

# A Coupling Theory Based Empirical Study on the High-tech Trade Enterprises from the Perspective of Financial Supply Side Reform

Yi Lu-xia<sup>1, a</sup>, You Yu-cong<sup>2, b</sup>

<sup>1</sup>Guangzhou College of Business and Technology, China

<sup>2</sup> Guangzhou College of Business and Technology, China

<sup>a</sup>stoneyc@163.com, <sup>b</sup>61070262@qq.com

**Keywords:** supply side reform; coupling theory; foreign trade enterprise; empirical research

**Abstract.** In this paper, the coupling theory is applied to the research on the structural reform of the financial supply side of the high-tech foreign trade enterprises; the coupling relationship between the high-tech foreign trade enterprises and the structural reform of the financial supply side is studied by referring to the cooperative theory in the system theory. By setting up the financial supply curve demand function of the technology-based foreign trade enterprises, this paper studies the coupling mechanism of the structural reform of the financial supply side on the technology-based foreign trade enterprises. Conclusion is drawn with the corresponding suggestions on the three aspects of capital protection, technical provision and risks control.

## 1. Introduction

The theory of "structural reform of the supply side" can be traced back to the famous law of the early 19th century: Say's Law, or the Say's rule, which is widely regarded as the beginning of the supply school. China's development has given birth to the "new supply school" (New Supply Economics), which is a long history of a continuation and development of the logic of verification with the Chinese characteristics of the "new supply school" pragmatic form of the history of economic supply school.

## 2. Literature Review

The history of economic supply school can be traced back to the American economist Arthur Laffer being the representative. Arthur Laffer (1983) proposed "Laffer Curve", which stressed that "the demand in the economy will automatically adapt to the supply changes", that supply determines the connection between supply and demand. Arthur Laffer (1983) stressed that free competition in the market economy of the supply and demand is balanced, putting forward many of the recommendations on the supply side, such as advocating the market economy; encouraging savings and investment; advocating a substantial reduction in tax benefits and insurance, Through the role of mechanisms to eliminate the factors that contribute to the supply of unfavorable factors of production, increased supply; in the financial sector, Arthur Laffer (1983) proposed supply reform to control the currency issue, being against inflation.

"Coupling" is a concept referring to the "two or more than two systems or forms of movement between each other through a variety of interactions and the formation of pairs A mechanism that affects each other." Specifically, it is the interaction between two or more subsystems and the interaction between them. Such as between the two pendulums with a spring, their vibration on each other ups and downs, mutual influence, this interaction is called single pendulum coupling. Similarly, assuming that the object is A and B, the A-B coupling can be defined by the interaction between the A system and the B system by the interaction of the respective coupling elements. According to the "coupling" theory, the "coupling" of the system has three main characteristics: self-organization, synergy and measurability. The "self-organization" of the "coupling" of the system refers to the fact that a subsystem inside the system automatically forms a certain structure or a certain function. When

the external environment changes, under the influence of the system's synergistic effect and its own fluctuation, the system will form a new space-time structure, which leads to its new "coupling" direction of development; system "coupling" has a certain degree of synergy, refers to the system through a variety of internal elements of a collaboration between The internal forces generated by the internal forces can be systematically disorderly state of the orderly transformation into time and space on the function of an orderly state; system "coupling" also has a certain Measurability can be used to reflect the degree of fit between systems by using the "coupling" degree. The system is divided into two variables at the transformation point, namely "slow relaxation variable" and "fast relaxation variable". The "slow relaxation variable" is a kind of order parameter, which determines the fundamental process of system development.

From the current literature review at home and abroad, most scholars agree that resource allocation and efficient optimization of resources are a core of financial, it is to guide a specific industry to improve and optimize the efficiency of a very critical factor. By optimizing the allocation of financial resources can it cultivate new economic growth and build a new economic growth platform. The structural reform of the financial supply side is to start from the economic and financial supply factors, optimize the combination of financial supply elements, promote the production efficiency and quality of financial supply factors, guide and create new financial needs, and promote the sustainable development of the financial industry. However, the current literature rarely conducted from the perspective of structural reform of the supply side to study the development of technology industry or high-tech enterprises and supply side of the structural reform between the existence of a similar system of "coupling" mechanism. This paper discusses how to improve the structural reform strategy of the supply side by implementing the effective reform strategy of the financial supply side and provide a more accurate, scientific and feasible countermeasures for the development of the foreign trade enterprises.

### 2.1 Model Construction

Based on the system theory founded by Bertalanffy of American Austrian biologist, this paper uses the system view to study the objective things and the world, and studies the system characteristics of economic phenomena from different angles and summarizes them. Based on the system theory system, we mainly studied the internal subsystem relationship and the overall function of the system, and constructed the model by Synergetics. Synergetics is proposed by the German physicist Haken (1971) to study the distance from the equilibrium. The open system under certain conditions, how through the time, space and a specific function of a collaborative guide system to interact with each other, mutual cooperation, so that the system from the disorder state to the orderly state of the process of change. Therefore, the system collaborative theory model of this paper constructs the cooperative theory to describe the degree of macroscopic order of the system. The structure and order degree of the system evolution depend on the size of the order parameter. Combined with the coupling effect of the American scholar K. E. Weick, that is, the association and interaction of the subsystems (or between the two or more elements) or between the systems, as shown in Fig1.

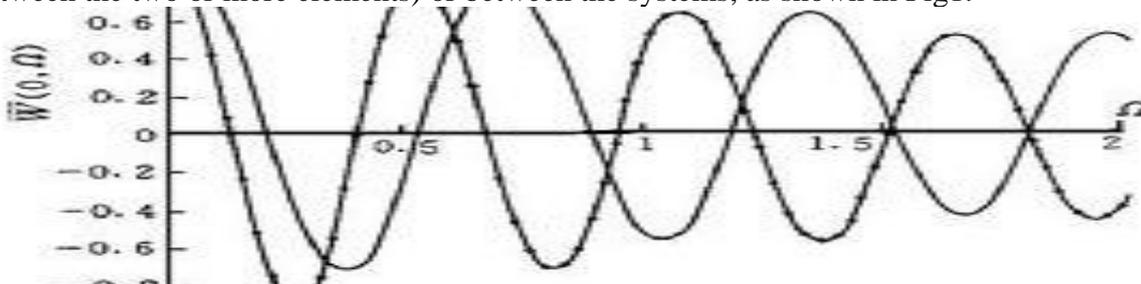


Fig1. Coupling Effect

In this paper, we referred to the first-order ordinary differential equations, where  $A_i$  is the amplitude of the  $i$ -th mode in the coupled system.  $K_{ij} = j\beta_i$  in the coupled transmission line problem. In this paper, we consider the first-order ordinary differential equations,  $K_{ij} = j\omega_i$ ,  $\beta_i$  and  $\omega_i$  are the phase

shift constant and oscillation frequency of mode  $i$ , respectively;  $K_{ij}$  ( $ij$ ) is the coupling coefficient, which is a function of space coordinate  $z$  in the transmission line problem. In the oscillation problem, it is time  $t$  is the amplitude of the modulus  $i$  excited by the unit  $j$  at the unit coupling length or unit time. The equations (1) are written in matrix form

$$Z_0 = \frac{2\sigma \begin{pmatrix} 1 & -1 \\ r_1 & r_p \end{pmatrix}}{(\rho_w - \rho)g} \pm \frac{\rho_w}{\rho_w - \rho_0} \cdot \frac{dz}{dx} X \quad (1)$$

Where  $A$  is the column matrix and  $k$  is the square of the coupling coefficient. The solution of the coupled mode equation is based on the coupling coefficient and the boundary condition. The coupling capability  $Q_{ij}$  represents the coupling strength between modes  $i$  and  $j$ .

## 2.2 Coupling Mechanism

Based on the system collaborative theory model, this study is based on the financial supply curve function of the foreign trade enterprises of science and technology,

$$S = F(X_i)$$

Among them,  $S$  is the output value of financial enterprises that provide financial supply for the development of science and technology foreign trade enterprises.  $X$  represents the input of other factors of production resources, such as financial and financial elements and financial institutions such as banks and Internet finance ( $i = 1, 2, 3 \dots$ )

The financial demand curve function is set to:

$$D = F(Y_i)$$

Where  $D$  is the total amount of financial demand for the development of a technology-based foreign trade enterprise;  $Y_i$  represents the various factors that affect the financial needs of the foreign trade enterprise, such as the price of the capital, the price of the substitute, the expectation of the future and the industry ( $I = 1, 2, 3 \dots$ ), according to the system collaborative theory model, the financial supply and demand of the development of science and technology foreign trade enterprises each form a dynamic and open system, the open system consists of many elements of interaction, The interaction between the development of science and technology foreign trade enterprises driven by the financial needs and supply curve movement.

In this paper, the coupling mechanism of the structural reform of the financial supply side of the science and technology foreign trade enterprise is firstly discussed from the point of view of the development of the financial demand and the corresponding supply system of the foreign trade enterprises of science and technology, and further elaborates the structural reform system of the development of science and technology foreign trade enterprise and the financial supply side The formation of the interaction and influence of a dynamic change, development and gradual evolution of the process. The process of developing financial needs of science and technology foreign trade enterprises is a dynamic evolution process of the development of science and technology foreign trade enterprises, that is, from the beginning of the period of technology industry, its growth, expansion and maturity of the development of financial needs in various stages of science and technology foreign trade enterprises, The supply process is also the process of scientific and technological foreign trade enterprises continue to reform the financial supply side, for the development of technology industry to provide financial support to the process, we will demand and supply as an external system, then the technology-based foreign trade enterprises and financial supply side reform system It is to promote the external system changes in the internal system, in this an internal system, the innovation of new technologies to drive the development of technology-based foreign trade enterprise development system has become active, and the capital of the supplier built-in "profitability" Which determines the development of the technology-based foreign trade enterprises to promote the qualitative leap in the reform of the financial supply side. The two sides

realize the dynamic evolution and optimization of the system through the cooperative evolutionary coupling mechanism. In this paper, the development of science and technology foreign trade enterprises and financial supply side reform system as two interactive dynamic evolution of the development of the system, the two systems through mutual interaction and interaction mechanism to achieve co-evolution, and ultimately the formation of more complex high-level "technology Development of Foreign Trade Enterprises - Reform of Financial Supply Side ". That is, the two systems belong to the order parameter of the composite system. According to the coupling mechanism, each coupling parameter is also a subsystem, and the coupling between the coupling parameters and the coupling parameters is the coupling between the coupling system. The evolution of the evolution of the coupling system, the coupling system will also change the speed and scale of the evolution of the coupling system.

### **3. Summary**

Based on the above analysis, the conclusions and recommendations are as follows. Technology-based foreign trade enterprises need a lot of money, especially scientific research and technical support, with the development of science and technology foreign trade enterprises, science and technology foreign trade enterprises will become more and more industrial scale, and thus its economic output value will be more and more high, the corresponding, due to the existence of coupling mechanism, science and technology foreign trade enterprises on the demand for funds, especially the size and means of scientific research and technology funds will be more and more, to promote the financial services market space becomes more and more large, due to the existence of the coupling mechanism, the financial products for the foreign trade enterprises of science and technology are endless and promote the development of the financial institutions. Finally, the structural reform of the financial supply side is promoted, which is also provided by the scientific and technological foreign trade enterprises for the structural reform of the financial supply side on a certain coupling material basis. The efficiency of the financial sector makes the financial participants increase rapidly, the rapid expansion of the transaction volume, reduce the average cost of financial transactions, through the role of coupling mechanism to promote financial participation in innovation efficiency.

### **Acknowledgements**

This work was financially supported by the Guangdong Province Philosophy and Social Sciences "13th Five-Year Plan" 2016 annual academic projects (Guangdong foreign trade "supply side reform" driven development path analysis, project number GD16XYJ30) and Guangzhou philosophy and social science development "13th five" plan 2017 Research on Resource Allocation and Innovation Driving Path of Guangzhou Foreign Trade Enterprises under the View of Structural Reform of Supply Side, Project No. 2017GZGJ20).

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