Analysis of cooperative efficiency and influencing factors based on dea-tobit method

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Abstract. The improvement of people's quality of life is the core of national economic development. As the key to improve the rural economy, farmers' professional cooperatives can provide help for the overall revitalization of the rural economy. However, due to the influence of various factors, farmers' professional cooperatives cannot guarantee their operational efficiency. Therefore, in order to create a broader development prospect for farmers' professional cooperatives, the article analyzes the efficiency and influencing factors of farmers' professional cooperatives, so as to provide more options for the long-term operation of farmers' professional cooperatives. First of all, DEA data envelopment analysis method is used to analyze the efficiency of 40 farmers' professional cooperatives surveyed and analyze their technical efficiency, scale efficiency and comprehensive efficiency. Then, through Tobit regression analysis, determine the relevant independent variables, take the three efficiency values analyzed in the first step as the explained variables, carry out regression analysis, and draw relevant conclusions that affect the level of cooperative operation efficiency. Finally, the purpose of this paper is to provide some scientific guidance and suggestions for the development of Chinese farmers' professional cooperative.

Keywords: farmers' professional cooperatives, efficiency, DEA-Tobit.

1   Introduction

Farmers' cooperatives are mutual-aid economic organizations that are voluntarily united and democratically managed by the broad masses of farmers on the basis of household contract management. To enhance the service driving capacity of farmers' cooperatives, we should effectively solve the difficulties faced by small farmers in production and operation. In China, the efficiency of farmers' professional cooperatives is an important link in agricultural economic analysis. If we can grasp the efficiency and influencing factors of farmers' professional cooperatives, we can carry out various work of farmers' professional cooperatives. As for the measurement of efficiency, most experts at home and abroad use DEA data envelopment analysis to measure it. For example, Li Lili measured the overall efficiency of farmers' cooperatives and the efficiency of product types by using DEA-Tobit method based on the survey data of farmers' cooperatives in Chongqing, and analyzed various factors affecting their effi-

ciency in detail[1]. Guo Xiuping and Lan Haiqing used the DEA method to calculate and evaluate their circulation efficiency from three aspects of efficiency and scale income[2]. The research and measurement methods of efficiency are generally less controversial, but there are still large disputes about the relevant factors affecting efficiency.

For example; Lorendahl believed that the economic efficiency of farmers' professional cooperatives was mainly affected by the cooperative's infrastructure construction, employment and business development, all of which had a significant positive impact on efficiency[3]. Narciso Arcas, Salvador Ruiz found through research that the cooperative's business strategy, rich resources and advanced professional skills have a great impact on its business efficiency[4]. Ren Weifang and Huo Xuexi started with the Apple Cooperative and believed that the factors affecting efficiency included the scale of the cooperative, the number of directors, the strength of internal supervision, the ability of managers and the number of member training[5]. Lin Qiujun believed that the age of the president, cooperation with technical units, registered capital, operating time, and number of workers had a significant positive impact on the operating efficiency of the cooperative[6]. The degree of education and the frequency of receiving technical services had a significant negative impact on the operating efficiency. Huang Zuhui put the research goal on the members, He believed that the structure and quality of the members of the cooperative have a great impact on the efficiency of the cooperative, and improving the quality training is more conducive to strengthening the efficiency of the cooperative[7]. Zhu Wenchun believed that the internal relations and external social relations of farmers' professional cooperatives are very important, and a good relationship network can greatly improve the efficiency of cooperatives[8].

Therefore, the research purpose of this paper is to put forward relevant assumptions, determine the factors that may affect the efficiency of cooperatives, and provide an empirical reference and support for the research on the factors that are still controversial.

2   Analysis of the efficiency of farmers' cooperatives

2.1   Data source

The data used in this study is mainly obtained through a combination of questionnaire survey and field visits. Through direct visits, the cooperative leaders and members are exchanged and interviewed. With the guidance and help of researchers, Completed the questionnaire. Through the survey of 41 farmers' professional cooperatives in 8 towns and townships in Pengxi County, Suining City, Received 40 Director General questionnaires and 312 were recovered, of which 280 were valid, with 89.7% effective rate. The data used in this paper are obtained from field survey, true and effective, and have certain research significance.

2.2   Research Assumptions

Throughout the research on the causes of the difference in the efficiency of cooperatives, scholars mostly analyze the impact on the efficiency of farmers' professional cooperatives from the perspectives of the internal governance, director capacity, and the level of human capital of members. the internal organizational structure and system design of cooperatives, human capital, and external supervision mechanism[9] . but most of them analyze from a single perspective. This paper focuses on the leadership of managers, From the perspective of human capital of members, resource endowment of cooperatives, and internal governance of cooperatives, we comprehensively analyze the potential possibility that may affect the operation efficiency of cooperatives, and make the following assumptions:

Hypothesis 1: The leadership ability of managers has an impact on the operation efficiency of cooperatives

Herbel studied the chairman and scale of farmers' professional cooperatives. He mentioned that the cultural level and management ability of the chairman of cooperatives have a significant impact on the performance of cooperatives[10]. An excellent leader can provide effective guidance for the enterprise in management, decision-making, production, and operation, and comprehensively improve the enterprise's operating efficiency.

Hypothesis 2: The human capital of members has an impact on the operation efficiency of cooperatives

From the perspective of human capital, human capital is the sum of employees' knowledge, technical ability and other quality levels [11]. The human capital of the "elite" in the countryside is that they either have high prestige or extensive human resources, and these resources are closely related to the production of the cooperative. Their participation can greatly improve the operating efficiency of the cooperative. Therefore, it is of great significance to study the individual ability, family situation and social relationship level of the members for the analysis of the factors affecting the cooperative performance.

Hypothesis 3: Cooperative resource endowment has an impact on cooperative operation efficiency

Cooperatives enable farmers to obtain effective market negotiation power [12]. The scale of the cooperative itself determines its external social status. The larger the scale, the more advantageous it is in the market trading behavior. For example, the better the reputation is, the more financial support can be obtained. The greater the brand influence is, the easier it is to gain market recognition. The superior geographical location can reduce transportation costs and obtain more market information. These cooperatives are caused by their own conditions, which may affect the objective conditions of enterprises' sales, operation and financing, and are also necessary factors to study the efficiency of cooperatives.

Hypothesis 4: The internal governance of cooperatives has an impact on the operational efficiency of cooperatives

The performance of cooperatives is the result of the organic combination and function of internal and external factors and relevant systems, but mainly depends on the

internal institutional arrangements [13]. The relationship trust within the cooperative has a significant impact on the overall performance[14]. The training and exchange within the cooperative is an important part of the internal governance of the cooperative. During the training, the members can communicate with each other, thus promoting the spread of new technologies and knowledge, and also improving the cohesion among the members of the cooperative. Therefore, a good internal governance environment has an important impact on business efficiency.

Based on the above assumptions, the relevant variables determined are as follows table 1:

Table 1. variable table

Variable classification description		Variable classification description	
Leadership of managers	Age of directorsx1	Cooperative resource endowment	Cooperative levelx14
	Director registered residencex2		Years of establishmentx15
	Director's degreex3		Number of directorsx16
	Monthly income of directorsx4		Number of membersx17
	Membership outside the cooperativex5		Distance from high speedx18 management modelx19
			Is there a brandx20
			Services provided by cooperativesx21
Human capital of members	Membership agex6	Internal governance of cooperatives	Number of trainingx22
	Genderof membersx7		Number of traineesx23
	Membership educationx8		Number of meetings per yearx24
	Number of family membersx9		Membershipx25
	Maximum education level of family membersx10		
	Whether the members are collected by the cooperativex11		
	external income x12		
	Proportion ofnon-agricultural income x13		

Table 2. Tobit regression results

term	technical efficiency		Scale efficiency		Comprehensive efficiency	
	regression coefficient	P value	regression coefficient	P value	regression coefficient	P value
intercept	-1.053	0.185	-0.155	0.702	-1.678	0.054
Age of directorsx1	0.013	0.019	0.005	0.121	0.016	0.012
Director registered residencex2	-0.342	0.007	-0.013	0.837	-0.312	0.024
Director's degreex3	0.057	0.326	-0.001	0.974	0.057	0.374
Monthly income of directorsx4	0.012	0.790	0.037	0.114	0.037	0.469
Membership outside the cooperativex5	-0.038	0.678	-0.117	0.012	-0.150	0.131
Membership agex6	0.024	0.008	0.006	0.163	0.026	0.007
Genderof membersx7	-0.041	0.750	-0.034	0.601	-0.109	0.438
Membership educationx8	0.133	0.182	0.128	0.012	0.235	0.031
Number of family membersx9	0.129	0.003	0.064	0.003	0.171	0.000
Maximum education level of family membersx10	0.059	0.232	-0.023	0.363	0.021	0.696
Whether the members are collected by the cooperativex11	-0.481	0.005	0.165	0.057	-0.376	0.043
external incomex12	-0.000	0.000	-0.000	0.976	-0.000	0.000
Proportion ofnon-agricultural incomex13	0.072	0.034	0.032	0.063	0.087	0.018
Cooperative levelx14	-0.017	0.754	-0.047	0.083	-0.046	0.434
Years of establishmentx15	-0.034	0.111	0.037	0.001	0.005	0.824
Number of directorsx16	-0.003	0.898	-0.014	0.272	-0.013	0.618
Number of membersx17	-0.004	0.000	0.001	0.010	-0.003	0.001
Distance from high speedx18	-0.037	0.000	-0.021	0.000	-0.054	0.000
management modelx19	-0.162	0.135	-0.024	0.669	-0.175	0.140
Is there a brandx20	-0.080	0.337	0.053	0.207	-0.032	0.725
Services provided by cooperativesx21	0.171	0.005	0.006	0.857	0.172	0.010
Number of trainingx22	0.051	0.004	-0.010	0.269	0.032	0.097
Number of traineesx23	0.000	0.013	-0.000	0.001	0.000	0.282
Number of meetings per yearx24	-0.010	0.402	-0.005	0.372	-0.014	0.259
Membershipx25	-0.017	0.852	-0.023	0.620	-0.030	0.761
log(Sigma)	-1.777	0.000	-2.452	0.000	-1.688	0.000

Conclusion from Table 2. For management leadership, the director's age significantly affects the technical efficiency level of cooperatives. the director's registered residence registration has a significant negative impact on technical efficiency, and the director's non cooperative status has a significant negative impact on scale efficiency. For agricultural production, the older farmer leaders, in addition to skilled skills, are

also familiar with local social culture and climate conditions, It can better handle local relations and coordinate production. If the chairman has more social part-time jobs, it may distract him from more energy, which is not conducive to the careful management and operation of the cooperative. because the income from part-time jobs is far greater than that from cooperatives.

From the perspective of human capital of members, the proportion of non-agricultural income, the number of members' families and the age of membersthe can help improve the technical efficiency of cooperatives. whether the members have non-cooperative income has a significant negative impact on technical efficiency. The educational background of members and the number of members' families have a significant positive impact on scale efficiency SE. Membership age, membership education background, membership family population, and the proportion of non-agricultural income will affect the comprehensive benefits OE。 It has a significant positive impact relationship. It can be seen from the above that the higher the individual human capital of the members, the more obvious the improvement of the economic benefits of the cooperative. In addition, the impact of the number of family members is mainly through the social network of individual members indirectly acting on the cooperative. Solve some problems encountered by cooperatives through personal social networks, such as relatives and friends. This situation is also more in line with Chinese rural society.

From the perspective of resource endowment of cooperatives, the type of services provided by cooperatives will have a significant positive impact on the technical efficiency TE. The years of establishment and the number of members will have a significant positive impact on the scale efficiency SE. The geographical distance from the highway intersection is not conducive to the generation of scale efficiency SE. The type of service provided by the cooperative will affect the comprehensive benefits OE. From the above, we can see that the distance from the cooperative to the expressway has a significant impact on the three benefits. The closer it is to the expressway, the more communication costs and transportation costs can be reduced. At the same time, the longer the cooperative has been established, the more members it has, which means that the scale is relatively large and it is easier to form economies of scale benefits. The more types of services provided by cooperatives means the longer the industrial chain of cooperatives, which means that cooperatives have more modern production equipment, which is beneficial to the growth of technical efficiency.

For internal governance: Technical efficiency is affected by the number and number of training sessions for members, and is in direct proportion to it.and the number of trainees will have a significant negative impact on the scale efficiency SE. Enterprise training promotes the internal communication of the enterprise, is conducive to the exchange of technology and the cultivation of feelings, and a good enterprise atmosphere can improve the work efficiency of enterprise employees. Although training can improve the technical efficiency of cooperatives, too much training makes the scale of enterprises insufficient to carry too many technical staff, resulting in the loss of scale efficiency.

3   Conclusion

From the above regression results, we can see that the cooperative's leadership, the human capital of its members, the resource endowment of the cooperative, and the internal governance of the cooperative have a significant positive impact on the cooperative's operating efficiency. Therefore, in the process of the development of cooperatives, we should strengthen the training of the management ability of the cooperative managers, strengthen the training of the skills of the members, properly develop the scale of the cooperatives, expand the overall economic strength of the cooperatives, actively carry out the training within the cooperatives, and coordinate the internal governance of the cooperatives, especially the harmony of the internal interpersonal relationships. Starting from these aspects, we can provide a feasible route for improving the operation efficiency of cooperatives, developing the cooperative economy, increasing the economic income of members and promoting rural revitalization and development.

Funding

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