Research on the Interactive Mechanism and Coordinated Development of Evolutionary Game between Dalian Free Trade Zone and Hinterland Economy Based on the Advantage of Port

Mingqiang Xu¹, Dahai Dong¹ and Te Ma²,*

¹School of management, Dalian University of Technology, Dalian, 116600, China
²School of Tourism, Dalian University, Dalian, 116620, China

*Correspondence author email: 717126748@qq.com

Abstract. Dalian Free Trade Zone has realized the development direction of taking service trade as the core, international division of labor as the goal, and new opening strategy as the guidance. However, due to the bottleneck of financial system reform and the limitation of system mechanism and policy, especially the slow pace of reform in the aspects of foreign exchange control, free floating of exchange rate and marketization of interest rate related to the free flow of capital, Dalian's "four centers": economic center, financial center, trade center and shipping center, the pace of construction is limited to a certain extent. It is also difficult to further expand the space for the development of the liberal economy. The competition and cooperation conditions in Liaoning free trade zone are quite different from those in other free trade zones, so this paper makes an in-depth study around Liaoning free trade zone.

Keywords: Free trade zone; Dalian; Liaoning Free Trade Zone.

1. Introduction

With the development of multi polarization, economic globalization, social informatization and cultural diversity, the flow of goods, services, capital, personnel and information is becoming faster and faster, and the free trade zone has become the experimental field of China's reform and opening up. The construction of China's pilot free trade zone (hereinafter referred to as the free trade zone) is a strategic measure for China to comprehensively deepen reform and expand opening-up in the new situation. It shoulders the important mission of accelerating the transformation of government functions, actively exploring innovation in management mode, promoting trade and investment facilitation, and exploring new ways and accumulating new experience for comprehensively deepening reform and expanding opening-up. It is a national strategic need. The construction of the pilot free trade zone with Chinese characteristics mainly covers seven areas, namely, investment system reform, trade facilitation, financial opening and innovation, in process and post-supervision, improving business environment, scientific and technological innovation and serving national strategy. The construction of the pilot free trade zone with Chinese characteristics has gone through five stages so far. In 2013, the state officially approved the establishment of China (Shanghai) pilot Free Trade Zone, which we call the 1.0 era of free trade zone; In September 2018, the State Council officially approved the overall plan of China (Hainan) pilot Free Trade Zone, marking that China's free trade zone has entered the era of 4.0. In August 2019, the state approved six pilot free trade zones, including
Shandong, Jiangsu, Guangxi, Yunnan, Hebei, Heilongjiang, etc., the establishment of Shanghai Lingang New Zone, and the free trade zone entered the era of 5.0.

2. Key Restrictive Factors Related to the Development of Dalian Free Trade Zone and Hinterland

Finance is the core of modern economy. Only the free flow of capital can support the development of trade. Especially in the face of the most competitive competitors from the world, the modern financial system marked by the free flow of capital is the ultimate force to support the continuous development of reform and opening up, and also the key factor to help the construction of Dalian international financial center and even the "four centers". The "central construction" of Dalian's planned construction is closely related to the development of the service industry. In order to become a regional financial, shipping and Trade Center, and finally a regional economic center, it must be based on a high level of modern high-end service industry. Therefore, the construction of Dalian's regional financial center can realize leaping development with the help of the carrier of free trade zone, so as to avoid the lagging development of service industry affecting the improvement of Dalian's competitiveness.

Strengthening the joint development of inland hinterland and Dalian is an important supporting force for building an open economy in Northeast Asia. The construction of Dalian Free Trade Zone cannot do without the market and support provided by the huge economic aggregate in the inland hinterland. In order to realize the convertibility of capital account and the floating of exchange rate, including the marketization of interest rate, which is essential for the reform of financial system, we must rely on the common strength of all relevant departments. Therefore, it is suggested to carry out multi department law enforcement and coordinated management in the free trade zone, aiming at promoting financial innovation, reforming financial management system and promoting the construction of regional financial center, and to formulate financial management system and norms in the free trade zone under the authorization of the state. Strengthen the service and supervision of the financial operation of the free trade zone with local self-discipline and cooperative supervision. To explore the system of law enforcement, local self-discipline and cooperative supervision in the free trade zone can not only provide legal guarantee for the reform of financial management system, but also provide experience in exploring replicable and popularized management system.

3. Find out the Influence of the Interaction Mechanism between Dalian Free Trade Zone and Hinterland Economy

In recent years, the trade in Dalian has increased dramatically, which effectively expands the demand for port transportation industry, and brings good development opportunities. At the same time, the rapid development of the free trade zone can greatly promote the prosperity of international trade and regional economy. Therefore, to coordinate the development of the relationship between the free trade zone and the hinterland economy is of great benefit to the development of national or regional economy. How to rely on the existing economic and technological conditions of the city to achieve self-improvement and self-development, and how to use the portal of the free trade zone to go to the world, so that the free trade zone can be used for the development of Dalian, and the hinterland can be prospered by the free trade zone. The interaction between the two is profound. The free trade zone is essential to promote and promote the economic development of Dalian. The acceleration of the construction of the free trade zone and the enhancement of its functions provide unique conditions and advantages for the rapid economic development of Dalian and the Northeast coastal areas.

The successful experience of the cultural industry development of the mature international free trade zone has a very good reference for Dalian Free Trade Zone to explore its own and hinterland economic industry development characteristics. Although they have their own characteristics, such as agglomeration development mode, free development mode, national development mode and integrated development mode, they have a lot in common, which has profound enlightenment for Dalian to utilize free trade zone and hinterland economic construction and development. The core of economic construction in FTZs and hinterland is system innovation, and international experience reflects the
important direction of its industry development. It is a good opportunity for the construction of the free trade zone to speed up the exploration of the economic connotation of the hinterland.

4. Based on the Evolutionary Game Theory, a Game Relation Model is Constructed Based on the Interaction Mechanism between Dalian Free Trade Zone and Hinterland Economy

First, the participants of both sides of the game are determined, then the behavior strategies that both sides can adopt are determined, and the probability that both sides can adopt various strategies is preset, and finally the specific parameters are determined.

The successful experience of the cultural industry development of the mature international free trade zone has a very good reference for Liaoning free trade zone to explore its own and hinterland economic and industrial development characteristics. Although the modes of agglomeration development mode, free development mode, national development mode and integrated development mode have their own characteristics, they have many common points, which have profound enlightenment for Liaoning Province to utilize free trade zone and hinterland economic construction and development. The core of economic construction in FTZs and hinterland is system innovation, and international experience reflects the important direction of its industry development. It is a good opportunity for the construction of the free trade zone to explore the economic connotation of the hinterland. It is the characteristics of the cultural industry development of the free trade zone in Liaoning Province to summarize the advantages and avoid the disadvantages. Suppose that the relevant variables of free trade zone are as follows.

\[
(-c_1, c_2, -c_3), (-c_1, -c_2, 0), (-c_1 + c_3 + c_4, -c_3), (-c_1 + c_4, 0), (-c_1, -c_2, -c_3), (0, -c_2, 0), \\
(-c_1, 0, c_3), (0, 0, 0)
\]

According to the hypothesis above and game combination strategies, the expected revenue of the regulator is:

\[
\begin{align*}
E_{AT} &= YZ(-c_1 + c_2) \times Y(1-Z)c_1 + (1-Y)Z(-c_1 + c_3 + c_4) \\
& \quad + (1-Y)(1-Z)(-c_1 + c_4) \\
E_{BT} &= XYZ(-c_1 + c_3) - XY(1-Z)c_1 + X(1-Y)Z(-c_1 + c_3 + c_4) \\
& \quad + X(1-Y)(1-Z)(-c_1 + c_4) - (1-X)Zc_3 \\
\end{align*}
\]

(1)

The expected return of tourism enterprises:

\[
\begin{align*}
E_{BR} &= -XZc_2 - X(1-Z)c_2 - (1-X)Zc_2 - (1-X)(1-Z)c_2 \\
& = -[XZ + X(1-Z) + (1-X)Z + (1-X)(1-Z)]c_2 = -c_2 \\
E_{BN} &= -XYZc_2 - XY(1-Z)c_2 - X(1-Y)Zc_2 - X(1-Y)(1-Z)c_2 \\
& \quad - (1-X)YZc_2 - (1-X)Y(1-Z)c_2 \\
& = -Yc_2 - X(1-Y)c_2
\end{align*}
\]

(2)

Expected benefits of users:

\[
\begin{align*}
E_{CN} &= -XYc_2 - X(1-Y)c_2 - (1-X)Yc_2 + (1-X)(1-Y)c_6 \\
& = -[X + (1-X)Y]c_2 + (1-X)(1-Y)c_6 \\
E_{CN} &= -XYZc_2 - X(1-Y)Zc_2 - (1-X)Yc_2 + (1-X)(1-Y)Zc_6 \\
& = -[XYZ + X(1-Y)Z + (1-X)YZ]c_2 + (1-X)(1-Y)Zc_6
\end{align*}
\]

(3)

Users Equilibrium Analysis
a when \( X = 1 \) or \( X = \frac{c_6}{c_6 + c_7} \) \( F(Z) = \frac{dZ}{dt} = Z(E_{CT} - E_{CN}) = -Z(1-Z)c_7 \) \( F(Z) = 0 \) can derive \( Z = 0, Z = 1 \). From \( \frac{dF(Z)}{dZ} = -(1-2Z)c_7, \frac{dF(Z)}{dZ} \mid_{Z<0}<0, \frac{dF(Z)}{dZ} \mid_{Z>0}>0 \), thus \( Z = 0 \) is the stable point. In other words, when regulatory authorities implement supervision, users will choose not to release harmful information.

b when \( c_6/c_6 + c_7 < X < 1 \), \( (1-X)(1-Y)c_6 - (X + Y - XY)c_7 < 0 \), thus \( Z = 0 \) is the stable point.

c when \( 0 < Y < c_6/c_6 + c_7 \) and \( 0 < X < c_6/c_6 + c_7 \), \( (1-X)(1-Y)c_6 - (X + Y - XY)c_7 > 0 \), thus \( Z = 1 \) is the stable point.

5. Conclusions and Recommendations

The development of Dalian Free Trade Zone focuses on revitalizing the old northeast industrial base. In recent years, the GDP of the three eastern provinces has been in a downward state, the economy is lack of vitality, young people continue to flow out, forming a vicious circle. The development goal of Dalian Free Trade Zone is to speed up the reform of market-oriented system and mechanism, actively promote the structural adjustment, and strive to build the pilot free trade zone.

Through the analysis and summary of international excellent free trade zones, we can conclude that their success has the following aspects: preferential tax policies, loose investment environment and policies, sound legal protection, efficient and free management mode. From the published overall plan of Dalian area, these areas are also the main direction of development of Dalian area in the future.

References

[1] Tang Chao. An empirical study on the Evolution of Internet emotion[J]. Intelligence magazine, 2012,31(10):48-52.
[2] Lan Yue is new, Deng Xinyuan. Research on the Evolution Law Model of Network Public opinion of Emergent events[J].Intelligence magazine, 2011,30(8):47-50.
[3] Zhang Qingmin, Wu Jieqiong, Wu Chunmei. A study on the Evolution of Network Public opinion crisis based on Enterprise pollution behavior: a case study of Environmental events[J]. Intelligence magazine, 2012, 31(10)53-58.
[4] Ding F, Ma T. Dynamic relationship between tourism and homogeneity of tourist destinations[J]. IEEE Access, 2018:1-1.
[5] Ma T. Evaluation effect of Internet word of mouth and application of big data[J]. Journal of Physics: Conference Series, 2019.