



A Driving Force Analysis Model and Efficient Pathways for the Innovative Regulatory Mechanisms on Integrated Development of the Yangtze River Delta Pilot Free Trade Zones

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Abstract. The innovative construction of the coordinated regulatory systems for the Yangtze River Delta Pilot Free Trade Zone (FTZs) is the basic guarantee for empowering the higher-quality integrated development of the Yangtze River Delta. However, the imbalance of regional development, insufficient depth of reform measures and lack of innovation promotion in key areas hindered the coordination of the Yangtze River Delta FTZs. The root cause lies in the insufficient driving force for coordinated development and regulatory system innovation. This paper constructs an APNR model to reveal the driving forces of the coordinated regulatory system innovation of the Yangtze River Delta FTZ from four aspects: top-level, external, endogenous, and technological driving forces. Accordingly, the efficient pathways are proposed: strengthening the top-level design of coordinated regulation, establishing a division of labor and incentive mechanism for coordinated regulation, and building an cooperation platform to achieve coordinated regulation that emphasizes both development and security.

Keywords: Yangtze River Delta Pilot Free Trade Zones; Coordinated Supervision; APNR Model.

1 Introduction

The Pilot Free Trade Zone (FTZ) is a test field for institutional innovation and a high-level open area that facilitates trade liberalization and stimulates the vitality of market entities. Since the first FTZ was established in Shanghai in 2013, China has established 22 FTZs, covering coastal, inland and border areas, which has formed a new pattern of comprehensive multi-level opening-up. With the establishment of Anhui Province FTZ in 2020, the strategic FTZ layout of Yangtze River Delta region has completed. The implementation area of the FTZs reaches 705.34 square kilometers, accounting for about 1/500 of the total area of the Yangtze River Delta region [1]. As the core economic areas of Yangtze River Delta, it is an important mission for the FTZs

to cooperate and give full play to the advantages of the three provinces (Zhejiang, Jiangsu, Anhui) and Shanghai, to promote the high-quality cooperated development of Yangtze River Delta. However, due to the non-synchronous establishment time of the FTZs, the development and system construction in various places varies greatly, resulting in the split of regulatory systems and the lack of mature cooperated development mechanisms. It has become urgent to realize coordinated development through institutional and supervision innovation.

This paper analyzes the obstacles behind the coordination of the Yangtze River Delta FTZs and constructs an APNR model to dig out the driving forces to the innovation of coordinated regulatory system. Accordingly, the efficient pathways are proposed with aims to achieving the coordinated regulatory among the Yangtze River Delta FTZs.

2 Main issues on the Coordinated Institutional Innovation

Early attempts of coordinating development of the Yangtze River Delta FTZs can be found in 2019 after the signing of the "Shanghai Jiangsu Zhejiang Free Trade Pilot Zone Coordinated Development Strategic Cooperation Framework Agreement", which includes eight aspects such as jointly building an institutional innovation highland, promoting industrial development, and carrying out scientific and technological innovation. After the formal establishment of the Anhui FTZ, the four regions initiated the Yangtze River Delta FTZ Alliance promoting the joint construction and sharing of alliance resources in terms of trade facilitation, investment facilitation, financial innovation, and cross-border researches [2]. Although the coordinated development has made great contributions to promoting the overall strength of the Yangtze River Delta, there is still a certain gap in the institutional and mechanism innovation of the coordinated FTZs, which is mainly manifested in:

(1) Insufficient regional balance of institutional innovation and development

According to the "2023-2024 China Pilot Free Trade Zone Institutional Innovation Index" released by Sun Yat-sen University, Shanghai, Jiangsu, Zhejiang and Anhui are ranked 1st, 10th, 12th and 19th respectively. Further, the institutional innovation scores of nine special areas of the Yangtze River Delta FTZs have been assessed and seven of them are higher than the national average score of 75.9, among which Shanghai (Pudong) and Shanghai (Lin-Gang) are far ahead, ranking 2nd and 4th respectively among the 57 special areas nationally. It is obvious that the FTZs of the three provinces and Shanghai have shown a relatively unbalanced development pattern in terms of institutional innovation due to the different establishment time, regional industrial development foundations and Geographic locations.

(2) Incomplete system integration and coordination of the reform measures

Since establishment, the Yangtze River Delta FTZs have achieved a series of institutional innovation results. For instance, more than 150 institutional systems was piloted at Shanghai FTZs and have been promoted nationally; Zhejiang FTZs have accumulated 299 institutional innovation results and practical cases in the fields of oil and gas trade and transactions; 25 of 400 institutional innovation results in Jiangsu

FTZs, as well as 32 out of 207 in Anhui FTZs, have been replicated nationwide. However, it lacks high integration and deep coordination among the proposed innovation results. Without a joint force of institutional innovation that runs through the innovation chain, industrial chain, supply chain and value chain, the industries in the Yangtze River Delta region cannot evolve to a higher level of clustered forms.

(3) Inadequate promotion and sharing of innovation systems in key areas

Following the integrated development strategy of the Yangtze River Delta, the Yangtze River Delta FTZs have achieved cooperative results in many areas such as cross-regional declaration of import and export trade, mutual recognition of customs supervision and cross-regional declaration, financial innovation based on free trade accounts, and cross-domain supply of bonded marine fuel oil. However, the promotion and extension of institutional innovation has no obvious effect on extending the industrial chain and promoting the integration of industrial ecology in key areas and key regions. Taking bio-medicine as an example. According to the 2023 Yangtze River Delta Bio-medicine Development Index, the Yangtze River Delta has become the core cluster of the domestic bio-medicine industry, with 36% of the top 100 pharmaceutical companies in China and the number of innovative medicines and medical devices accounts for 46% and 39%, respectively. The revenue of bio-medicine industrial enterprises above designated size accounts for 43% of China. Yangtze River Delta FTZs have explored and introduced different innovative systems. The Zhangjiang area of the Shanghai FTZ has launched the "double-independent linkage" development strategy between the FTZs and the national independent innovation demonstration zone to explore the drug marketing authorization holder system. The Jiangsu FTZ has promoted the innovative development of the entire biomedical industry chain. The Zhejiang FTZ has launched a pilot program for the joint safety supervision mechanism for inbound special items and an integrated customs clearance platform for special biological products. The Anhui FTZ supports the development of clinical cutting-edge medical technology research projects such as immune cells and stem cells. Such innovation systems of bio-medicine were developed separately. It is necessary to form an innovation chain by creating a cross-regional sharing and integration platform for systems and factors.

3 A Driving Force Analysis Model for Regulatory System Innovation

The main reason for the mentioned problems lies in figure out strong driving forces for conducting coordinated regulatory system of the FTZs. Based on the Need-Resources (N-R) management decision model, this section constructs an Administer-Policy-Need-Resources (APNR) comprehensive model to describe the driving mechanism of regulatory system innovation.

3.1 Need-Resources (NR) Model

The NR model was first proposed by Yu Saito in 1990, aiming to help organizations and individuals understand demand and effectively allocate resources [3]. It is based on two key concepts of Needs (N) and Resources (R). Needs refer to organizational or individual needs, which can be material, non-material or psychological. Resources refer to the materials, funds, skills or other available elements needed to meet needs. This model represent a mutually dependent relationship between needs and resources. When a certain need is generated and the existing resources cannot meet this need, a mismatch between needs and resources will occur, thereby stimulating and forcing the occurrence of innovative activities until the gap between needs and resources disappears. Therefore, the contradiction between resources and needs is the objective motivation for stimulating innovation.

According to the public interest theory, regulation can be seen as a means for the government to improve resource allocation and income distribution, which can achieve the social needs by protecting public interests, maintaining social order and fair competition. Meantime, regulatory system can improve economic efficiency, and promote the stability of the capital market, thereby achieving the economic needs of maintaining market order. When existing social resources do not match social and economic needs, regulatory innovation is triggered to achieve a more reasonable allocation of resources [4]. Therefore, the NR relationship is also applicable to innovation in regulatory policies and corresponding regulatory activities.

3.2 Administer-Policy-Need-Resources (APNR) Model

Based on the NR model, an APNR model is proposed, which incorporates regulators and policy environments, and examines the regulatory innovation needs of administrators, the innovation subjects, in the policy environment, social and economic environment and resource environment. Since regulatory innovation needs are mainly reflected through internal and external demands in the social and economic environment, the various driving factors can be divided into three aspects [5]: top-level (Policy, P), exogenous and endogenous, scientific and technological driving force and resource shortage pressure. The conceptual diagram is shown in Figure 1. The Regulatory innovation subjects (Administer, A) mainly refer to government regulatory departments at all levels in the FTZs. Regulatory innovation needs (N) represent social needs and market demands. Resources (R) are used to meet social needs, market demands and support regulatory system innovation, including science and technology and resource supply. The policies (P) include national strategies and various FTZ regulations and systems.

The main driving forces of government regulatory innovation include national macroeconomic policies, exogenous and endogenous driving forces, and scientific and technological progress [6]. National macroeconomic policies, the top-level driving force for regulatory innovation, are the basis and guidelines for government departments to formulate and carry out new regulatory policies [7]. The exploration of regulatory innovation is inseparable from the top-level design of the system and the au-

thoritative support of the central government. Exogenous driving factors of regulatory innovation refer to external social and economic environmental factors that exist outside the regulatory system and can prompt regulators to take innovative measures. They are the original motivation for the internal dynamics of regulatory innovation activities [8]. The main exogenous driving factors include economic development, public demand, international standards and cooperation. On contrary, endogenous driving factors of regulatory innovation are driving factors within the regulatory system, such as the regulatory party's organizational culture and values, leadership, talents and capabilities, internal processes and mechanisms, etc. The exogenous and endogenous driving factors are complementary: exogenous driving factors can achieve efficiency only by stimulating or transforming into endogenous driving forces; endogenous driving factors can produce effective power cycles with the help of external driving forces [9]. As effective tools for improving regulatory efficiency and the quality of public services, scientific development and emerging technologies such as big data, cloud computing, and artificial intelligence play an important supporting and motivating role in the reform in terms of regulatory methods, regulatory capabilities, and regulatory concepts [9].

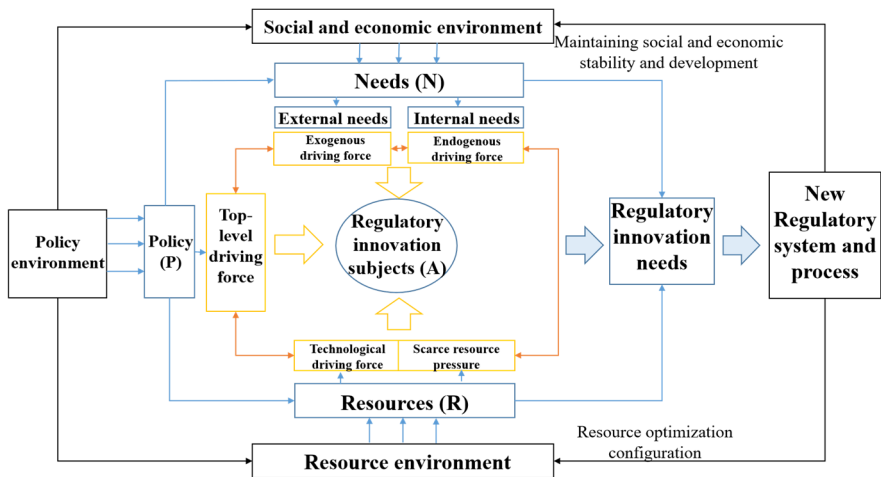


Fig. 1. Conceptual diagram of the APNR model

The regulatory innovation dynamic mechanism by the APNR model can be described as follow. Based on the corresponding national macro-policy guidelines, when the regulatory authorities recognize the new social and market demand, as well as the competitive pressure from regional economic development and other factors, it stimulates and drives the regulatory parties to seek various regulatory innovation opportunities that can be utilized from the environment. Therefore, the demand-oriented regulatory system and process innovation that utilize and transform resources in the economic environment, resource environment and policy environment start. Regulatory system innovation is carried out in terms of policies, norms, rules, etc., and regulatory process innovation implement the specific regulatory activities. This can not only meet

social needs or market needs, but also improve and change the macroeconomic environment. The emergence of new demands will stimulate and drive a new round of regulatory innovation activities. The whole process is a dynamic development, forming a two-way dynamic cycle that repeats itself.

4 Innovation Dynamics of the Coordinated Regulatory of the Yangtze River Delta FTZ based on the APNR Model

In this section, the driving forces of regulatory system innovation for the Yangtze River Delta FTZs are analyzed based on the APNR model.

4.1 Top-Level Driving Force

The integrated development of the Yangtze River Delta is a major strategy made with a view to achieve the "two centenary goals" and promote the formation of a new pattern of reform and opening-up. In November 2018, General Secretary Xi Jinping announced at the first China International Import Expo that the integrated development of the Yangtze River Delta region is set to a national strategy. Since then, various policies and plans have been introduced. In November 2019, the CPC Central Committee and the State Council issued the "Outline of the Yangtze River Delta Regional Integrated Development Plan", proposing to build a higher-level free trade pilot zone, exploring and implementing a regulatory model with security and higher-level trade liberalization and facilitation. In March 2021, the "Outline of the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Long-Term Goals for 2035" clearly put forward high-standard construction requirements for the coordinated development of the Yangtze River Delta FTZs for the first time. In November 2023, General Secretary Xi Jinping presided over a symposium on deepening the integrated development of the Yangtze River Delta in Shanghai and stressed the need to accelerate the improvement of the integrated development system and mechanism. The implementation of national strategies and the top-level policies on the integrated development of the Yangtze River Delta ask for the institutional opening-up and innovation, which are also the fundamental driving force for the coordinated development of the Yangtze River Delta Free Trade Zone.

4.2 Exogenous Driving Force

The exogenous driving force mainly comes from two aspects. Firstly, there is an imbalance between the differentiation of regulatory systems in the Yangtze River Delta and the demand for coordinated development. Secondly, the fierce competition for domestic regional development pushes the coordinated development of the Yangtze River Delta FTZs.

The optimal allocation of innovative factors and cross-regional trade of enterprises cannot be separated from the support of unified regulatory standards and coordination mechanisms [10]. However, the construction time and development foundation of each

FTZ in the Yangtze River Delta are different, as well as the regulatory requirements and implementation standards. The circulation of high-end innovative factors is affected to varying degrees, which brings uncertainty and cost pressure to enterprises. It is urgent to establish a new coordinated regulatory system to meet the actual needs of enterprises for cross-regional operations. Furthermore, a multi-level competitive relationship exist between the Yangtze River Delta and the Beijing-Tianjin-Hebei, Guangdong-Hong Kong-Macao Greater Bay Area and other regions. It is becoming increasingly fierce innovation competition in terms of economic development, industrial structure and talent attraction. This competitive relationship stimulates regional development momentum and innovation vitality, which also drives the improvement and innovation of the corresponding coordinated regulatory system. According to the United Nations Industrial Development Organization (UNIDO), the industrial structure similarity coefficient of Shanghai-Jiangsu, Shanghai-Zhejiang, Zhejiang-Jiangsu is 0.82, 0.76, 0.97, correspondingly. The highly similar industrial structure provides a breeding ground for the promotion and replication of the coordinated development system of the FTZs, which further promotes the innovation of the coordinated regulatory system.

4.3 Endogenous Driving Force

The various regulatory parties in the FTZs consist of central vertical management departments such as customs and public security, as well as local management agencies such as industry and commerce bureau, taxation bureau, and banks. Other multiple districts and linkage innovation areas of FTZs are also involved. There is an inherent and urgent need to actively serve the development of different FTZs, various districts of the same FTZs, and FTZs coordinated innovation areas. The reform and innovation of the FTZ regulatory system by various regulatory authorities needs to be strengthened through departmental linkage and cooperation with each other [11], which can also strengthen secure and effective regulatory capabilities, and reduce repeated supervision and regulatory loopholes.

4.4 Scientific and Technological Driving Force

Scientific development and technological progress strongly supports the cost reduction and efficiency improvement of the coordinated supervision of the Yangtze River Delta FTZs. Emerging technologies such as big data, cloud computing and artificial intelligence can not only promote the cooperation among the various regulatory departments, but also improve the accuracy and comprehensiveness of supervision, further enhancing the transparency and fairness of supervision [12]. In addition, automatic monitoring, automatic risk identification and automatic decision-making of the regulatory process can be carried out by means of intelligentization and automation technological innovation. It also promotes the regulatory authority to continuously improve its own digitalization and intelligence level, and better adapt to the needs of the coordinated development of the Yangtze River Delta FTZs.

In addition, strengthening data-driven decision-making and coordinated supervision is one of the effective ways to enhance the image of the regulatory authority. Through big data analysis and data mining technology, the regulatory authority can deeply explore the laws and trends. By improving the accuracy and effectiveness of supervision based on data-driven decision-making and regulatory model, the regulatory authority is able to establish its authoritative and professional image, enhancing the public's trust and recognition.

5 The path of the coordinated regulatory innovation in the Yangtze River Delta FTZs

5.1 Strengthen the Top-Level Design of Coordinated Supervision

Based on the existing framework of regional cooperation in the Yangtze River Delta, a "Yangtze River Delta FTZs Coordinated Supervision Standards and Rules Research Office" can be established, composed of experts from relevant local governments, regulatory departments and industry associations. The office is responsible for studying the industrial development plan and policy linkage, formulating unified standards and processes for joint supervision of the Yangtze River Delta FTZs' industries, and designing an evaluation and feedback mechanism for joint supervision. The initial trail could be conducted on complementary industries of the Yangtze River Delta FTZs such as the new energy vehicles industry. Formulate linkage supervision standards and specifications including production, sales, services and other processes, and introduce advanced technical means such as big data analysis and block chain to improve the efficiency of coordinated new energy vehicles supervision. Organize training for supervisors and develop a performance evaluation mechanism for the supervision of the new energy vehicle industry in the Yangtze River Delta FTZs, regularly evaluating and adjusting the supervision work. Establish a feedback mechanism accepting supervision and suggestions from all sectors of society. In this way, Replicable and popularizable joint supervision experience and practices can be extracted.

Furthermore, a joint supervision cooperation office is also crucial in dealing with the problems and bottlenecks encountered in the promotion of joint supervision in the Yangtze River Delta FTZs.

5.2 Establishment of Coordinated Supervision Division and Incentive Mechanisms

Just as the Yangtze River Delta, where the path to the integrated development is to eliminate the regional division of industries, the coordinated supervision of the Yangtze River Delta FTZs also seek to break through the administrative system division under the premise of an open economy. With the goal of integrated development and industrial chain security, implementing a division of supervision will allow the efficient, safe flow and optimal combination of factors. The incentive mechanism for collaborative supervision is the key to promoting effective cooperation among the FTZs in the

Yangtze River Delta. An assessment mechanism can be used to evaluate the performance of each FTZ in terms of collaborative supervision. Rewards or penalties will be given to encourage each FTZs to actively participate in collaboration. For instance, building a cross-regional information sharing reward system to encourage each FTZ to share supervision information.

Regarding the construction of coordinated supervision infrastructure, a specific fund for collaborative supervision can be set to improve the level of supervision and enhance the actual effect of collaboration. In addition, a publicity mechanism for outstanding cases of collaborative supervision is also necessary, with aims to fully commending the FTZs and relevant personnel that have made remarkable achievements in collaborative supervision.

5.3 Building a Coordinated Supervision E-Platform

The industrial supervision data and information of each free trade zone can be integrated to a unified digital supervision platform which provides data support for the development of joint supervision. By introducing big data, AI and other technologies for data analysis and mining, the efficiency and accuracy of supervision can be improved. The regulatory authorities are able to quickly identify problems and risks, and take corresponding measures in time. The platform should have a high degree of security and reliability to ensure the confidentiality and integrity of the data. A standardized data sharing and exchange mechanism should be established to promote information sharing and cooperation among the free trade zones. Professional talents with advanced technologies and cross-regional supervision capabilities should be cultivated to improve the overall quality and level of the regulatory authorities. Training and learning exchange activities should be carried out to share supervision experience and best practices among the free trade zones.

6 Conclusions

The coordinated development of the free trade zones in the Yangtze River Delta is committed to building a new open economic system. Through policy coordination and resource sharing, it promotes a more convenient trade and investment environment, attracting both domestic and foreign capital and talent inflows, and enhancing the openness and international competitiveness of the entire region. This collaboration not only helps to enhance the comprehensive competitiveness of each free trade zone, but is also an important way to promote the transformation and upgrading of the entire regional economy. Its core lies in promoting in-depth cooperation and coordination among the free trade zones through institutional innovation, and promoting high-level opening-up and high-quality development in the Yangtze River Delta region. By constructing the APNR model, this paper explores the driving force mechanism and implementation path of the coordinated regulatory of the Yangtze River Delta FTZs from the perspectives of top-level, exogenous, endogenous and technological driving forces.

These measures are helpful to establish a coordinated supervision system that emphasizes both development and security.

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