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# Evolutionary Game Analysis of Single Credit Reputation Supervision in E-commerce

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## Abstract

In order to effectively reduce the behavior of e-commerce and purify the e-commerce environment, the problems of third-party e-commerce platform and merchants in e-commerce in China are analyzed. Based on the theory of platform self - organization, the model finds that the dynamic evolution of single-brush behavior has roughly gone through four stages, which is the result of the combination of platform self-organization and environment selection, and is the joint effect of internal and external dynamics. Finally, the model is simulated by MATLAB programming, and the simulation results verify that the changes of different parameters correspond to different evolution equilibrium. The model results show that ensuring the healthy development of e-commerce is the joint responsibility of government, platform and enterprise. We should attach importance to the important role of government behavior in avoiding stage confusion during the evolution of the platform, improve legislation and strengthen supervision. Strengthen the implementation of the main responsibility of the platform and encourage businessmen to be autonomous.

## Keywords

E-Commerce, Click Farming, Evolutionary Game Theory, Self-Organization.

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## 1. Introduction

With the rapid development of the Internet, online shopping, a new way of shopping, makes our life more convenient. In recent years, the continuous growth of e-commerce market volume and the popularity of consumer online shopping has further promoted the development of e-commerce<sup>[1]</sup>. After the popularity of online shopping, there are many online shop operators selling homogenous goods, and each business has driven the competition. When the purchaser chooses to purchase the product, in addition to prioritizing the price, quality and details of the product, it will also consider its trading volume and comments. Therefore, when there is no difference in other conditions, when the keyword is searched for a product, the top ranked is the store with higher credit, larger transaction volume, and more favorable comments<sup>[2]</sup>. However, the amount of praise and the volume of transactions are not accumulated in a short period of time, so there is a professional "brushing" career<sup>[3]</sup>. The brush list is the economic rational choice of the operators under the market game, and is also the network platform interest analysis. The connivance is the result of consumer information decision-making free ride<sup>[4]</sup>. Brushing a certain product can enhance the effective exposure of the product to a certain extent, attract more consumers' attention, and increase the exposure of other products in the store and increase sales<sup>[5]</sup>.

How to achieve effective supervision of the brushing behavior is an urgent problem to be solved. Literature [6] and [7] based on empirical research to analyze the phenomenon of brushing, the impact

on consumers and governance strategies. Some of the literature [8] and [9] analyzed the legal responsibility of the bill from the perspective of legal norms. Literature [10] to [12] used big data to analyze the phenomenon of dishonesty in e-commerce, and did not further verify the model. In [13], in the face of brushing behavior, the method of detecting the behavior of the brush is designed, and how to improve the brushing phenomenon is not explained.

In view of the above-mentioned scholars' lack of research, this paper further studies the problem of brushing, uses the evolutionary game wheel model to analyze the evolution mechanism of the single merchant and platform, and based on the platform self-organization theory, studies the dynamic mechanism of the evolution of the single-credit supervision. It is concluded that its dynamic evolution is the result of the combination of platform self-organization and environmental choice, and it is the combined effect of endogenous power and external dynamics. This paper also introduces the situation of legal constraints and analyzes the influencing factors of strategic choices between the two sides of the game.

## 2. Evolutionary game model

### 2.1 The establishment of evolutionary game model

Evolutionary game theory mainly obtains an equilibrium stability (ESS) by analyzing the behavior of relevant decision-making bodies<sup>[14]</sup>. According to Akerlof's research conclusions, "government intervention can promote the improvement of the income of all participants in economic relations, and thus the efficiency of the whole society"<sup>[15]</sup>. The judicial department pursued the main responsibility of the single merchant. Specifically, Taobao is a new type of unfair network competition. The judicial department punishes merchants according to the degree of bad influence caused by the merchants, mainly giving warnings such as warnings, sales restrictions, and industry exposure. Here, suppose that the punishment of the judicial department for the single-sale merchant is E, and the administrative department for industry and commerce checks whether the platform strictly monitors whether the merchant has swiped the bill. When the platform is not strictly supervised, the administrative department of industry and commerce will have fewer political benefits for its assessment results, and the administrative department of industry and commerce will impose penalties on the platform, such as interviews and industry criticism. Here, it is assumed that the penalty for the business administration department not strictly supervising the platform is F.

The basic symbols and definitions are as follows:

Table 1 The list of symbols

Symbol or variable	Meaning
$\pi_1$	Business income when the platform is not supervised and the merchants do not pay the bill
$\pi_2$	The platform revenue when platform is not supervised and the merchant does not brush the order
$C_1$	Merchant billing cost
$C_2$	Platform supervision cost
$\alpha_1$	Merchant bill yield
$\alpha_2$	The influence of merchants on the platform
$\beta_1$	Platform supervision affects its own revenue
$\beta_2$	Platform monitoring impact on merchants
E	Punishment of the judicial department on the single merchant
F	Punishment by the administration of industry and commerce for not strictly supervising the platform

The model assumes:

Setting 1: On the e-commerce platform, in order to increase sales and popularity, improve their product image, and attract more consumers to buy, they will perform the billing behavior. Here, it is assumed that these billing behaviors are Brush praise.

Setting 2: The platform can use the previous sales related data of the merchant to evaluate and predict the merchant’s ability, and at the same time, rating the merchant, the platform can monitor whether the merchant sweeps the bill, and both players can have each other and their own capabilities. Clear understanding.

Setting 3: When the merchant’s bill is found by the judicial department, the penalty is E; when the platform is not strictly supervised, the industrial and commercial administration department checks that the penalty is F.

Setting 4: When the platform is not supervised and the merchant does not stamp the order, the revenue of the merchant and the platform is assumed to be  $\pi_1$ , respectively  $\pi_2 - F$ , and  $\pi_1 > 0, \pi_2 > 0$ .

Setting 5: When the merchant performs the billing, the merchant pays the cost  $c_1$ . When the platform monitors, the platform pays the cost from  $c_2$ , and  $c_1 > 0, c_2 > 0$ .

Setting 6: When the merchant does not brush the order, the platform supervises the cost to  $c_2$ , the platform supervision affects the profit of  $\beta_1$ , and the influence on the merchant is  $\beta_2$ , and the indirect benefit obtained by the merchant is  $\pi_2 + \beta_1 c_2 - c_2$ .

Setting 7: When the merchant swipes the order, the cost is  $c_1$ , the platform does not supervise it, the merchant’s bill has an impact on its own rate of return is  $\alpha_1$ , and the impact on the platform is  $\alpha_2$ , the direct income obtained by the merchant is  $\pi_1 + \alpha_1 c_1 - c_1 - E$ , The indirect benefits obtained by the platform are  $\pi_2 + \alpha_2 c_1 - F$ .

Setting 8: When the merchant swipes the order, the cost is  $c_1$ , the platform supervises the cost as  $c_2$ , the merchant’s bill has the effect on its own rate of return is  $\alpha_1$ , and the impact on the platform is  $\alpha_2$ , the influence of platform supervision on its own revenue  $\beta_1$ , the impact on the business is  $\beta_2$ , the two sides will not only directly benefit from their own behavior, but also indirectly benefit from the other party’s behavior. Business and platform revenue separately  $\pi_1 + \alpha_1 c_1 + \beta_2 c_2 - c_1 - E, \pi_2 + \alpha_2 c_1 + \beta_1 c_2 - c_2$ .

You can get the income matrix of the merchant and platform as follows:

Table 2 Income matrix of both sides of the game

platform Merchant	Supervision	Unsupervised
Click farm	$(\pi_1 + \alpha_1 c_1 + \beta_2 c_2 - c_1 - E, \pi_2 + \alpha_2 c_1 + \beta_1 c_2 - c_2)$	$(\pi_1 + \alpha_1 c_1 - c_1 - E, \pi_2 + \alpha_2 c_1 - F)$
Not click farm	$(\pi_1 + \beta_2 c_2, \pi_2 + \beta_1 c_2 - c_2)$	$(\pi_1, \pi_2 - F)$

### 2.2 Evolutionary strategy

Let x be the probability that the merchant will brush the order, and y is the probability that the platform will supervise. According to the applicability formula for the merchant:

The applicability of choosing to perform a billing behavior is:

$$U_A^1 = y(\pi_1 + \alpha_1 c_1 + \beta_2 c_2 - c_1 - E) + (1 - y) (\pi_1 + \alpha_1 c_1 - c_1 - E) \tag{1}$$

The applicability of choosing not to perform the billing behavior is:

$$U_A^2 = y(\pi_1 + \beta_2 c_2) + (1 - y) \pi_1 \tag{2}$$

Therefore, the average applicability of merchant participants is:

$$\overline{U}_A = x U_A^1 + (1 - x) U_A^2 \tag{3}$$

The dynamic equation of replication for merchant participants is:

$$F(x) = \frac{dx}{dt} = x(U_A^1 - \overline{U}_A) = x(1 - x)(U_A^1 - U_A^2) = x(1 - x)(\alpha_1 c_1 - c_1 - E) \tag{4}$$

According to the applicability formula for the platform:

The applicability of choosing to conduct supervisory behavior is:

$$U_B^1 = x(\pi_2 + \alpha_2 c_1 + \beta_1 c_2 - k_1 c_2) + (1 - x)(\pi_2 + \alpha_1 c_1 - c_1) \tag{5}$$

The applicability of choosing not to supervise behavior is:

$$U_B^2 = x(\pi_2 + \alpha_2 c_1 - F) + (1 - x)(\pi_2 - F) \tag{6}$$

Therefore, the average applicability of platform participants is:

$$\overline{U}_B = y U_B^1 + (1 - y) U_B^2 \tag{7}$$

The replication dynamic equation for platform participants is:

$$F(y) = \frac{dy}{dt} = y(U_B^1 - \overline{U}_B) = y(1 - y)(U_B^1 - U_B^2) = y(1 - y)(\beta_1 c_2 - c_2 - F) \tag{8}$$

According to the above formulas (4) and (8), a two-dimensional discrete dynamic system can be obtained:

$$\begin{cases} F(x) = x(1 - x)(\alpha_1 c_1 - c_1 - E) \\ F(y) = y(1 - y)(\beta_1 c_2 - c_2 - F) \end{cases} \tag{9}$$

The evolution of the supervision and billing system of merchants and platforms can be expressed by the above formula. Let  $F(x)=F(y)=0$ , we can get the four local equilibrium points of the system are (0,0), (0,1), (1,0), (1,1). For a population dynamic described by a differential equation system, the stability of the equilibrium point is obtained from the local stability analysis of the Jacobian Matrix obtained by the system. We can get the Jacobian matrix of the above system:  $J = \begin{bmatrix} \partial F(x)/\partial x & \partial F(x)/\partial y \\ \partial F(y)/\partial x & \partial F(y)/\partial y \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$

$$= \begin{bmatrix} (1 - 2x) & (k_1 \alpha_1 c_1 - k_1 c_1 - E) & 0 \\ 0 & (1 - 2y) & (k_2 \beta_1 c_2 - k_2 c_2 - F) \end{bmatrix} \tag{10}$$

If the following two conditions are met at the same time, the equilibrium point of the replication dynamic equation is the evolutionary stability strategy.<sup>[16]</sup>(ESS):

- (1)  $\text{Tr}(J) = a_{11} + a_{22} < 0$ ;
- (2)  $\det(J) = \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11} a_{22} - a_{21} a_{12} > 0$

When the balance point of the replicator's dynamics is an evolutionary equilibrium (evolutionary equilibrium refers to any local asymptotically stable fixed point of the evolutionary dynamic process), it is the evolutionary stability strategy<sup>[17]</sup>.

Table 3 Copy the dynamic balance points corresponding to  $\det(J)$  and  $\text{Tr}(J)$

balance point	$\det(J)$	$\text{Tr}(J)$
$x = 0, y = 0$	$V_1$	$W_1$
$x = 0, y = 1$	$V_2$	$W_2$
$x = 1, y = 0$	$V_3$	$W_3$
$x = 1, y = 1$	$V_4$	$W_4$

$$V_1 = (\alpha_1 c_1 - c_1 - E)(\beta_1 c_2 - c_2 - F), \quad V_2 = -(\alpha_1 c_1 - c_1 - E)(\beta_1 c_2 - c_2 - F), \quad V_3 = (\alpha_1 c_1 - c_1 - E)(\beta_1 c_2 - c_2 - F), \quad V_4 = (\alpha_1 c_1 - c_1 - E)(\beta_1 c_2 - c_2 - F), \quad W_1 =$$

$$(\alpha_1 c_1 - c_1 - E) + (\beta_1 c_2 - c_2 - F) \quad , \quad W_2 = (\alpha_1 c_1 - c_1 - E) - (\beta_1 c_2 - c_2 - F) \quad , \quad W_3 = -(\alpha_1 c_1 - c_1 - E) + (\beta_1 c_2 - c_2 - F) \quad , \quad W_4 = -(\alpha_1 c_1 - c_1 - E) - (\beta_1 c_2 - c_2 - F) \quad .$$

Using the Jacobian matrix to determine whether the equilibrium point is in a locally asymptotically stable state, when the system equilibrium point makes  $\det(J) > 0$  and  $\text{tr}(J) < 0$ , the equilibrium point is in a locally asymptotically stable state, then it is Evolutionary equilibrium. By analyzing the above table, the stability mainly depends on the values of the respective V and W.

Table 4 Results of local asymptotic stability analysis

balance point	Reach stable conditions
$x = 0, y = 0$	$V_1 > 0, W_1 < 0$
$x = 0, y = 1$	$V_2 > 0, W_2 < 0$
$x = 1, y = 0$	$V_3 > 0, W_3 < 0$
$x = 1, y = 1$	$V_4 > 0, W_4 < 0$

According to the above table, the system evolution equilibrium point will depend on the symbols of the two expressions  $(\alpha_1 - 1)(\beta_1 - 1)$  and  $c_1(\alpha_1 - 1) + c_2(\beta_1 - 1)$ . According to the above conditions, there are four cases of positive and negative of these two expression symbols.

Case 1: When  $\alpha_1 > 1, 0 < \beta_1 < 1, (\alpha_1 - 1)(\beta_1 - 1) < 0, c_1(1 - \alpha_1) + c_2(\beta_1 - 1) < 0$ , point (1,0) is the evolution stable point (ESS) (see Table 5). At this time,  $\text{Tr}1(J) < 0, \det(J) > 0$ . The game process between the platform and the merchant is: for the merchant, whether the platform is strictly controlled or not supervised, the merchants choose to pay more for the bill, and at this time, the merchant update tends to increase the profit by swiping the bill; For the platform, regardless of whether the merchant chooses to swipe or not to swipe, the platform chooses to monitor the gains more. At this time, the platform is more inclined not to supervise the entire platform, allowing the merchant to make a single order. Therefore, the evolutionary stability strategy is (single, unsupervised) (see Figure 1). Referring to Bai Jingkun and Wang Jian, "Study on the Self-Organization Formation Mechanism of Platform-Based Enterprises" [18], it can be found that this situation generally occurs in the initial stage of the platform. The platform and the merchants are in a mutual temptation relationship, and they are all in a stage of development from scratch. Platforms and businesses urgently need traffic. The platform hopes to see the problems that the merchants have in the process of development, to improve their own corrections to the platform, and to provide better platform service mechanisms and platform construction. Because the Internet industry has the characteristics of network externality, this network effect arises from the market demand. On this basis, a demand-side economies of scale are formed. As the number of users of a certain product or service increases, the product or service The greater the value, the more it is possible to attract new users to use the product or service, which in turn creates a positive feedback effect on the network. At this point, the merchants unscrupulously attract customers and import traffic for the platform. Both of them passively adapt to social development, find a way out, and seek better development.

Table 5 Equilibrium point stability analysis

balance point	case1			case 2			case 3			case 4		
	DetJ	TrJ	Stable state	DetJ	TrJ	stable state	DetJ	TrJ	stable state	DetJ	TrJ	Stable state
(0,0)	-	uncertain	Saddle point	+	+	unsteady	-	uncertain	Saddle point	+	-	ESS
(0,1)	+	+	unsteady	-	uncertain	Saddle point	+	-	ESS	-	uncertain	Saddle point
(1,0)	+	-	ESS	-	uncertain	Saddle point	+	+	unsteady	-	uncertain	Saddle point
(1,1)	-	uncertain	Saddle point	+	-	ESS	-	uncertain	Saddle point	+	+	unsteady

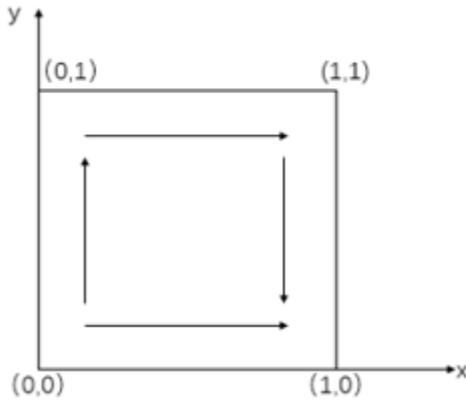


Figure1 Phase change of case 1

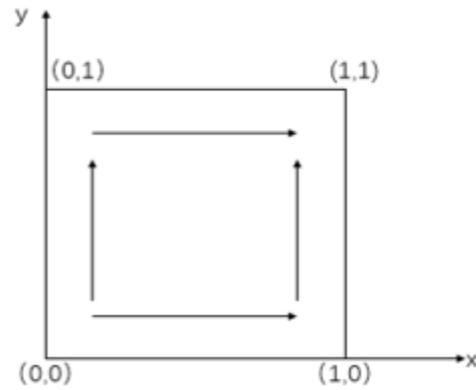


Figure2 Phase change of case 2

Case 2: When  $\alpha_1 c_1 - k_1 c_1 - E > 0$ ,  $\beta_1 c_2 - c_2 - F > 0$ ,  $V_4 > 0$ ,  $W_4 < 0$ . Point (1,1) is the evolution stable point (ESS) (see Table 5). At this time,  $Tr(J) < 0$ ,  $det(J) > 0$ . The game process between the platform and the merchant is: for the merchant, whether the platform is strictly controlled or not supervised, the merchants choose to pay more for the bill, and at this time, the merchant update tends to increase the profit by swiping the bill; For the platform, regardless of whether the merchant chooses to swipe or not to swipe, the platform chooses strict supervision to obtain more benefits. At this time, the platform is more inclined to supervise the entire platform and severely crack down on the single-player behavior. Therefore, the evolutionary stability strategy is (single, supervised) (see Figure 2). With reference to Bai Jingkun and Wang Jian, “Study on the mechanism of self-organization of platform-based enterprises”, it can be found that this situation generally occurs in the stage of platform expansion. At this time, the ecological boundary of e-commerce continues to expand outward, and is derived from consumer demand. The internal functions are not only perfect, but also related to the services. At this stage, the scale of the merchants on the platform is huge and the competition is becoming increasingly fierce. The platform begins to manage all of these businesses. Businesses have a strong influence on the platform, while the platform is weak and can enjoy free rider benefits. Because the platform supervision system is not perfect or the supervision is not enough, there is no way to completely eliminate the brushing behavior.

Case 3: When  $\alpha_1 c_1 - c_1 - E < 0$ ,  $\beta_1 c_2 - c_2 - F > 0$ ,  $V_2 > 0$ ,  $W_2 < 0$ . The point (0, 1) is the evolution stable point (ESS) (see Table 5). At this time,  $Tr(J) < 0$ ,  $det(J) > 0$ . The game process between the platform and the merchant is: for the merchant, whether the platform is strictly controlled or not supervised, the merchant chooses not to get more revenue from the single bill. At this time, the merchant update tends to improve oneself by not brushing the bill. Revenue; for the platform, regardless of whether the merchant chooses to swipe or not, the platform selection supervision gets more benefits. At this time, the platform is more inclined to supervise the entire platform, so that they can get more benefits. Therefore, the evolutionary stability strategy is (not to be single, supervised) (see Figure 3). With reference to Bai Jingkun and Wang Jian, “Study on the mechanism of self-organization of platform-based enterprises”, it can be found that this situation generally occurs in the stage of coordinated development of the platform. The development of the platform has entered a relatively mature stage, and the number of merchants has broken through the critical threshold of the platform. Point, the competition between similar businesses is becoming increasingly fierce, self-organizing clusters and self-service phenomena are becoming more and more obvious, and the growth rate of merchants is slowing down, but the relationship between merchants is more complicated. And the development of the platform has received enough attention from the society. When everyone’s attention is here, the platform and the merchant will unconsciously regulate their behavior. In such a highly competitive environment with limited resources, cooperation brings better collective and personal benefits than competitive energy stocks. Merchants find that their cooperation and competition are equally important. Collaboration avoids vicious competition and complements

resources. Of course, it also helps to improve the overall competitiveness of the entire platform ecosystem.

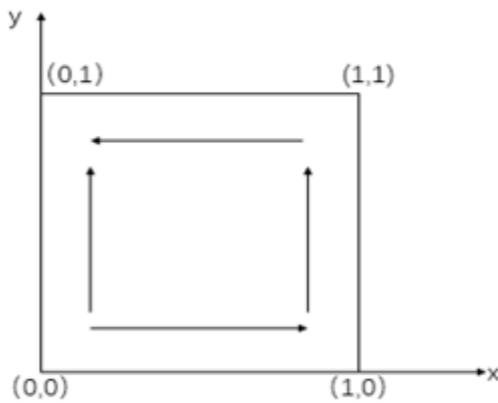


Figure3 Phase change of case 3

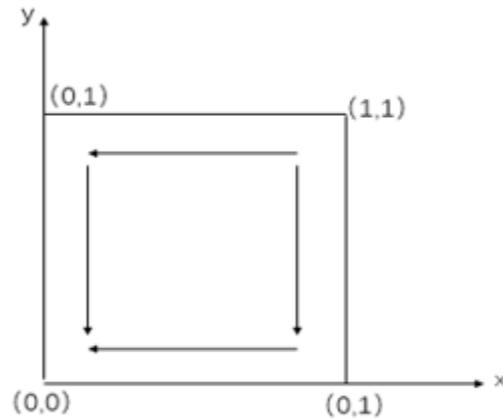


Figure4 Phase change of case 4

Case 4: When  $\alpha_1 c_1 - c_1 - E < 0$ ,  $\beta_1 c_2 - c_2 - F < 0$ ,  $V_1 > 0$ ,  $W_1 < 0$ , point (0,0) is the evolution stable point (ESS) (see Table 5) When  $Tr(J) < 0$ ,  $det(J) > 0$ . The game process between the platform and the merchant is: for the merchant, whether the platform is strictly controlled or not supervised, the merchant chooses not to get more revenue from the single bill. At this time, the merchant update tends to improve oneself by not brushing the bill. Revenue; for the platform, no matter whether the merchant chooses to swipe or not, the platform chooses to monitor the gains more. At this time, the platform prefers not to supervise the entire platform, so that they can get more benefits. Therefore, the evolutionary stability strategy is (not to be single, not supervised) (see Figure 4). Referring to Bai Jingkun and Wang Jian, “Study on the mechanism of self-organization of platform-based enterprises”, it can be found that this situation generally occurs in the evolution stage of platform evolution. When the development of the platform faces changes in external factors such as new government policies, new business models and new technologies, the development of the platform has entered an evolutionary stage. All the populations in the e-commerce ecosystem are undergoing changes and adjustments. I want to survive in the fierce competition and evolve into a new e-commerce system<sup>[19]</sup>.

### 3. Evolutionary game numerical simulation

In order to ensure the correctness of the theoretical results, this paper verifies the equilibrium point of the evolutionary game. The following will use Matlab evolution simulation to verify the equilibrium point. The specific parameters are changed as follows:

(1) : If  $\alpha_1 c_1 - c_1 - E > 0$ ,  $\beta_1 c_2 - c_2 - F < 0$ ,  $V_3 > 0$ ,  $W_3 < 0$ . point (1,0) is Evolutionary stability point (ESS). Hypothesis  $\alpha_1 = 1.5$ ,  $\beta_1 = 1.1$ ,  $c_1 = 1$ ,  $c_2 = 1$ ,  $E=0.3$ ,  $F=0.5$  To meet the above requirements, according to the evolution diagram of the above numerical simulation, as shown in Figure 5, the number of steps in the evolutionary iteration increases, the proportion of supervision of the platform is continuously reduced, and the proportion of merchants’ bills is increasing, and finally the game between the two Equilibrium point is (1,0).

(2) If  $\alpha_1 c_1 - k_1 c_1 - E > 0$ ,  $\beta_1 c_2 - c_2 - F > 0$ ,  $V_4 > 0$ ,  $W_4 < 0$ . Point (1, 1) is the Evolution Stable Point (ESS). Assuming  $\alpha_1=1.2$ ,  $\alpha_1=1.6$ ,  $c_1=2$ ,  $c_2=2$ ,  $E=0.3$ ,  $F=0.3$  satisfy the above conditional requirements, and the evolution diagram according to the above numerical simulation is as shown in Fig. 6: the number of steps in the evolution iteration increases. The proportion of platform supervision and merchants’ bills is increasing, and the game equilibrium point between the two is (1,1).

(3) If  $\alpha_1 c_1 - c_1 - E < 0$ ,  $\beta_1 c_2 - c_2 - F > 0$ ,  $V_2 > 0$ ,  $W_2 < 0$ . Point (0, 1) is the Evolution Stable Point (ESS). Assuming  $\alpha_1=1.1$ ,  $\beta_1=1.5$ ,  $c_1=2$ ,  $c_2=2$ ,  $E=0.5$ ,  $F=0.3$ , satisfying the above conditions, the evolution diagram based on the above numerical simulation is shown in Figure 7 below:

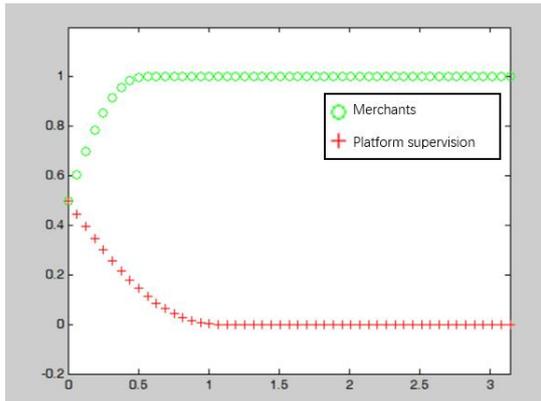


Figure 5 Group 1 numerical evolution simulation

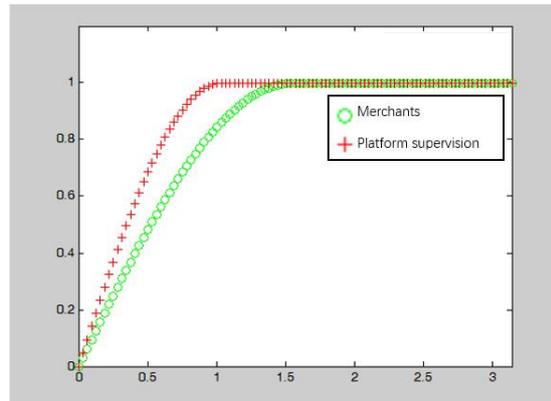


Figure 6 Group 2 numerical evolution simulation

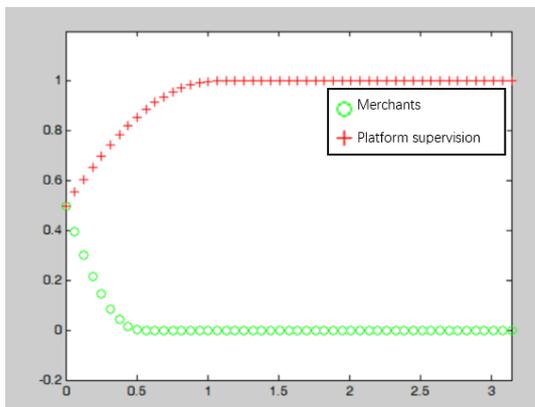


Figure 7 Group 3 numerical evolution simulation

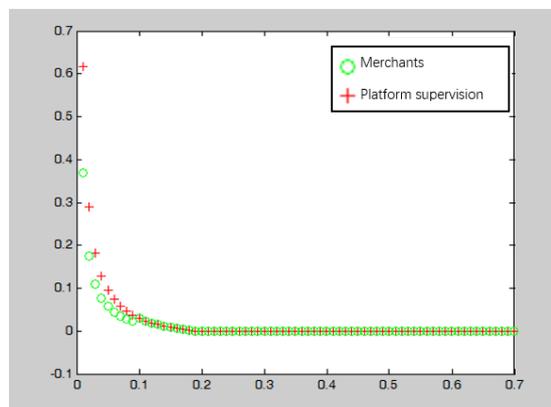


Figure 8 Group 4 numerical evolution simulation

(4) When  $\alpha_1 c_1 - c_1 - E < 0$ ,  $\beta_1 c_2 - c_2 - F < 0$ ,  $V_1 > 0$ ,  $W_1 < 0$ , point (0,0) is the evolution stable point (ESS). Assume that  $\alpha_1=1.1$ ,  $\beta_1=1.1$ ,  $c_1=2$ ,  $c_2=2$ ,  $E=0.5$ ,  $F=0.5$  satisfy the above conditional requirements, and the evolution map according to the above numerical simulation is as shown in Fig. 8 as the number of steps of the evolution iteration increases. The proportion of the platform for supervision and merchants to print orders is decreasing, and the game equilibrium point between the two is (0,0).

## 4. Case analysis

### 4.1 Case Analysis - Brushing Behavior in Alibaba E-commerce Platform

(1) Start-up period: In February 1999, Ma Yun led the entrepreneurial team of 17 people to establish Alibaba Company in Hangzhou apartment. When it was founded, merchants and consumers did not know anything about online shopping. They were more inclined to open entities. Shops and spending in physical stores, not willing to believe in online shopping, Ma Yun and other dozens of founders to take things from their own homes to sell online, and then buy and sell each other, in order to let the public know about this online shopping platform, do not use it Extreme brush flow, let more people know about this platform. At this time, competition and management are chaotic, and there is no concept of coordinated development. In May 2003, Taobao was born. Ma Yun announced that it would continue to implement the free policy and not charge Taobao within three years. The platform will face a lot of competitive pressure in the initial stage, such as eBay’s suppression strategy on Taobao, hinder its development. The platform considered how to attract more merchants and SMEs. At that time, the strategy was to lower the threshold and free of charge, but there was no other management of the settled merchants. In order to attract more traffic and consumers, the newly-invested merchants will perform a large number of billing behaviors.

(2) Expansion period: In 2006, Taobao solemnly introduced the “Lucky Treasures” charging project, which aims to allow merchants to invest a certain amount of advertising fees for their own products, so that their products are ranked in the forefront of Taobao. Taobao suddenly introduced the commodity bidding ranking mechanism, which caused the anger of millions of merchants. The traffic of the platform plummeted. The Taobao platform lost a large number of merchants, and the project ended in failure. The user’s stickiness to the Taobao platform is not high. For sustainable development, the platform should improve the user’s experience, improve user stickiness, and bind users. At this time, Taobao began to manage and control the platform users and build an incubation mechanism. Taobao uses “Small Two” to manage all merchants in an all-round way, so that everyone can share with each other in various aspects such as source management, product photography, promotion operation, logistics management, and customer service transaction security. On October 10, 2010, Taobao decided to upgrade the merchant management system on the platform. The merchant pays a high default margin to the platform. When the business has a breach of contract, the platform can deduct the default bond of 10,000 yuan from the merchant, and the money directly enters the consumer protection fund to protect the consumer’s rights and interests from damage. After the consumer group has been damaged, for example, if you buy fake goods, you can enjoy the compensation of “fake one loses five”. In 2013, Taobao severely cracked down on false brushing behaviors, including means of letting goods off the shelf, lowering the credit rating of merchants, and sealing up stores. During the platform expansion period, the platform provides top-down service and control, which limits merchant autonomy.

(3) Coordination period: In January 2015, the State Administration for Industry and Commerce and the China Consumers Association conducted two quality inspections on the products sold on the e-commerce platform. Through testing, the authenticity rate of Tmall Mall was 85.71%. Taobao only There are 37.25%. Compared with Taobao’s individual operators, Tmall Mall has more business operators such as SMEs. Each brand has good consumer awareness and good product quality assurance and improvement capabilities. In December 2016, the National Development and Reform Commission signed a memorandum of understanding on the promotion of the integrity system in the business sector with Alibaba, and jointly launched a fight against Ali. In June 2017, the judicial organs of our country sentenced the first case of illegal business crimes due to the swipe. The defendant was sentenced to 5 years and 7 months in prison. This case shows the determination of the judiciary to severely crack down on the bills, which is conducive to Strike the brush phenomenon.

During the platform coordination period, the merchants on Tmall Mall are relatively mature, self-organizing clusters and self-service phenomena are increasingly apparent, and merchants will unconsciously regulate their behaviors and try to achieve a win-win result. After the platform retired from the station and decentralized, the merchants began to organize and coordinate. And at this stage, the government joint platform to curb the printing and build a credit system in the business field, Alibaba corporate integrity system will become the infrastructure of the future e-commerce.

## **4.2 Case revelation**

### **4.2.1 The law needs to be further improved**

There are a large number of fakes and false brushing behaviors in the e-commerce market of Taobao platform, which have seriously damaged consumer rights. When the SAIC detected that Taobao’s sales were very serious, the attitude was very clear and unacceptable. In the end, it ended with a handshake with Taobao. It can be seen that the relevant departments have a vague attitude on such a serious problem and the legal procedures are not enough. perfect. China’s long-standing traditional philosophy has made us focus only on the final result of time, and we don’t care how the process happens. Our existing laws only restrict what punishments will be imposed after breaking the law, instead of guiding the public to do so at the beginning. In fact, the law must not only strengthen supervision over the matter, but also strengthen supervision over the situation.

#### 4.2.2 Implementing the main responsibility of the platform

The e-commerce platform is a stakeholder in the behavior of online billing. At the same time, it also holds the main information of the merchant's online transactions. The platform can strengthen the supervision of the authenticity of the merchant's transactions, and at the same time stipulate the penalty rules for the verified billing behavior. Limit the seller's billing behavior. All e-commerce platforms should cooperate with each other. For those businesses that find a single-page behavior on a platform, other platforms should conduct a strict review to jointly build a defense line against the single-player behavior.

#### 4.2.3 Encourage business autonomy

In the system established by the platform, the merchants cannot blindly let the platform promote development, and should be moderately self-governing. Rely on the information provided by the platform to achieve social collaboration between businesses. To a certain extent, there is a close cooperation relationship between merchants and merchants and platforms. Only common development and progress can promote mutual growth and growth. Businesses and businesses have mutual cooperation in marketing, promotion, research and development, design and other aspects, and mutual cooperation to achieve a win-win effect.

#### 4.2.4 Resisting the brush list is the responsibility of the government, enterprises and society

Taobao has done a lot of work in resisting the brushing and counterfeiting. In 2013, Taobao launched the most stringent action against stamps and fakes. In 2014, we launched a more in-depth action with the government. Not long ago, with its cooperation companies through technology innovation, developed a product QR code to identify genuine technology, to avoid consumers buying fakes due to brushing. These measures of the Taobao platform can only alleviate the problems currently faced and cannot be solved fundamentally. Now consumers are not eye-catching, can not accurately identify which are true and true evaluation, which are brushed, there are certain possibilities will be misled to buy unworthy goods. We want to eliminate all efforts and cooperation from the source, and government support is indispensable. The Internet world where e-commerce is located is a virtual world. The government is not perfect in the construction of laws, regulations and systems related to the virtual world. It needs to keep pace with the times and constantly improve. Enterprises need to go hand in hand with the public and the government through the existing data and technology to jointly contribute to the boycott.

## 5. Conclusion

This paper uses evolutionary game theory to analyze the interaction process between e-commerce platform and merchants in the single-single behavior. The research results show that when there are constraints from the judicial department and the industrial and commercial administration department, increase the cost of the merchants to brush the bill, increase the platform supervision cost, and increase the platform supervision. The impact on the income of the merchants and the increase of platform supervision can encourage the merchants to operate in good faith and not to brush the orders; increase the cost of the merchants to brush the bills, increase the impact of the merchants' bills on the platform's revenue, and reduce the platform supervision costs can prompt the platform to supervise the merchants. Improve the penalties imposed by the judiciary on swiping merchants, and reduce the impact of merchants' bills on their own earnings (Make it smaller than  $1 + \frac{E}{k_1 c_1}$ ) Can promote the business integrity management does not brush the order; Improve the punishment of the industrial and commercial administration departments for not strictly supervising the platform, and increase the impact of platform supervision on their own income (Make it larger than  $1 - \frac{F}{k_2 c_2}$ ) can promote the platform to supervise the business.

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