Game strategy selection of government financial expenditure competition ——Analysis of game model based on Stacklderg game model

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Abstract: The competition of financial expenditure is the game choice between local governments for resources. Analysis of the optimal strategic solution of participants by the game model is to guide the behavior choice of the behavior subject. Using the Stacklderg Game model as the strategic analysis framework. It is believed that in the course of the competition of fiscal expenditure, the choice of the government's behavior subject has the order of successively and has the "predominant advantage". Hence the intensification of fiscal expenditure is competition.

1. Introduction

The reform of fiscal decentralization provides the main guarantee for the local government to exercise independent participants. In order to maximize the interests of the area, compete for the mobile resources and enhance the level of economic growth, local governments develop active financial competition in infrastructure, policy environment and so on. The administrative activities of the government is divided into tax competition and fiscal expenditure competition, but tax incentives gradually from the region to the industry transition, and local government tax policy convergence, financial competition subject to tax competition means the revenue generated is gradually shrinking, the government expenditure adjustment strategy to seek the path. China's resources are limited. What are the strategic choices of local governments when they compete with other regions when they compete for resources and attract mobile elements as independent economies?

2.The summary of government game theory

Game Theory is a new branch of the field of mathematics, to study of the formulaic interactions among the subjects of action. It is used to study the mathematical theories and methods of struggle or competition. Through the optimization strategy analysis of the participants in the game, the behavior of the participants is predicted and the strategy selection of the participants is guided. The game theory model is composed of many elements, such as participation, behavior selection path, information, strategy, income, equilibrium, result and so on[1].

According to the degree of the participants' mastery of information, it is divided into complete information game and incomplete information game. A static game and a dynamic game based on whether the participants are selected at the same time or not. The academic circles pay more attention to the non cooperative game between the participants. The non cooperative participants were selected and analyzed according to the specific model to find the experience of the behavior basis.

Government game theory is different from individual game and enterprise game. It is to play the local government as the main body of behavior, and play the strategy game with the central government and other local governments with the identity of the main body of behavior. The optimal choice of the participants in the government game theory is the balanced development of regional economy and society.

3.The premise of government game theory

The traditional central government is highly centralized in terms of rights. Under the hierarchy of administrative system, the local government has small decision-making power in economic development, and the enthusiasm of participating in economic construction is insufficient. The reform of decentralization, which is characterized by the decentralization of the central government, breaks the relationship between the original central government and the local government. The central government more assumes the role of macro control, devolution part of the rights to local governments, so that local governments have independent participant status in economic development. t has the right to optimize the allocation of resources in the area, and also forms the competition pattern between the local government and the central government, the local government and the local government.

The "camp to increase" has changed the financial dependence of the local government and the central government, and changed from relative independence to excessive dependence. The competition between the local governments around the central government is becoming increasingly fierce. Therefore, economic construction and social development should be overly dependent on financial subsidies and transfer payments by the central government, which aggravates the economic relations between local governments. Based on this, the local government in order to compete for more resources, active financial expenditure structure, attract related preferential policies. The entrust of local government participants, the relative reliance on the central government and the competitive relationship between the governments at the same level stimulate the initiative and participation of local governments in actively investing in the economy. With the expansion of the economic autonomy of local governments, the status and role of the main participants have been further promoted, and the interests and rights of local governments have also expanded rapidly.

4.Model element setting

4.1 Participants

The local government is a participant, N=1，2，3，……，i，……n, i∈N, it is called a participant. In this article, the participants are the leader's behavior subject 1 and the followers' behavior subject 2.

4.2The order of action of the participants

The actions of leaders and followers are in sequence. The follower chooses the action after observing the effect of the leader. The difference in sequence gives the participants different positions and different effects.

4.3Information mastered by a participant

The followers choose to choose according to the leader's action. The information of policy environment, the resources of fiscal expenditure and competition and so on are all fully controlled by participants. Therefore, participants' information when they choose actions is complete information.

4.4Payment function

Set U as a payment set, U：T→Rn,U(t)=(u1(t), u2(t)，……，un(t)), ∀t∈T，A path from d0 to t. There will be any such path that corresponds to the action combination of the people in the Bureau, so the payment function can be considered as a function of the action combination. Ui (t) represents the payment value of the participant i under this action[1].

5.Model building

Assuming participant1 and participant 2 as two oligopolies of public goods and public services on the market. Behavior1 is the leader who first enters the market, invest in financial expenditure product s1[2]. The behavior 2 is the follower. After observing the local government invested in the

financial expenditure product s1, it also enters the market to invest in the financial expenditure product s2. The strategy s2 of the behavior 2 is selected according to the strategy selection of the behavior subject 1. But behavior 1 cannot choose according to the strategy choice of the 2 of the behavior subject. So the strategy of the behavior 2 is the function from s1 to s2，s1=[0，S]，s2=[0，S]. The competitive benefit function of local government i(i=1,2) is obtained[3].

$\pi_i(s_j,s_i)=P(S)-C_i(q_i),i=1,j=2$ (1)

In the upper form, S=s1+s2 is the product of all fiscal expenditure, assuming that s is the fiscal expenditure product of the competitive market, then P (S) is the price function, and $C_i(q_i)$ is the cost function of the i(i=1, 2) of the local government. C is a convex function.

The backward regression solution of this game is calculated by the backstepping method. Under the behavior 1 fiscal expenditure product is s1, to study the behavior 2 financial expenditure products.

The financial expenditure product s2=s2 (s1), which is invested by the behavior 2, the maximized profit function is π2 (s1, s2). According to the formula (1), the maximum competitive benefit of the behavior subject 2 is calculated, as follow:

$\max_{s2} \pi 2(s1,s2) = P(s1+s2) - C2(s2)$ (2)

Since π2 (s1, s2) is a concave function of s2, the 1 order condition is a sufficient and necessary condition for the maximization of π2.

$\frac{\partial \pi_2（s_1，s_2）}{\partial s_2}=0$

P（s1+s2）+P’(s1+s2)s2-C2’(s2)=0

The competitive benefit of the behavior 2 is solved,

s2(s1)=$\frac{1}{2}$(a-s1-C2)

Suppose s1<a-c, s2 (s1) is when the financial expenditure product of the behavior 1 is s1, the actual choice of the behavior 2 is the reflection function s2=s2 (s1) on the behavior subject 1.

The behavior 1 expects that the reflection function of the behavior subject 2 is s2=s2 (s1). In order to maximize the profit of behavior 1’s own, the profit of behavior 1 is,

$\max_{s1} \pi 1(s1,s2（s1）) = P(s1+s2(s1)) - C1(s1)$

P（s1+s2（s1））+(P’(s1+s2(s1))(1+s2’(s1))s1-C1’(s1)=0

s1=$\frac{1}{2}(a-c)$ (3)

Bring s1=1/2 (A-C) into s2 (s1) and get it,

s2=s2(s1)=$\frac{1}{4}(a-c)$ (4)

When C1=C2=C, the two equilibrium results are s1= (a-C) /2, s2= (a-C) /4, and we can calculate the competitive revenue of the behavior 1,π1= (a-C) ^{2}/8, the competitive income of the behavior 2, π2=（a-C）^{2}/16, and therefore theπ1>π2.

6.Conclusion

From the above results, we can see that the behavior 1 is the first action, so the behavior 1 has the advantage of first move, that is to say, in game, the first person to take action is more than the latter. Therefore, in the process of local government's fiscal expenditure competition, local governments are competing for the game strategy first, so as to make the area more competitive and attract the elements of mobility.

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