

The Influence of Brand Creation and R&D Innovation on the Operating Income of Agricultural Small and Micro Enterprises in Gansu Province

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Abstract: According to the survey data of Chinese small and micro enterprises (CMES), this paper uses OLS and Probit models to study the impact of brand creation and innovative research and development of agricultural small and micro enterprises on their operating income. The results show that brand creation and innovative R&D have a significant role in promoting the operating income of agricultural small and micro enterprises, while the overall brand creation and innovative R&D investment of agricultural small and micro enterprises in Gansu Province are at a backward level. Therefore, the revenue of agricultural small and micro enterprises in Gansu Province Ability may be weak. Secondly, this paper further analyzes and finds that financing constraints have a significant inhibitory effect on the brand creation, innovative R&D and operating income of agricultural small and micro enterprises, and the financing constraints of agricultural small and micro enterprises in Gansu Province are also relatively large, so they are inhibited.

1. Introduction

The sound development of small and micro enterprises is related to a series of major issues of economic and social development in my country, such as economic growth and employment. According to the 2021 China Small and Medium Enterprise Financing Development Report, small and micro enterprises account for 96.5% of my country's market players, contributing 60% of GDP and 80% of employment. Whether small and micro enterprises can develop well and orderly as a whole is very important.

On the other hand, there has been an unbalanced development between urban and rural areas and regions in my country for a long time. The economic and social development of the eastern region is far ahead of that of the central and western regions. Gansu Province, as a northwestern inland province, has a strong economic and social development in the whole country and even in the western region. Development is at a backward level, so Gansu Province has a series of problems such as backward regional economic development, poor employment quality and poverty. Since the unique geographical and ecological environment of Gansu is suitable for the development of characteristic agriculture, whether the agricultural small and micro enterprises in Gansu can develop well is particularly important for the development of Gansu's economy and people's livelihood.

The current research on small and micro enterprises includes: the impact of financing constraints on the confidence of small and micro enterprise operators (Hou Baofeng et al., 2022) [1], the export of inclusive finance to small and micro enterprises (Zhang Mingxin et al., 2022) [2], the whole Factor productivity (Gu Ning et al., 2021) [3], technological innovation (Yang Jun et al., 2021) [4], financing constraints (Zou Wei et al., 2018) [5], etc. (Huang Yufang et al., 2013) [6], the influence of innovation (Huang Yuhong, 2018) [7]. Research on small and micro enterprises has been carried out in many aspects, but from another perspective, most of the current research on small and micro enterprises is aimed at the overall small and micro enterprises, and the development difficulties faced by different types of small and micro enterprises may be different. Different, and this is the missing aspect of the current research. At present, most of the research on agricultural small and micro enterprises is considered from the perspective of theoretical analysis (Huang Shanshan, 2013; Zhang Qingliang, 2014) [8-9], while the empirical research on agricultural small and micro enterprises is relatively lacking.

To sum up, this paper intends to explore the development status of e-commerce, brand creation, and innovative research and development of agricultural small and micro enterprises, and to study the relationship between them and the operating income level of agricultural small and micro enterprises. Compared with the existing research, the possible contributions of this paper are: a series of regression analysis is carried out with agricultural small and micro enterprises as the research subject; the impact of brand creation and innovative R&D of agricultural small and micro enterprises on operating income is quantitatively analyzed; The financing constraint is further introduced, and the influence of the internal cause of financing constraint is analyzed.

The rest of this paper are: variable selection and model construction, empirical analysis, further analysis, conclusions and policy recommendations.

2. Variable selection and model building

2.1. Variable selection and descriptive analysis

According to the China Small and Micro Enterprise Survey (CMES) database, this paper makes a certain analysis of the development of agricultural small and micro enterprises in Gansu Province, the data contains detailed data of 5,497 small and micro enterprises in 28 provinces across the country in 2014, laying a solid data foundation for our analysis of agricultural small and micro enterprises in Gansu Province.

This paper firstly conducts a comparative analysis on e-commerce, brand creation, innovative R&D and enterprise asset scale (million RMB) which are the focus of attention. The selection questions are "whether the enterprise sells products through the Internet or mobile Internet", "whether the enterprise has its own brand", "whether the enterprise currently has or has any product or technology R&D and innovation activities", and "the enterprise's current total assets" four This question compares the development status of agricultural small and micro enterprises in Gansu Province, the national agricultural small and micro enterprises, and the three northwestern provinces (Shaanxi, Gansu, Ningxia). Table 1 is a comparative descriptive analysis of this part.

Comparing the development status of agricultural small and micro enterprises in Gansu Province (Table 2), the whole country and the three northwestern provinces, it can be seen that in terms of e-commerce, whether it is Gansu Province, the whole country or the three northwestern provinces, there are no online sales channels. The ability of enterprises to use e-commerce is very weak; in terms of brand creation, the average brand creation of agricultural small and micro enterprises in Gansu Province is 0.091, the national average is 0.245, and the three northwestern provinces are 0.176. It can be seen that the brand creation of agricultural small and micro enterprises in Gansu Province is serious. It lags behind the national average, and it is also in a backward state among the three

northwestern provinces; in terms of innovation and R&D, the average value of innovative R&D of agricultural small and micro enterprises in Gansu Province is 0.100, the national average is 0.335, and the three northwestern provinces are 0.188. The investment in innovation is far behind the national average, and it is also at a backward level among the three northwestern provinces; in terms of asset size (million RMB): the average value of Gansu Province is 5.181, the national average is 7.179, the three northwestern provinces are 6.812, and the agricultural small and micro enterprises in Gansu Province are 5.181. The asset scale of enterprises also lags behind the national average and the average of the three northwestern provinces.

Table 1 Descriptive analysis of the main business of agricultural small and micro enterprises

Region	variable name	N	average value	standard deviation	min	max
Gansu province	e-commerce	0				
	brand creation	11	0.091	0.302	0	1
	Innovative research and development	10	0.100	0.316	0	1
	Asset size	11	5.181	7.159	0.940	26.300
Entire Country	e-commerce	3	0	0	0	0
	brand creation	465	0.245	0.431	0	1
	Innovative research and development	433	0.335	0.472	0	1
	Asset size	465	7.179	27.900	0	400.00
Three Northwest Provinces	e-commerce	0				
	brand creation	17	0.176	0.393	0	1
	Innovative research and development	16	0.188	0.403	0	1
	Asset size	17	6.812	8.987	0.100	30.700

Table 2 Descriptive analysis of small and micro enterprises whose business includes agriculture

Region	variable name	N	average value	standard deviation	min	max
Gansu province	e-commerce	0				
	brand creation	15	0.067	0.258	0	1
	Innovative research and development	14	0.286	0.469	0	1
	Asset size	15	4.699	6.174	0.500	26.300
Entire Country	e-commerce	6	0	0	0	0
	brand creation	499	0.271	0.445	0	1
	Innovative research and development	464	0.345	0.476	0	1
	Asset size	498	7.975	28.800	0	400.000
Three Northwest Provinces	e-commerce	0				
	brand creation	21	0.143	0.359	0	1
	Innovative research and development	20	0.300	0.470	0	1
	Asset size	21	6.157	8.192	0.100	30.700

We relax the definition of agricultural small and micro enterprises. We analyze the small and micro enterprises whose business includes agriculture as agricultural small and micro enterprises. We find

that Gansu Province still lags behind the country and the three northwestern provinces in terms of brand creation, innovation and R&D, and asset scale. The overall e-commerce development of small and micro enterprises is still seriously insufficient.

Overall, the development level of agricultural small and micro enterprises in Gansu Province is far behind the national average in the three dimensions of brand creation, innovation and R&D, and asset scale, and it is also at a backward level among the three northwestern provinces. The development of characteristic agriculture in Gansu is not optimistic. .

Further, we added a series of control variables, the control variables at the business owner level: age, gender, education level; the control variables at the enterprise level, the scale of enterprise assets, the number of years of business operation, whether to join an industry association, and conduct regression analysis, e-commerce, brand creation, Whether innovative R&D promotes the company's operating income. Among them, add one to the asset size and take the logarithm. To study whether the brand entrepreneurship and innovative research and development of agricultural small and micro enterprises at the national level are conducive to the increase of business income of enterprises, and the business income of enterprises is added to take the logarithm. Table 3 shows the descriptive statistics of the explained variables and control variables.

Table 3 Descriptive statistics

variable name	N	average value	standard deviation	min	max
Enterprise operating income	428	11.780	5.000	0	19.371
business owner age	430	44.337	8.813	22	77
business owner gender	439	0.904	0.294	0	1
Business owner degree	434	4.099	1.526	1	8
Enterprise asset scale	465	14.338	2.070	0	19.807
Enterprise operating years	463	5.875	5.734	0	58
join the association	433	0.256	0.437	0	1

2.2. Model construction

Since the explained variable operating income is a continuous variable, this paper uses OLS regression for regression analysis. The model formula is as follows:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Among them, Y is the operating income of the explanatory variable, X1 is the key explanatory variable brand creation/innovative research and development, X2 is a series of control variables, and ε is the random error.

3. Empirical Analysis

3.1. Basic return

This paper firstly conducts a regression analysis on whether brand creation and innovative R&D

will promote the operating income of agricultural small and micro enterprises. The regression results are shown in Table 4:

Brand creation and innovative research and development have a significant role in promoting the increase in the operating income of agricultural small and micro enterprises. Creating a brand can significantly increase the operating income of the enterprise by 1.178% units, and innovative research and development can significantly increase the operating income of the enterprise by 1.647% units. The level of brand creation, innovation and R&D of agricultural small and micro enterprises in Gansu Province is significantly lower than the national average level, so the revenue capacity of agricultural small and micro enterprises in Gansu Province will be more seriously inhibited due to these two reasons.

Table 4 The impact of brand creation and innovative R&D on the operating income of agricultural small and micro enterprises

variable name	1	2
brand creation	1.178* (0.613)	
Innovative research and development		1.647*** (0.540)
business owner age	-0.044 (0.029)	-0.038 (0.029)
business owner gender	0.600 (0.842)	0.643 (0.836)
Business owner degree	0.091 (0.174)	0.125 (0.170)
Enterprise asset scale	0.100 (0.140)	0.087 (0.138)
Enterprise operating years	0.209*** (0.048)	0.209*** (0.047)
join the association	1.673*** (0.607)	1.517** (0.606)
R2	0.110	0.123
N	397	397

Note: ***, **, and * represent significant at the 1%, 5%, and 10% levels, respectively, and the standard deviation is in brackets.

3.2. Robustness test

The above regression results show that brand creation and innovative R&D have a significant role in promoting the increase in the operating income of agricultural small and micro enterprises. In order to verify the robustness of the regression results, this paper adopts the following methods to conduct robustness tests. The first is to relax the definition of agricultural small and micro enterprises: that is, as long as the business includes agriculture, it is defined as agricultural small and micro enterprises; the second is to truncate the 90th percentile of operating income. Table 5 shows the results of the robustness test:

The results of the robustness test show that brand creation and innovative R&D still have a significant promoting effect on agricultural small and micro enterprises, which is consistent with the basic regression results. The conclusion of the basic regression results in this paper is robust.

Table 5 Robustness test

variable name	Replacing agricultural small and micro enterprises		Censoring	
	1	2	3	4
brand creation	1.1251** (0.563)		0.989* (0.625)	1.636*** (0.548)
Innovative research and development		1.420*** (0.511)		
business owner age	-0.041 (0.028)	-0.035 (0.028)	-0.045 (0.030)	-0.040 (0.029)
business owner gender	0.540 (0.793)	0.564 (0.790)	0.640 (0.856)	0.685 (0.848)
Business owner degree	0.079 (0.166)	0.130 (0.162)	0.055 (0.178)	0.075 (0.173)
Enterprise asset scale	0.162 (0.133)	0.165 (0.132)	0.047 (0.142)	0.027 (0.141)
Enterprise operating years	0.200*** (0.044)	0.199*** (0.043)	0.204*** (0.049)	0.205*** (0.049)
join the association	1.613*** (0.563)	1.489** (0.566)	1.790*** (0.620)	1.612*** (0.616)
R2	0.124	0.130	0.097	0.112
N	424	424	388	388

Note: ***, **, and * represent significant at the 1%, 5%, and 10% levels, respectively, and the standard deviation is in brackets.

3.3. Endogenous test

Secondly, the explanatory variables in this paper may have endogeneity problems such as reverse causality, omitted variables and measurement errors. Common solutions include lagged variables, PSM-DID, fixed-effect panel data, and instrumental variable methods. In view of the availability of data, this paper uses the instrumental variable method to test for endogeneity. Since the enterprises concerned in this paper are small and micro agricultural enterprises, the number of observations in each province is relatively small, and even at the county and city level, there may be no samples of agricultural small and micro enterprises in many districts and counties. Therefore, this paper adopts the agricultural small and micro enterprises at the provincial level. The mean value of brand creation and innovation R&D is brought into regression to test the endogeneity of the model. The average value of provincial brand creation and innovative R&D of agricultural small and micro enterprises is the overall development of agricultural small and micro enterprises in a province, and there is a significant correlation with the brand creation and innovative research and development of a certain agricultural small and micro enterprise. The correlation between the operating income of small and micro enterprises is weak, so the selection of instrumental variables in this paper is appropriate. The endogeneity test results are shown in Table 6:

The Wald value is greater than the critical value of 16.38 proposed by Stock, the t values of the instrumental variables are all significant, and the F values in the first stage are all greater than 10. Therefore, there is a strong correlation between the instrumental variables and key explanatory variables in this paper, and there is no weak instrumental variable. Regression of instrumental variables shows that creating a brand can significantly increase the company's operating income by 3.284% units, and innovative R&D can significantly increase the company's operating income by 2.552% units. The results of the instrumental variable regression are far greater than the results of the OLS regression, which shows that the conclusion of the basic regression in this paper

is reliable, but the OLS underestimates the promotion effect of brand entrepreneurship and innovative R&D on operating income.

Table 6 Endogenous test

variable name	1	2
brand creation	3.284* (1.986)	
Innovative research and development		2.552* (1.660)
business owner age	-0.050* (0.030)	-0.037 (0.029)
business owner gender	0.744 (0.856)	0.711 (0.839)
Business owner degree	-0.036 (0.209)	0.105 (0.172)
Enterprise asset scale	0.021 (0.157)	0.056 (0.148)
Enterprise operating years	0.198*** (0.049)	0.206*** (0.047)
join the association	1.342** (0.679)	1.330* (0.684)
R2	0.083	0.116
F value of the first stage	15.90	12.75
Instrumental variable t value	6.43***	6.74***
Wald value	41.366***	45.422***
N	397	397

Note: ***, **, and * represent significant at the 1%, 5%, and 10% levels, respectively, and the standard deviation is in brackets.

4. Further analysis

Financing difficulties are a major dilemma faced by the development of small and micro enterprises, and the overall economic development level of Gansu Province is extremely backward in the country. The financing difficulties faced by the development of small and micro enterprises in Gansu Province may also be more serious. Regardless of whether it is the operating income, brand creation, and innovative R&D of agricultural small and micro enterprises, financing support will be required. In the case of large financing constraints, operating income, brand creation, and innovative R&D will be seriously affected. This paper firstly compares the current situation of financing constraints in Gansu Province, the whole country and the three northwestern provinces. In this paper, the financing constraints are analyzed by the SA index of Liu Liya et al. (2015) [10]. The SA index construction formula is:

$$SA = 0.043Size^2 - 0.737Size - 0.04Year$$

Among them, Size is the total assets of the enterprise, in millions of RMB; Year is the operating years of the enterprise. This paper retains the part of the SA index less than 0. The SA index is less than 0. The larger the value, the greater the financing constraints. Table 7 is a descriptive analysis.

The results in Table 7 show that the average financing constraints of agricultural small and micro enterprises in Gansu Province are larger than those of the whole country and the three northwestern provinces, that is, the financing constraints faced by agricultural small and micro enterprises in Gansu Province are stronger; secondly, this paper finds that in this data sample, the financing constraints The largest agricultural small and micro enterprises are located in Gansu. Financing constraints are a

major dilemma faced by agricultural small and micro enterprises in Gansu Province.

Table 7 Descriptive Analysis of Financing Constraints

Region	variable name	N	average value	standard deviation	min	max
Gansu Province	financing constraints	11	-0.843	0.554	-2.030	-0.034
National		338	-1.134	0.716	-4.545	-0.034
Three Northwest Provinces		16	-1.073	0.843	-2.820	-0.034

In order to analyze whether financing constraints will have a significant inhibitory effect on the brand creation, innovative R&D and operating income of agricultural small and micro enterprises, this paper conducts the following empirical analysis, and the formula is constructed as follows:

$$Probit(Y_1) = \beta_1 SA + \beta_2 X_2 + \varepsilon$$

$$Y_2 = \beta_1 SA + \beta_2 X_2 + \varepsilon$$

Among them, SA is the financing constraint, X2 is a series of control variables, and ε is the random error. Y1 is the brand creation and R&D innovation, the model is the Probit model, and Y2 is the business revenue of the enterprise, and the model is the OLS model. Since the construction of the SA index is measured by the size of the company's assets and the company's operating years, these two variables will not be added to the control variables in this part to avoid the serious collinearity problem between the SA index, the size of the company's assets and the company's operating years. For the empirical analysis, see:

Table 8 Analysis of Financing Constraints

variable name	1brand creation	2Innovative research and development	3Operating income
financing constraints	-0.106*** (0.038)	-0.139*** (0.039)	-0.967** (0.446)
business owner age	0.004 (0.003)	-0.002 (0.003)	-0.029 (0.035)
business owner gender	-0.116 (0.086)	-0.066 (0.093)	0.054 (1.045)
Business owner degree	0.045*** (0.017)	0.015 (0.018)	0.137 (0.201)
join the association	0.123** (0.054)	0.141** (0.058)	1.778*** (0.660)
R2	0.089	0.071	0.063
N	299	299	296

Note: ***, **, and * represent significant at the 1%, 5%, and 10% levels, respectively, and the standard deviation is in brackets. Columns 1 and 2 report the average marginal effects, and column 3 reports the coefficients.

The results in Table 8 show that financing constraints significantly inhibit the brand creation, innovative R&D, and operating income of agricultural small and micro enterprises across the country. Every time the financing constraints increase by one unit, the probability of brand creation of agricultural small and micro enterprises will decrease by 10.6%, and the probability of innovative research and development will decrease by 13.9%. Every time the financing constraint increases by one unit, the operating income of agricultural small and micro enterprises will decrease by 0.967%. It can be seen that financing constraints may inhibit the operating income of agricultural small and micro enterprises by inhibiting the brand creation and R&D innovation of agricultural small and micro enterprises. Secondly, if agricultural small and micro enterprises want to expand reproduction,

they often need financing support, and financing constraints will obviously inhibit the expansion of agricultural small and micro enterprises in production and directly inhibit the growth of operating income. At the same time, according to the descriptive analysis in Table 7, the financing constraints of Gansu Province are obviously stronger than the average financing constraints of the whole country and even the three northwestern provinces. Therefore, the agricultural small and micro enterprises in Gansu Province may be more inhibited due to financing constraints.

5. Conclusion and Policy Recommendations

Based on the China Small and Micro Enterprise Survey (CMES) database, this paper uses the OLS and Probit regression models to determine whether brand creation, innovative R&D will significantly promote the operating income of agricultural small and micro enterprises, and verify that financing constraints have an impact on agricultural small and micro enterprises. The impact of brand creation, innovative R&D, and operating income. The research results show that brand entrepreneurship and innovative research and development have a significant role in promoting the operating income of agricultural small and micro enterprises, while the proportion of brand creation and innovative research and development of agricultural small and micro enterprises in Gansu Province is at a backward level in the country and even in the three northwestern provinces. Therefore, due to the authenticity of the brand and the lack of innovative research and development, the agricultural small and micro enterprises in Gansu Province will have less operating income. In addition, consistent conclusions have been obtained in the robustness test and the endogeneity test. This basic conclusion is reliable. Secondly, this paper further analyzes the impact of financing constraints on the brand creation, innovative research and development, and operating income of agricultural small and micro enterprises. The results show that financing constraints are not conducive to the development of small and micro enterprises in these areas. The financing constraints of agricultural small and micro enterprises in Gansu Province are the larger in the whole country and even in the three northwestern provinces, because the agricultural small and micro enterprises in Gansu Province may be more affected by financing constraints.

In view of the above conclusions, this paper puts forward the following policy suggestions: (1) Agricultural small and micro enterprises in Gansu Province should pay attention to the cultivation of brands and investment in innovative research and development, which is an important guarantee for the good development of enterprises. (2) The government should introduce policies to support the cultivation of brands and innovation of agricultural small and micro enterprises. (3) It is necessary to vigorously develop the cause of inclusive finance and alleviate the financing difficulties of small and micro agricultural enterprises.

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