example, Wu et al. chose citrus growers in Sichuan province to conduct micro-empirical study on this issue [2]; Second, China's macro data are taken as the object. For example, Li et al studied the income distribution effect of the development of rural e-commerce in China with "Taobao Village" as the object [3], and Ji studied

the impact of e-commerce adoption behavior on total household income [4] with the comprehensive demonstration county of rural e-commerce as the object, but the income in rural areas is mainly plantation income. Therefore, the research object selection of this team is biased to the southern Jiangxi navel orange growers whose plantation income is the main. From the perspective of research content, scholars generally take farmers' planting income or total household income as the explained variable to study and compare the income difference between adopting e-commerce behavior and not adopting e-commerce behavior. From the research conclusion, there are the following characteristics: First, many scholars believe that the adoption of e-commerce can significantly improve farmers' income and promote the increase of farmers' income; Second, the e-commerce of agricultural products can effectively reduce intermediate costs. For example, Yu et al believe that farmers can directly connect with consumers through e-commerce platforms to improve operating profits, thus driving farmers to increase their income [5]. Third, the development of e-commerce in rural areas has a significant impact on narrowing the income gap between urban and rural residents [6]. Fourth, the development of e-commerce in poor rural areas has an income increasing effect on farmers and contributes to the poverty problem in rural areas [7].

Based on the above conclusions, it can be seen that the current academic circles agree that the development of e-commerce in rural areas can drive the increase of farmers' income on the issue of whether e-commerce can promote the increase of farmers' income. However, there is a lack of investigation and research on farmers in poor areas who mainly rely on planting income. Therefore, this paper takes navel orange farmers in poor mountainous areas in southern Jiangxi as an example to investigate the impact of e-commerce adoption on their planting income and fill the research gap.

3. Data Source and Model Construction

3.1. Data source

The data in this paper come from the field research of navel orange planting field in Gannan, Jiangxi Province in 2021. The origin of Ganzhou navel orange is located in Jiangxi Province. By 2020, the city's navel orange area has reached 113,000 hectares, and the output has reached 1.378 million tons, making it the largest navel orange planting area in China.

However, for a long time, Gannan navel orange not only faces the natural risk of natural environment constraints, but also faces the market risk of small-scale management lack of negotiation ability, so the growers in Gannan navel orange face the dilemma of "harvest but not increase income" for a long time. In order to change this situation, local navel orange growers are constantly trying the new path of e-commerce under the help and support of the state and the promotion of policies, and push Gannan navel orange to the whole country and export to the world. On July 20, 2020, Gannan navel Orange passed the application for regional protection of origin and was included in the protection list of China-Europe geographical indication products, becoming a well-known trademark in China, which provides a good opportunity for the e-commerce development of Gannan navel orange. Therefore, it is of great practical significance to explore the effect of e-commerce adoption on the income of small farmers in the context of the adoption of e-commerce into the large market in southern Jiangxi Province. In this survey, more than 70 questionnaires were distributed.

3.2. Variable design

3.2.1. Dependent variable

The explained variables of this paper are farmers' income, including total household income and planting income. The study collected the income data of farmers of geographical indication agricultural products from 2019 to 2021, and constructed a model of total household income and planting income after logarithmic processing.

3.2.2. Core variables

This paper focuses on the impact of e-commerce adoption behavior on income, so in the process of variable selection, we set the adoption behavior of e-commerce farmers as the core variable. If the adoption of e-commerce sales is 1, the non-adoption is 0.

3.2.3. Control variables

By combing numerous literatures and combining with the actual situation of the survey, this paper selected gender, age, education level, whether they are village cadres and whether they are poor households, so as to reflect the basic characteristics of the interviewed farmer households. Entrepreneurial experience, work experience, gift expenditure and access degree of network and logistics are selected as influencing factors of e-commerce adoption behavior, and these factors are taken as control variables to explore their impact on income.

Table 1. Variable names and descriptions

Variable	Variable description and value assignment
Navel navel orange planting income	Actual income is a log number
Household income	Actual income is a log number
E-commerce adoption behavior	Whether to adopt the e-commerce company, yes =1, no =0
Sex	Male =1, female =0
Age	Physical age
Education level	No school =1, primary school =2, junior high school =3, senior high school =4, junior college or above =5
Village cadres	Whether for the village cadre, yes =1, no =0
Low income family	Whether it is poor households, yes =1, no =0
Entrepreneurship experience	Whether you have entrepreneurial experience, yes =1, no =0
Work experience	Whether there is a migrant work experience, yes =1, no =0
Network accessibility	Very bad =1, worse =2, generally =3, better =4, very good =5
Logistics convenience	Unconvenient =1, less inconvenient =2, generally =3, better =4, very good =5
Plant area	Actual planting area
Gift money expenditure	Actual expenditure

3.3. Descriptive statistics

According to the descriptive statistical results in Table 2, only 30.9% of navel orange growers adopted e-commerce in all samples, indicating that there is still a large space for the development of e-commerce in this region. In addition, the navel orange growers in the sample area were older and less educated. Of the respondents, 60.3 percent were male; The average age of respondents was 52.4 years old; The education

level is mainly concentrated in junior high school and below; Most of the respondents are risk-averse, with only 32.4% having entrepreneurial experience. Rural households in this region generally have migrant work experience, and 66.2% of respondents in the survey sample have migrant work experience. In all the samples, the average actual farmland area of the respondents was 5.13 mu, and the average gift expenditure was 2,000 yuan.

Table 2. Descriptive analysis of the overall sample data

Variable	Mean	Standard error	Min	Max
Navel navel orange planting income	1.85	0.24	1.39	2.26
Household income	2.23	0.14	1.84	2.52
E-commerce adoption behavior	0.31	0.46	0	1
Sex	0.60	0.49	0	1
Ago	52.41	7.41	35	67
Education level	2.25	1.04	1	5
Village cadres	0.17	0.38	0	1
Low income family	0.52	0.50	0	1
Entrepreneurship experience	0.32	0.47	0	1
Work experience	0.66	0.48	0	1
Network accessibility	3.23	1.13	1	5
Logistics convenience	3.21	1.15	1	5
Plant area	5.13	1.45	3	8
Gift money expenditure	0.23	0.12	0.02	0.52

Table 3 shows the descriptive statistical results of dependent variables and control variables of farmers' e-commerce adoption and non-adoption behavior. As can be seen from the table, the income of farmers after adopting e-commerce is 1.934, higher than that of farmers who do not adopt e-commerce, which is 1.809. Therefore, it can be preliminarily assumed that the adoption of e-commerce has an impact on income increase, but its significance needs further suggestions. As can be seen from the basic characteristics of the interviewees, the average age of the farmers who have adopted e-commerce is 50 years old, while the average age of those who have not adopted e-commerce

is 53 years old. As the use of e-commerce to sell navel oranges is a new form, young farmers have a strong ability to accept new things. In terms of education level, the education level of farmers who adopt e-commerce is 2.76, which is significantly higher than that of farmers who do not adopt e-commerce. As the adoption of e-commerce requires certain knowledge and skills, farmers with higher education have stronger learning ability. In addition, in terms of entrepreneurial experience and work experience, farmers who have adopted e-commerce are also higher than those who have not adopted it to a certain extent.

Table 3. compares the descriptive statistics of farmers who participate in e-commerce with those who do not

Variable	Adopted		Not adopted	
	Mean	Standard error	Mean	Standard error
Navel navel orange planting income	1.93	0.20	1.80	0.25
Household income	2.29	0.13	2.19	0.14
E-commerce adoption behavior	0.52	0.51	0.63	0.48
Sex	50.42	5.97	53.29	7.87
Ago	2.76	1.09	2.02	0.94
Education level	0.19	0.40	0.17	0.38
Village cadres	0.28	0.46	0.63	0.48
Low income family	0.33	0.48	0.31	0.47
Entrepreneurship experience	0.71	0.46	0.63	0.48
Work experience	3.90	0.76	2.93	1.15
Network accessibility	3.95	0.86	2.87	1.12
Logistics convenience	5.47	1.56	4.97	1.37
Plant area	0.27	0.13	0.20	0.10

3.4. Model construction

In order to examine the influence of various factors on the income of navel orange growers in southern Jiangxi province, this paper uses multiple regression model to investigate the effect of e-commerce adoption behavior on the income of navel orange growers in southern Jiangxi Province. The specific model is as follows:

$$Income = \alpha + \beta commerce + \gamma X_i \quad (1)$$

In order to better test the impact of e-commerce adoption behavior on the total household income, the core variable was changed to *All income* to further test the impact of each factor on the total household income of farmers. The specific model is as follows:

$$All\ income = \alpha + \beta commerce + \gamma X_i \quad (2)$$

Among them, *Income* is the dependent variable, indicating the planting income of navel orange growers; α is a constant item; *commerce* is the core variable: adopt e-commerce, X_i is the control variable; α and γ are effect coefficients.

4. Empirical Test and Result Analysis

4.1. Multitext T test

In order to test whether the mean difference between the dependent variable and the control variable of the adoption and non-adoption behavior of farmers' e-commerce is significant, this paper analyzes the variables through multitext T test. As can be seen from the following table, the adoption of e-commerce by farmers has significant differences on the mean value of their navel orange planting income and family total income, in which 95% indicates a significant impact on the navel orange planting income, and 99% indicates a significant impact on the family total income. In addition, there are significant differences in the mean value of education level, whether they are poor households, whether they have entrepreneurial experience and work experience, network access, logistics convenience and gift expenditure, indicating that these factors have a significant impact on the adoption of e-commerce by navel orange growers in southern Jiangxi.

Table 4. Sample data T test

Variable	T-test		
	Mean difference	Standard error	P
Navel navel orange planting income	0.13**	0.06	0.04
Household income	0.11***	0.03	0.00
E-commerce adoption behavior	-0.11	0.12	0.38
Sex	-2.86	1.92	0.14
Ago	0.74***	0.26	0.00
Education level	0.02	0.10	0.84
Village cadres	-0.35***	0.12	0.00
Low income family	0.02*	0.12	0.06
Entrepreneurship experience	0.08*	0.12	0.08
Work experience	0.97***	0.27	0.00
Network accessibility	1.08***	0.27	0.00
Logistics convenience	0.49	0.37	0.19
Plant area	0.07**	0.02	0.02

Note: *, ** and *** are significant at the 10%, 5% and 1% levels, respectively. Similarly hereinafter

4.2. Results of regression analysis

As can be seen from Table 5, e-commerce adoption behavior of navel orange growers in southern Jiangxi positively affects their planting income at 99% level and their total household income at 95% level, indicating that e-commerce adoption behavior has a significant impact on farmers' income increase.

Table 5. Regression analysis of farmers' e-commerce adoption behavior and income model

Variable	Model (1)			Model (2)		
	Coef	Standard error	P	Coef	Standard error	P
E-commerce adoption behavior	0.11***	0.04	0.00	0.12**	0.06	0.05

Factors such as entrepreneurial experience, work experience, gift expenditure, access to network and logistics will affect the e-commerce adoption behavior of farmers to a certain extent, and then affect the income increase efficiency of farmers. Therefore, these factors will be used as control variables to explore their impact on the adoption behavior of e-commerce, and put forward feasible suggestions for the development of e-commerce in this region.

Table 6. Regression analysis of influencing factors of e-commerce adoption behavior of farmers

Variable	Interpreted variable: whether to adopt e-commerce		
	Coef	Standard error	P
Sex	0.01	0.10	0.96
Ago	-0.01	0.02	0.91
Education level	0.14***	0.06	0.02
Village cadres	0.26*	0.15	0.09
Low income family	-0.15	0.10	0.15
Entrepreneurship experience	0.10**	0.11	0.06
Work experience	0.20**	0.12	0.06
Network accessibility	0.14***	0.04	0.00
Logistics convenience	0.09**	0.05	0.07
Plant area	0.91***	0.40	0.02

It can be seen from Table 6 that the education level of farmers at 99% has a significant positive impact on their e-commerce adoption behavior. The adoption of e-commerce requires

certain knowledge and skills, and farmers with higher education have stronger learning ability, which helps farmers to adopt e-commerce and thus promote their income increase. Both entrepreneurial experience and migrant work experience have a significant positive impact on farmers' e-commerce adoption behavior at 95% level. Farmers with entrepreneurial experience and migrant work experience have advantages in accepting new things, which helps them master e-commerce sales skills. The degree of network and logistics accessibility also has a significant positive impact on farmers' e-commerce adoption behavior. The degree of network and logistics accessibility will affect the cost of farmers' e-commerce adoption behavior. Convenient network and logistics will reduce the cost of farmers' e-commerce adoption and help farmers to accept the e-commerce model. In addition, gift money expenditure and whether they are village cadres also have a significant positive impact on their e-commerce adoption behavior, because more gift money expenditure and the employment of village cadres can help farmers contact more people or things, and they are more likely to adopt e-commerce earlier or more willing.

5. Conclusion and Suggestion

By investigating the e-commerce adoption behavior of navel orange growers in southern Jiangxi Province and using empirical methods to study its effect on farmers' income, this paper draws the following conclusions: First, 31% of the

farmers adopt e-commerce in the sample, and the farmers who adopt e-commerce have higher planting income and total family income than those who do not; Secondly, the e-commerce adoption behavior of navel orange growers in southern Jiangxi positively affects their plantation income at 99% level and their family income at 95% level. Third, factors such as farmers' education level, entrepreneurial experience, work experience, gift expenditure, network and logistics accessibility significantly affect farmers' e-commerce adoption behavior, thus affecting the income increase effect of e-commerce and promoting the income increase of navel orange growers.

According to the above conclusions, the following suggestions are put forward for the development of e-commerce in this region: First, improve the e-commerce infrastructure in the concentrated area of navel orange planting in southern Jiangxi, improve relevant policies, and encourage growers to participate in e-commerce; Second, strengthen the publicity of the benefits of e-commerce, so that farmers have a deeper understanding of e-commerce, and attract more farmers to participate in e-commerce; Third, strengthen the introduction of e-commerce professionals, improve the education mechanism of e-commerce in navel orange growing areas, strengthen the professional skills training of farmers, so that farmers can master the basic knowledge and skills of e-commerce application, which is conducive to more standardized e-commerce adoption behavior of farmers, and promote the income increase of navel orange growers.

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