

# *Research on Delocalization of Ethnic Villages Based on Evolutionary Game Analysis*

Wanqing Lv\*, Yijie Wang, Yi Zhang

School of Business and Tourism Management  
Yunnan University  
Kunming, China

**Abstract**—“Delocalization” has been a serious problem in tourism development. For solving the phenomenon, this paper established an Evolutionary Game Model which includes local governments and tourism enterprises. Based on the assumption of Bounded Rational Hypothesis, this research analyzes the decision-making basis and behavioral game of each subject in the evolution of the localization problem of ethnic villages. And further, using replicated dynamic equations, discusses some factors effecting the behavior of the main body by analyzing stability of the equilibrium point in the system. The result shows that local government’s strategic choice plays a vital role in the Evolutionary Game Model and relates to the strategic choices among Tourism Companies. In additional, punitive incentives can have more influence on the behavior of the Game Subjects and play an important role in the stability evolution of the model. Finally, the social forces represented by tourists and public have a certain impact on the stability of system evolutions.

**Keywords**—*Ethnic Villages; Delocalization; Game Theory*

## I. INTRODUCTION

Nowadays, tourism has played an important role in the development of Ethnic Villages, but at the same time, the problem of “De-localization” brought by tourism to Ethnic Villages has gradually become prominent. As a carrier of national culture, Ethnic Villages played an important role in the inheritance of national culture. The problem of De-localization of Ethnic Villages has a great impact on the protection and inheritance of national culture. Therefore, the research on the delocalization of tourist destinations in ethnic villages has strong urgency and practical significance.

However, for local governments and tourism enterprises, they should consider whether maintaining localization is in line with the pursuit of maximization of development. Therefore, the game analysis of the behavior of the local government and tourism enterprises is necessary. For solving “Delocalization”, this paper constructs the evolutionary game theory model to discuss the solution to the problem of delocalization in the tourism development of ethnic villages.

## II. BACKGROUND

The theory of “Delocalization” originated in 1990s, Heyman used Delocalization to describe the phenomenon that

local traditional culture and materials were actually replaced by foreign standardized products and lose locality in the process of destruction [1]. Heyman’s Delocalization Theory shows that the modernization and standardization of regional space was the problem of delocalization. As a product of modernization, tourism was bound to promote the elimination of local characteristics when it was developing [2]. Wood believes that Modern Tourism was developed on the basis of local characteristics, but it has to lead the disappearance of local characteristics, namely: The Paradox of Homogenization [3].

The academic research on the contradiction between tourism development and De-localization began in the 20<sup>th</sup> century. In the 1990s, Auge proposed the conception of “non-place” based on the “placelessness” theory. In this theory, Auge describes an over-existing site with homogenous landscape and single function formed in tourism development [4]. In this place, the locality of the geographical has been eliminated, becoming a homogenous and standardized space.

For the problem of delocalization of tourist destinations, the academic community generally believes that the solution to the problem of localization of tourism destinations can be achieved by guiding the behavior of core tourism stakeholders [5-8]. In addition, local governments and tourism enterprises, as the main core of tourism interests, have an important role in the solution of the problem of localization tourism destinations [9-11]. Therefore, exploring the game process between local governments and tourism enterprises, and making “Local Protection” consistent with their interest appeals, was the fundamental method to solve the problem of De-localization of Ethnic Tourism. However, from the existing literatures, the research on the localization of tourism destinations in the academia were generally based on a static, single perspective to study the implementation of tourism policies, and rarely from dynamic and evolutionary multi-party Game analysis. In addition, static and unilateral perspective research was difficult to fully understand the problem of “De-localization” caused by multi-party interests in the tourism development process.

Therefore, based on the Evolutionary Game Theory, this paper constructs a replication dynamic model of local government and tourism enterprises to analyze the evolutionary game behavior of the two parties. In this way, we study the game activities of tourism interest subjects in the

---

The work described in this paper was fully supported by the National Natural Science Foundation of China (No. 71663061)

tourism development of Ethnic Villages and provide ideas for the mitigation of the problem of “De-location” in the Ethnic Villages.

III. THEORY HYPOTHESIS AND GAME MODEL

A. Theory Hypothesis

Based on the Ethnic village tourism development, this paper makes the following assumptions about the Game behavior of government and tourism enterprises:

- Local Governments and Tourism Enterprises respectively represent two interest groups. The individual’s strategic space is the same, and the decision-making process of the parties will affect each other and eventually reach Equilibrium.
- Based on the Bounded Rationality Assumption, local governments and tourism enterprises are all bounded rational subjects, and the information for both sides are not completed.
- Local Governments were the main force of supervision and guidance in the process of tourism development. The strategies set were  $T_1 = \{ \alpha_1 \text{ Supervisions, } \alpha_2 \text{ Non-Supervisions} \}$ . In the sets of  $T_1$ , the probability of Local Governments adopting “Regulatory” and “Non-Regulatory” were  $x$  and  $1 - x$  respectively.
- The strategy sets of Tourism Enterprises was  $T_2 = \{ \beta_1 \text{ Protection, } \beta_2 \text{ Non-Protection} \}$ . In the sets of  $T_2$ , the probability of Tourism Companies adopting “Protection” and “Non-Protection” were  $y$  and  $1 - y$  respectively.

B. Parametric Hypothesis

Based on the model hypothesis, the Parameters of the model as follows:

1.) Local Governments

$O$  Local Governments’ supervise costs

$A$  The subsidy of the Local Governments when it supervision

$B$  The punishment for the Local Governments to choose the “Non-Protection” strategy Tourism Enterprise

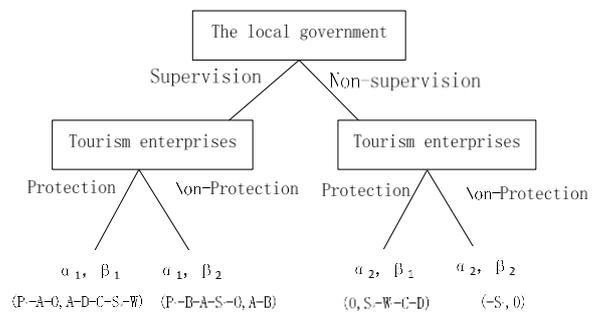


Fig. 1. Research model

$S_1$  The loss to the governments when the Tourism Enterprise chooses the “Non-Protection” strategy

$P_1$  The social benefit brought by the public and praise when the Local Governments chooses “Supervisions”

2.) Tourism Enterprises

$C$  The costs for Protecting the Ethnic Village’ material assets when choosing the “Protection” strategy for Tourism Enterprises

$D$  The costs for Protecting the Ethnic Village’ traditional culture when choosing the “Protection” strategy for Tourism Enterprises

$S_2$  The social reputation gained by Tourism Enterprises when they choose the “Protection” strategy

$W_1$  The economic benefits which comes from the customer’s satisfaction with the Ethnic Village because the true cultural needs of tourists are satisfied when the Tourism Enterprises choose the “Protection” strategy.

Based on Model and Parametric Hypothesis, this paper constructs the Game Model which includes Local Governments and Tourism Enterprises. Fig1 presents our research model.

Based on figure 1, in this section, we analyzes the dynamic Game process of Local Governments and Tourism Enterprises.

C. Local Governments Strategies’ selections Analysis

Let’s assume that the Expected Return when the Local Governments chooses the “Supervision” is  $U_{x1}$ , then the “Non-Supervision” is  $U_{x2}$ . The Average Expected Return is  $\bar{U}_x$ , then there is:

$$U_{x1} = P_1 + B - A - S_1 - O + y(S_1 - B) \tag{1}$$

$$U_{x2} = y(0) + (1 - y)(-S_1) = (y - 1)S_1 \tag{2}$$

$$\bar{U}_x = xU_{x1} + (1 - x)U_{x2} \tag{3}$$

According to equations (1) -(3), the replication dynamic equations of Local Governments behavior strategies are:

$$F(x) = dx / dt = x(1 - x)(P_1 + B - A - O - yB) \tag{4}$$

$$dF(x) / dx = (1 - 2x)(P_1 + B - A - O - yB) \quad (5)$$

It can be known from the ordinary differential equations: If  $x$  is an evolutionary stability strategy, there are:  $F(x) = 0$  and  $dF(x) / dx < 0$ . Combining equations (4) and (5) to solve the problem, then:

(a) When  $y = (P_1 + B - A - O) / B$  and  $F(x) = 0$ , then the results of  $dF(x) / dx$  always are zero. Therefore, regardless of the choice of "Supervisions" or "Non-Supervisions", Local Governments will always be in equilibrium.

(b) When  $y \neq (P_1 + B - A - O) / B$ , if  $F(x) = 0$ , then  $x = 1$  or  $x = 0$ . In this case, to reach the equilibrium, the notation of  $dF(x) / dx$  needs to be discussed.

In reality, when Governments adopts "Supervisions", the economic penalties  $B$  generally greater than the subsidies  $A$  for Tourism Enterprises. At this time, if  $P_1 > 0$ , that is, the social benefits obtained by Local Governments "Supervisions" are greater than the costs, therefore, there are always have  $P_1 + B - A - O > 0$ , then:

1) When  $y > (P_1 + B - A - O) / B$ , there are  $\left. \frac{dF(x)}{dx} \right|_{x=1} > 0$  and  $\left. \frac{dF(x)}{dx} \right|_{x=0} < 0$ . Therefore,  $x = 0$  are the equilibrium point.

2) When  $y < (P_1 + B - A - O) / B$ , there are  $\left. \frac{dF(x)}{dx} \right|_{x=1} < 0$  and  $\left. \frac{dF(x)}{dx} \right|_{x=0} > 0$ . Therefore,  $x = 1$  are the equilibrium point.

In contrast, if  $P_1 + B - A - O < 0$ , that is, local governments costs are too large, then,  $(P_1 + B - A - O) / B < 0$ . However, the probability that Tourism Enterprises choose a Protection are  $0 \leq y \leq 1$ . Therefore, when  $(P_1 + B - A - O) / B < 0$ , there are always exists  $y > (P_1 + B - A - O) / B$ . At this time,  $\left. \frac{dF(x)}{dx} \right|_{x=1} > 0$  and  $\left. \frac{dF(x)}{dx} \right|_{x=0} < 0$ . Therefore,  $x = 1$  are the equilibrium point.

**D. Tourism Enterprises Strategies' selections Analysis**

Let's assume that the Expected Return when the Tourism Enterprises chooses the "Protection" is  $U_{Y1}$ , then the "Non-protection" is  $U_{Y2}$ . The Average Expected Return is  $\bar{U}_Y$ , then there is:

$$U_{Y1} = xA + S_2 + W_1 - C - D \quad (6)$$

$$U_{Y2} = x(A - B) = x(A - B) \quad (7)$$

$$\bar{U}_Y = yU_{Y1} + (1 - y)U_{Y2} \quad (8)$$

According to equations (6) -(8), the replication dynamic equations of Tourism Enterprise behavior strategies are:

$$F(y) = dy / dt = y(1 - y)(xB + W_1 + S_2 - C - D) \quad (9)$$

$$dF(y) / dy = (1 - 2y)(xB + W_1 + S_2 - C - D) \quad (10)$$

According to the ordinary differential equation theorem, if  $y$  is an evolutionary stability strategy, there are:  $F(y) = 0$  and  $dF(y) / dy < 0$ . Combining equations (9) and (10) to solve the problem, then:

(a) When  $x = (D + C - W_1 - S_2) / B$  and  $F(y) = 0$ , then the results of  $dF(y) / dy$  always are zero. Therefore, regardless of the choice of "Protection" or "Non-Protection", Tourism Enterprises will always be in equilibrium.

(b) When  $x \neq (D + C - W_1 - S_2) / B$  if  $F(y) = 0$ , then  $y = 1$  or  $y = 0$ . In this case, to reach the equilibrium, the notation of  $dF(y) / dy$  needs to be discussed.

If use  $D + C - W_1 - S_2$  to represent the difference between the total cost of "Protection" and the total Return when the Tourism Enterprises chooses the "Protection" strategy. Then, when  $D + C - W_1 - S_2 < 0$ , there exists  $(D + C - W_1 - S_2) / B < 0$ . Because  $x$  is the probability that Local Governments choose "Supervisions" strategy, the  $x$  is always greater than zero. Therefore, when  $D + C - W_1 - S_2 < 0$ , there must have an inequality:  $x > 0 > (D + C - W_1 - S_2) / B$ . At this time, there are  $\left. \frac{dF(y)}{dy} \right|_{y=0} > 0$  and  $\left. \frac{dF(y)}{dy} \right|_{y=1} < 0$ , so when  $y = 1$  are the equilibrium point.

In contrast, if  $D + C - W_1 - S_2 > 0$ , then there two cases exist: when  $x > \frac{D + C - W_1 - S_2}{B}$ , there are  $\left. \frac{dF(y)}{dy} \right|_{y=1} < 0$  and  $\left. \frac{dF(y)}{dy} \right|_{y=0} > 0$ ; 2.) when  $x < \frac{D + C - W_1 - S_2}{B}$ , there are  $\left. \frac{dF(y)}{dy} \right|_{y=1} > 0$  and  $\left. \frac{dF(y)}{dy} \right|_{y=0} < 0$ . Therefore,  $y = 1$  and  $y = 0$  are the equilibrium point.

**E. Evolutionary Game Analysis**

In order to make the Game between Local Governments and Tourism Enterprises to reach the equilibrium, two conditions must be met: a.  $F(x) = 0$ ; b.  $F(y) = 0$ .

Based on the discriminant method proposed by Friedman, the differential equations were a dynamic description of the subject's behavior, so the stability result of the equilibrium points can be calculated by the Jacobi local stability matrix[12]. Therefore, the corresponding determinant  $Det(J_1)$  and its equation of locus are respectively ( $T_r$ ):

$$Det(J_1) = \begin{vmatrix} \frac{\partial F(x)}{\partial x} & \frac{\partial F(x)}{\partial y} \\ \frac{\partial F(y)}{\partial x} & \frac{\partial F(y)}{\partial y} \end{vmatrix} = (1 - 2x)(P_1 + B - A - O - yB) \bullet (1 - 2y)(xB + W_1 + S_2 - C - D) - x(x - 1)By(1 - y)B \quad (11)$$

$$Tr(J_1) = \frac{\partial F(x)}{\partial x} + \frac{\partial F(y)}{\partial y} = (1 - 2x)(P_1 + B - A - O - yB) + (1 - 2y)(xB + W_1 + S_2 - C - D) \quad (12)$$

According to the Friedman’s Discriminant Method, and based on the equations (11) and (12),  $Det(J_1)$  and  $Tr_1$  can be calculated. (To ensure the generality of the Game analysis, the parameter values assumed in this paper are greater than zero, the specific results are shown in Table1).

From the Table1, when the absence of Governments penalties, the guidance of Governments and Tourism Enterprises’ strategic choices can be only made by adjusting the initial parameters. After joining the Governments punishment (B), the government can significantly impact the strategic choices between two parties. Therefore, governments’ behavior can make the local government play a leading role in the Game process and adjust the punishment  $B$  to guide the behavior of Tourism Enterprises, so that the Game between the two eventually reaches the state of  $ESS_4$  (Supervisions, Protections).

TABLE I. DET( $J_1$ ) AND TR1 RESULTS OF JACOBI MATRIX

equilibrium point	Stability condition	Det	Tr	Result
$ESS_1(0, 0)$	$P_1+B<A+0; W_1+S_2<C+D$	+	-	stable
$ESS_2(0, 1)$	$P_1<A+0; W_1+S_2>C+D$	+	-	stable
$ESS_3(1, 0)$	$P_1+B>A+0; B+W_1+S_2<C+D$	+	-	stable
$ESS_4(1, 1)$	$P_1>A+0; B+W_1+S_2>C+D$	+	-	stable
$ESS_5(x^*, y^*)$	always holds	+	0	stable

**IV. CONCLUSION**

Through the analysis of the constructed Evolutionary Game Model, it’s not difficult find that in the evolution of the De-localization of Tourism destinations in the Ethnic Villages, the choices of Local Governments behavior have played a vital role in solving the problem of localization of Ethnic Villages. At the same time, in the Evolutionary Game Process of Local Governments and Tourism Enterprises, tourists and public behavior will have impact on the evolution and stability of the Game Strategy. Therefore, this paper draws the following conclusions:

Firstly, in the Game of the Evolution of Ethnic Villages, Local Governments should actively play a role of supervisor in the Evolutionary Game. The choice of Local Governments will have an important impact on the strategic choice of Tourism Enterprises. When Governments actively adopt the “Supervision” set, Tourism Enterprises are more likely to select “Protection” choices, and the game results are more stable.

Secondly, as the leading force to solve the problem of De-localization of Tourism areas in Ethnic Villages, the Local Governments should not pay much attention to economic

benefits and avoid cost risks. The Long-term social benefits should be paid attention and adopt a “Supervision” Strategy.

Finally, Social supervision also can ease the problem of delocalization. Public opinions of social public and tourists can obviously promote localization protection of the government and tourism enterprises. On the whole, local government plays a key character in localization protection. And the social public can impact the behavior of Local government and tourism enterprises.

However, there exist some disadvantages in this paper. In the real society, the tourists and public also may influence the outcome of the Game. For example, the evaluation of government policies by experts, and the public discussion about the service promoted by Tourism Enterprises, can affect the final results. Therefore, considering how public behavior will affects the outcome of the Game results that needs to be discussed in the following study.

**REFERENCES**

- [1] Thomas P. Conspicuous Construction: Houses, Consumption and 'Relocalization' in Manambondro, Southeast Madagascar[J]. Journal of the Royal Anthropological Institute, 1998, 4(3):425-446.
- [2] Wang N. Rethinking authentic city in tourism experience[J]. Annals of Tourism, 1999, 26(2):349.
- [3] Wood R E. Caribbean cruise tourism: Globalization at sea[J]. Annals of Tourism Research, 2000,27(2): 345-70.
- [4] Auge M. Non-places: Introduction to An Anthropology of SuperModernity[M]. London: Verso, 1995: 77-79.
- [5] Cole S. Tourism, Culture and Development[M]. Bristol: ChannelView Publications, 2007: 249-250.
- [6] Vereno Brugiatielli .For an Ethical and Integrated Way of Life: From Non-places to Places of Human Interaction[J]. Procedia - Social and Behavioral Sciences, 2016, 223: 58-61.
- [7] Mohammad Reza Mollahoseini Ardakani, Seyyed Mohsen Hashemi. Improvement of GVS RM with Addressing the Interoperability Issues in Global Village[J]. International Journal of Modern Education & Computer Science, 2014(10):21-28.
- [8] Ligu Wang, Yukio Yotsumoto .Conflict in tourism development in rural China[J]. Tourism Management,2019,70:188-200.
- [9] Taher Zaki, Mohamed Salim EL Bazzi, Driss Mammas. An Evolutionary Model for Selecting Relevant Textual Features[J]. International Journal of Modern Education & Computer Science, 2018(11):43-50.
- [10] Vicky Listyaningsih, Ema Utami. “Decision Support System Performance-Based Evaluation of Village Government using AHP and TOPSIS Methods: Secang Sub-district of Magelang Regency as a Case Study” International Journal of Intelligent Systems and Applications (IJISA), Vol.10, No.48, pp.18-28, 2018.
- [11] Shyam Sihare . “Role of m-Banking for Indian Rural Consumers, its Adaptation Strategies, and Challenges: Consumer Behavior Analysis” International Journal of Information Engineering and Electronic Business, Vol.9, No.6, pp.35-42, 2017.
- [12] Ramachandra Rao. Kurada, Karteeka Pavan. Kanadam. A Novel Evolutionary Automatic Data Clustering Algorithm using Teaching-Learning-Based Optimization[J]. International Journal of Modern Education & Computer Science, 2018(5):61-70.