

## The Competitiveness Development Of Shanghai Port Industry In The Context Of Government Support Strategies

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### Abstract:

*This quantitative study investigates the development of competitiveness in the Shanghai port industry, with a focus on the impact of government support strategies. The research constructs and tests a structural equation model based on 13 hypotheses related to organizational flexibility (OFY), government support (GST), industrial organizational structure (SIO), organizational innovation (OIN), management innovation (MIN), and port industry competitiveness (CPI). The study utilizes a range of statistical analyses, including reliability tests, convergent validity tests, structural model fit assessments, and mediation analyses. Results reveal that organizational flexibility (OFY), government support (GST), and industrial organizational structure (SIO) significantly contribute to port industry competitiveness (CPI). Additionally, organizational innovation (OIN) and management innovation (MIN) play crucial roles in enhancing competitiveness. The study emphasizes the intricate relationships among these factors, illustrating a complex network that influences the competitiveness of the Shanghai port industry. This research provides empirical evidence and insights for industry practitioners, policymakers, and scholars, offering a comprehensive understanding of the dynamics involved in the competitiveness development of the Shanghai port industry within the framework of government support strategies. In conclusion, the study sheds light on the critical interplay among organizational flexibility (OFY), government support (GST), industrial organizational structure (SIO), organizational innovation (OIN), management innovation (MIN), and port industry competitiveness (CPI). The intricate relationships within this complex network highlight the multifaceted nature of factors influencing the competitiveness of the Shanghai port industry. The findings underscore the pivotal roles of government support strategies and organizational flexibility in fostering innovation, contributing to a nuanced understanding of the dynamics shaping the sustained development of competitiveness in the Shanghai port industry. This research serves as a valuable resource for industry practitioners, policymakers, and scholars, offering empirical evidence and comprehensive insights into the intricate landscape of the Shanghai port industry's competitiveness.*

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## 1. Introduction

### 1.1 Background of the study

Shanghai port has historically played a pivotal role in China's foreign trade and economic development due to its strategic location at the mouth of the Yangtze River (Lee & Wang, 2019). As one of the first treaty ports established in China in the 19th century, Shanghai quickly became a thriving center of international commerce and shipping (Wu, Zhang & Li, 2020). Today, Shanghai port ranks first globally in total container throughput, handling over 47 million TEUs in 2022 (Shanghai Municipal Government, 2023). This reinforces its position as the world's busiest container port for the 13th consecutive year. However, Shanghai port has experienced slowing growth in recent years, with container throughput growth declining from over 10% annually in the early 2000s to less than 1% in 2022 (Chen, Zhou & Liu, 2021). Intensifying regional competition, especially from ports in Guangdong and Liaoning, poses a threat to Shanghai's competitiveness (Chang & Lee, 2022). Issues like port congestion, pollution, administrative inefficiencies, and labor shortages have also impacted productivity and operations (Wang, 2022). Additionally, disruptions like the COVID-19 pandemic and US-China trade war underscored supply chain risks and vulnerability (Lee & Park, 2022). To sustain its competitive advantage, Shanghai port needs to focus on expanding capacity, adopting new technologies, improving connectivity and integration, and implementing sustainable practices (Shen & Lai, 2020). Government support through policies, incentives and infrastructure development could also play a vital role in cementing Shanghai's position as a leading global maritime hub (Liu, Wang & Zhang, 2020). Further research is essential to develop strategies that can enhance the competitiveness of Shanghai port over the long term. This study will undertake a comprehensive examination of the factors impacting competitiveness of Shanghai port across areas like technology, infrastructure, environment, policies, and administration. It aims to address the research gaps and develop data-driven strategies and recommendations that can help secure Shanghai port's competitive advantage in the global maritime landscape over the long term.

Shanghai port faces growing challenges in sustaining its competitive advantage in the global maritime industry. Despite being the world's largest container port for over a decade, Shanghai is confronted by rising competition from rival ports in the region (Cheng et al., 2022). Ports in Guangdong like Shenzhen and Hong Kong have emerged as logistics hubs that threaten Shanghai's dominance in handling transshipment cargo (Senarak & Mookhavas, 2022). Neighboring ports like Ningbo-Zhoushan are also upgrading infrastructure and vying for business (Wan & Luan, 2022). This regional competition has led to a 12% decline in Shanghai's foreign trade container volumes (Ma et al., 2021). At the same time, Shanghai port is bogged down by inefficiencies that impact its productivity and service quality. Administrative bottlenecks, congestion and pollution have escalated in recent years (Chang et al., 2022; Heikkila et al., 2022). Delayed digitization and lack of automation have also affected operational efficiency and customer service levels (Sun, 2021). Shanghai port's

infrastructure requires upgrading to handle larger vessels and volumes, but space constraints pose a challenge (CBRE, 2022). Environment sustainability has also become an imperative, but initiatives to reduce emissions are still nascent (Chen et al., 2022). Exogenous factors like the COVID-19 pandemic and U.S.-China trade war have further exposed Shanghai port's vulnerability to disruptions (He, 2022). Lockdowns severely impacted port operations, leading to congestion and delays (Keogh, 2022). Shanghai port lacked the agility and resilience to respond swiftly to changing dynamics during these disruptions. Meanwhile, government policies and regulatory complexities continue to affect the efficiency and competitiveness of Shanghai port (Hetzner, 2022).

Although Shanghai ports are doing well and are recognized globally, there is a lack of clues when it comes to measuring and improving their competitiveness (Cheng, et al., 2022). Competitiveness is a large concept and past studies have delineated it. For example, the port of Shanghai, the largest port in the world and in China, is returning to normal after the delays and congestion caused by the new Crown Pneumonia pandemic (Schiffing and Kanellos, 2022). The port of Shanghai suffered major impediments due to a lack of organizational flexibility to respond and adapt quickly to change, however, the expansion of the COVID-19 pandemic has exacerbated congestion and further increased transport costs (He, 2022a). Container hold-ups extended from less than 5 days at the beginning to as much as 15 days (He, 2022b). In addition, the management of Shanghai's ports was deteriorating due to ultra-high pressure, logistics lagged, roads to deliver food were in trouble, and utility rates were raised, resulting in skyrocketing logistics rates (He, 2022a). Each price increase adds further pressure on consumer prices (Schiffing and Kanellos, 2022). The mismatch between the capacity of Shanghai's ports and the increasing demand for international trade has affected the competitiveness of Shanghai's ports (Container News, 2021, He, 2022a). Although Shanghai ports are trying to adapt to these changes, they lack agility such as changes in shipping routes, trade patterns or customer preferences (He, 2022a). Shanghai ports lack organizational flexibility, for example facing barriers to reallocating labor, tools, or infrastructure to meet fluctuating demands (Zainal, et al., 2020). Shanghai ports lack flexibility in adopting innovative solutions, and Shanghai ports face challenges in implementing technological advances in new systems (Damico, et al., 2021). Shanghai ports lack the ability to form agile collaborations with stakeholders, such as shipping companies, logistics providers or technology companies, indicating a lack of organizational flexibility (Herlina, et al., 2021).

## **1.2 Research Questions**

1. Why is there a correlation between organizational flexibility, government support, the industrial organizational structure, organizational innovation, managerial innovation, and competitiveness?
2. How does government support impact the competitiveness of the port industry?

## **1.3 Research Objectives**

1. To investigate the relationship between organizational flexibility, government support,

industrial organizational structure, organizational innovation, managerial innovation, and competitiveness within the port industry.

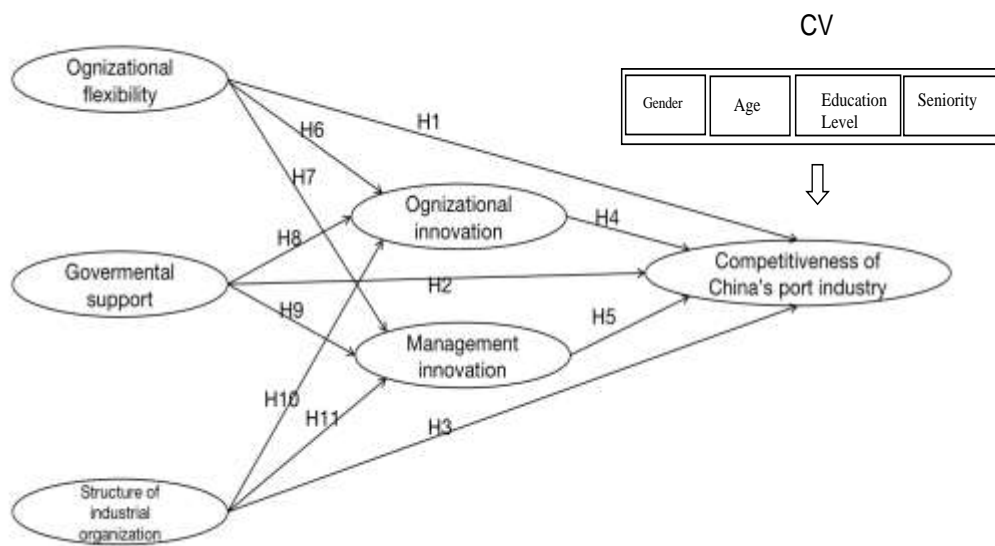
2. To explore how government support can impact the competitiveness of ports.

## **2. Literature review**

### **2.1 Research Model**

In Chapter 2, the literature review examines the basis for finding a competitiveness strategy for developing the port industry, with a focus on the port of Shanghai. This paper aims to answer the research questions posed in Chapter 1 by exploring the factors affecting competitiveness and the role of government support in the port industry. The research context in Chapter 2 is centered on the development of competitiveness in the port industry, with a focus on the port of Shanghai. It provides an overview of various theories, including organizational learning theory, resource base theory and stakeholder theory, to delve into the competitiveness of the port industry, focusing on the context of this study and the difficulties it faces. The chapter explores three original theories relevant to this study, namely organizational learning theory, resource base theory and stakeholder theory. It then delves into the immediate disciplines and discusses the factors that directly affect competitiveness such as organizational flexibility, government support, industrial organizational structure, organizational innovation, and managerial innovation. The chapter concludes with a presentation of the theoretical model and hypothesis statements, emphasizing the direct influence of the independent variables on the dependent variable. The literature review provides a structured area of research. Figure 1 demonstrates the interdependence of the factors in this study, with adaptive business practices, government support and industrial organizational structure influencing the mediating aspects of organizational and managerial innovation, and thus the competitive advantage of the Chinese port industry. The framework provides a structured approach to examine the relationships and contributes to the understanding of the competitiveness of the Chinese port industry.

Organizational learning theory, resource base theory and stakeholder theory provide the theoretical underpinnings that make up this model, with organizational learning theory providing the theoretical basis for the paths from the independent variable organizational flexibility to the mediating variable managerial innovation and organizational innovation to the dependent variable in the model. Resource base theory and stakeholder theory provide the theoretical basis for the independent variable's government support and industrial organizational structure.



**Figure 1 Research Model**

## 2.2 Research Theory

Organizational learning theory was established by Chris Argyris and Donald Shinn during the 1970s (Clark, 2021). This theory highlights how groups can enhance their efficiency and adapt to changing surroundings by obtaining, interpreting, and utilizing information. The components of the organizational learning theory encompass attaining insights, communicating, and sharing this understanding within the group, recognizing its significance, and implementing these comprehending's (Abbas et al., 2020; Argote et al., 2021). These facets involve tasks including gathering information, transferring knowledge, interpreting perception, and effecting organizational change.

This research argues through a discussion of organizational learning theory that organizational flexibility can positively influence competitiveness and the possibility that organizational flexibility can indirectly influence competitiveness through organizational and managerial innovation. It is also noted (Ni, et al., 2020) that organizational learning theory has an important supporting role in the research of port competitiveness models. The discussion of organizational learning theory argues that industrial organizational structure can positively influence competitiveness and the possibility that industrial organizational structure can indirectly influence competitiveness through organizational and managerial innovation. It is also pointed out (Ni, et al., 2020) that organizational learning theory has an important supporting role in the research of port competitiveness model. Therefore organizational learning theory provides theoretical support for the relationship between the independent variable's organizational flexibility and industrial organizational structure, and the mediating variables organizational innovation and management innovation in the Empirical Model of this study.

## 2.3 Research Hypotheses

Resource-based theory highlights the importance of organizational resources and capabilities in achieving competitive advantage (Kocyigit and Tabak, 2020). An entity's

flexibility is a valuable resource that allows for quick and skillful responses to business fluctuations, customer demands and competitive pressures (Saeed, et al., 2021b). By having the ability to adapt and modify their operations, ports can utilize their flexibility to create value and ultimately increase their competitiveness (Yoon and Kwon, 2022). Therefore, resource base theory supports a significant relationship between organizational flexibility and port industry competitiveness (Lis, 2021). Stakeholder theory suggests that organizations should be adaptable enough to take into account the desires and necessities of different stakeholders, including patrons, labor, suppliers, and society (Reypen, et al., 2021). Organizational flexibility can help to meet the different needs of the stakeholders by adapting to their changing needs and expectations (Hollebeek, et al., 2022). By being flexible and responsive to the needs of stakeholders, ports can build positive relationships and enhance their reputation (Obrenovic, et al., 2020). Stakeholder theory supports the view that organizational flexibility is essential to achieving competitiveness in the port industry by aligning stakeholder interests and needs (Andersen, et al., 2023). The researcher has formulated the following hypotheses for this study.

H1: Organizational flexibility has a significant relationship with the competitiveness of Shanghai's port industry

Government support is a valuable resource for ports as it provides financial assistance and policy incentives that can enhance their competitiveness (Simarmata, et al., 2022). Ports that effectively utilize government support have access to unique resources and capabilities that position them ahead of their competitors (Lebdioui, et al., 2021). Stakeholder theory recognizes the impact of external stakeholders, including government, on organizational competitiveness (McGahan, 2021). Government support aligns the intentions of the government and other stakeholders in the port to improve port competitiveness (Ashrafi, et al., 2020). Supportive government-funded national policies, regulations, and infrastructure development can improve the efficiency, sustainability, and reputation of ports. Stakeholder theory supports the existence of a relationship between government support and the competitiveness of the port industry by recognizing the role of government as a key stakeholder in shaping port competitiveness. The researcher has formulated the following hypotheses for this study.

H2: Government support has an important relationship with the competitiveness of Shanghai's port industry

Organizational learning theory suggests that industrial organizational structure greatly influences the acquisition, understanding and application of information within a firm (Argote, et al., 2021). The industrial organizational structure of the port industry can affect its competitiveness by influencing the structure of knowledge sharing, communication processes and decision-making processes (Bo and Meifang, 2021). A well-designed and efficient industrial organizational structure can improve the learning capacity of ports, which can lead to improved performance and competitiveness (Afshari and Hadian, 2021). Resource base theory highlights the importance of organizational resources and capabilities in achieving competitive advantage (Chen, et al., 2021). Industrial organizational structure can be considered as a key resource that contributes to the

competitiveness of the port industry (Yeni and Bastug, 2021). A well-designed industrial organizational structure, aligned with the strategic objectives of the port industry, allows for efficient resource allocation and effective coordination (Lis, 2021). A well-designed industrial organizational structure allows ports to manage their resources and capabilities, thereby enhancing competitiveness (Phan, et al., 2021; Otuaga, et al., 2023). Stakeholder theory recognizes the impact of different stakeholders on organizational performance and competitiveness (McGahan, 2021). The industrial organizational structure of the port industry can influence stakeholder relationships and alignment of interests (Ashrafi, et al., 2020). A well-designed industrial organizational structure that facilitates information sharing and stakeholder involvement can improve the competitiveness of ports (Balci and Surucu, 2021). Stakeholder theory supports that coordinating the interests of stakeholders such as customers, employees, suppliers and government agencies, industrial organizational structure helps to improve service delivery, customer satisfaction and overall port competitiveness (Ashrafi, 2021). The researcher has formulated the following hypotheses for this study.

H3: There is an important relationship between industrial organizational structure and the competitiveness of Shanghai port industry

Organizational innovation can be seen as a valuable resource that can differentiate a port from its competitors (Azeem, et al., 2021). By implementing innovative practices, processes, technologies and strategies, ports can create significant competitive advantages (Yeni and Bastug, 2021). Resource base theory supports the idea that there is a significant relationship between organizational innovation and port industry competitiveness (Djamaludin, et al., 2022). Stakeholder theory recognizes the influence of different stakeholders on organizational performance and competitiveness (Ogbeibu, et al., 2021). organizations can increase the satisfaction and participation of interested parties such as customers, workers, suppliers and the society through a shift in leadership structure (Chyhryn, et al., 2020). By introducing innovative practices and services, ports can meet changing stakeholder needs and build strong relationships, all of which contribute to competitiveness (Boulauazan and Vanelslander, 2022). Stakeholder theory supports the hypothesis that there is a significant relationship between organizational innovation and the competitiveness of the Shanghai port industry by emphasizing the importance of stakeholder satisfaction and integration with innovation practices (Li and Yuen, 2022). The researcher proposed the following hypotheses for this study.

H4: There is an important relationship between organizational innovation and the competitiveness of the Shanghai port industry

Organizational learning theory suggests that an organization that recognizes and promotes a learning climate has a higher chance of increasing its competitiveness through invention in its management practices (Zhou, et al., 2021). Management innovation involves the application of modern methods, procedures and plans to guide the organization (Kittikunchotimut, 2020). organizational learning theory supports a significant relationship between management innovation and port industry competitiveness, where innovative

management practices enhance the organization's ability to adapt, learn and improve, thus increasing port competitiveness (Zhou, et al., 2021). Resource base theory emphasize the role of valuable and unique resources in achieving competitive advantage (Potnis, et al., 2021). Management innovation can be seen as a valuable resource that can differentiate ports from their competitors (Potnis, et al., 2021). By adopting management innovation practices, ports can improve their strategic decisions and create competitive advantage (Battisti, et al., 2022). Resource base theory supports the idea that there is a significant relationship between management innovation and port industry competitiveness (Chao, et al., 2021). Stakeholder theory recognizes the impact of different stakeholders on organizational performance and competitiveness (Veronica, et al., 2020). Management innovation can increase stakeholder satisfaction by improving organizational processes and employee motivation (Veronica, et al., 2020). By implementing management innovation practices, ports can meet stakeholder needs and build strong relationships, all of which contribute to competitiveness (Ashrafi, et al., 2020). Stakeholder theory supports the existence of a significant relationship between management innovation and competitiveness in the port industry by emphasizing the importance of stakeholder satisfaction and integration with innovative management practices (Tran, et al., 2020). The researcher proposed the following hypotheses for this study.

H5: There is an important relationship between management innovation and the competitiveness of Shanghai port industry

Through flexibility and adaptability, organizations can allocate resources efficiently, delve into unexplored possibilities and innovate their systems, goods or facilities (Saeed, et al., 2022). Resource-based theory supports a relationship between organizational flexibility and organizational innovation (Hossain, et al., 2022). Stakeholder theory recognizes the influence of various stakeholders on organizational innovation (Karman, 2020). organizational flexibility contributes to stakeholder satisfaction and alignment with innovation practices (Karman, 2020). By being flexible, organizations can be more responsive to stakeholder needs, integrate their feedback, and generate innovative solutions (Singh, et al., 2022). Stakeholder theory supports the existence of a relationship between organizational flexibility and organizational innovation by emphasizing stakeholder involvement and promoting innovative practices (Chaurasia, et al., 2020). The researcher proposed the following hypotheses for this study.

H6: There is a significant relationship between organizational flexibility and organizational innovation

Resource base theory emphasize the role of organizational resources in driving innovation and competitive advantage (Saeed, et al., 2021b). organizational flexibility can be seen as a valuable resource that allows organizations to react to fluctuating business environments and adapt their management practices (Saeed, et al., 2021b). Through flexibility, organizations can allocate resources efficiently, experiment with different management approaches and introduce innovative strategies (Saeed, et al., 2022). Resource base theory supports the existence of a relationship between organizational flexibility and managerial innovation (Eernandes, 2020). Stakeholder theory recognizes the influence of



different stakeholders on organizational innovation and management practices (Singh, et al., 2022). organizational flexibility contributes to stakeholder satisfaction and alignment with innovative management practices (Singh, et al., 2022). By being flexible, organizations can integrate stakeholder feedback and develop innovation management practices that meet their expectations (Ebersberger and Kuckertz, 2021). Stakeholder theory supports the existence of a relationship between organizational flexibility and managing innovation by highlighting the importance of stakeholder engagement and its impact on promoting innovative management practices (Bellucci, et al., 2020). The researcher proposed the following hypotheses for this study.

H7: There is an important relationship between organizational flexibility and managerial innovation

Organizational learning theory suggests that organizations can learn from external sources, such as government support, to promote innovation (Leeuw, 2020). Government support can provide resources and incentives to encourage organizations to invest in innovation (Leeuw, 2020). By utilizing government support, organizations can gain access to new knowledge, practices and technologies which can lead to organizational innovation (Tu an Wu, 2021). organizational learning theory supports a relationship between government support and organizational innovation (Leeuw, 2020). Resource-based theory emphasizes the importance of valuable resources in driving innovation and competitive advantage (Alnuaimi, et al., 2021). Government support can be seen as a valuable resource that organizations can use to promote innovation (Alnuaimi, et al., 2021). By providing financial assistance and supportive policies, government support enhances the availability and accessibility of resources needed for innovation (Zheng and Ge, 2022). Resource base theory supports a relationship between government support and organizational innovation (Rismayani, et al., 2021). Stakeholder theory recognizes the role of stakeholders, including government, in influencing organizational innovation (Jiang, et al., 2020). Government support can facilitate stakeholder engagement, collaboration, and coordination of innovation goals (Jiang, et al., 2020). By providing support and creating an enabling environment, the government encourages organizations to innovate and respond to stakeholder needs (Guzawska, 2020). Stakeholder theory supports the existence of a relationship between government support and organizational innovation by highlighting the importance of stakeholder engagement and its impact on promoting innovative practices (Leonidou, et al., 2020). The researcher proposed the following hypotheses for this study.

H8: There is an important relationship between government support and organizational innovation

Government support can be seen as a valuable resource that organizations can use to promote managerial innovation (Lukovszki, et al., 2021). By providing financial assistance and supportive policies, government support increases the availability and accessibility of resources needed for innovative management practices (Rismayani, et al., 2021). Resource base theory supports the existence of a relationship between government support and management innovation (Liu, et al., 2020c). Stakeholder theory recognizes the

role of stakeholders, including government, in influencing managerial innovation (Albat, et al., 2020).... Government support can facilitate stakeholder involvement, collaboration and coordination of innovative management approaches (Albat, et al., 2020).... By providing support and creating an enabling environment, the government encourages organizations to adopt innovative management practices to meet stakeholder needs (Jiang, et al., 2020). Stakeholder theory supports the existence of a relationship between government support and management innovation by emphasizing the importance of stakeholder involvement and its impact on promoting innovative management practices (Ferraris, et al., 2020). The researcher proposed the following hypotheses for this study.  
 H9: There is an important relationship between government support and managing innovation.

Resource base theory supports the idea that there is a significant relationship between industrial organizational structure and organizational innovation (Wang and Yu, 2021). Stakeholder theory recognizes the influence of different stakeholders on organizational innovation (Mcgahan, 2021). Industrial organizational structure can influence stakeholder relationships and collaboration, which is important in promoting organizational innovation (Mcgahan, 2021). An industrial organizational structure that encourages stakeholder input and collaborative choices strengthens a firm's inventive capacity by harnessing the diverse perspectives and insights of the people involved (Imran, et al., 2021). Stakeholder theory supports the existence of a relationship between industrial organizational structure and organizational innovation by highlighting the importance of stakeholder involvement and its impact on facilitating innovation practices (Mcgahan, 2021). The researcher has formulated the following hypotheses for this study.  
 H10: There is a significant relationship between industrial organizational structure and organizational innovation

Resource base theory emphasizes the role of organizational resources in driving innovation and competitive advantage (Yahya, et al., 2021). Industrial organizational structure can be viewed as a resource that influences an organization's ability to innovate in its management practices (Yahya, et al., 2021). A structure that is able to communicate, coordinate and integrate different knowledge effectively can provide the necessary resources to implement innovative management practices (Yu, et al., 2021). Resource-based theory supports the existence of a relationship between industrial organizational structure and management innovation (Meng, et al., 2021; Yang, et al., 2022c). Stakeholder theory recognizes the influence of different stakeholders on organizational innovation and management practices (Mcgahan, 2021). Industrial organizational structures can influence stakeholder relationships, collaboration and alignment with innovative management practices (Mcgahan, 2021). An industrial organizational structure that promotes stakeholder involvement and engagement can contribute to the implementation of management innovations that are aligned with stakeholder expectations (Tu and Wu, 2021). Stakeholder theory supports the existence of a relationship between industrial organizational structure and managerial innovation by highlighting the importance of stakeholder involvement and its impact on promoting innovative management practices (Chaurasia, et al., 2020). The

researcher proposed the following hypotheses for this study.

H11: There is a significant relationship between industrial organizational structure and managerial innovation

The theoretical model usually includes three levels, namely internal factors, external factors and competitive factors, with internal factors referring to elements inherent in the port itself. External factors refer to the market, industrial environment, policies and regulations, and socio-cultural factors in which the port is located. Competitive factors refer to the competition and interaction between the port and other ports. The relationship between the factors affecting the competitiveness of the port industry, including the operational efficiency and service quality of the port and the level of competitiveness of the port industry in the organizational Learning Theory provides theoretical support for the establishment of the model, as well as in the Stakeholder Theory study, which involves the following categories of stakeholders related to the port industry, government agencies, port operators and port companies, shipping companies and cargo owners, etc., all of which provide the model with a theoretical basis.

H12: Organizational innovation (OIN) has a mediating effect on the relationship between organizational flexibility (OFY), government support (GST), industrial organizational structure (SIO), and port industry competitiveness (CPI)

H13: Management innovation (MIN) has a mediating effect between organizational flexibility (OFY), government support (GST), industrial organizational structure (SIO), and port industry competitiveness (CPI).

### **3. Methodology**

#### **3.1 Data Collection**

The qualitative part of the data collection will be carefully conducted using a combination of offline and online techniques (based on the voluntary mentality of the respondents). This tactical approach seeks to capitalize on the strengths of both domains to ensure a thorough and sophisticated grasp of participants' perspectives. The first phase of data collection will take place online, using a variety of online channels to initiate information-gathering actions. This online phase has many benefits, including accessibility and ease. Participants will be able to contribute their initial views and impressions of government support and its relationship to the competitiveness of Shanghai's port industry through online surveys and questionnaires. The utilization of the online platform encourages effective participation from a wide range of participants, enabling them to provide their early thoughts on the research project (Randhawa, Wilden, & Gudergan, 2018). However, the research design goes beyond the virtual world to recognize the complexity and depth of the subject matter. In order to delve into the perspectives of the participants with greater depth and information, offline interviews will be conducted. These face-to-face encounters provide an invaluable opportunity for exploratory dialogue, encouraging individuals to share their thoughts, experiences, and perspectives more fully. This research team hopes to learn more about underlying motivations, unique experiences, and subtle details through face-to-face

interviews that may not be fully captured through online interactions (Moser, & Korstjens, 2018).

This research aims to build a solid foundation for its qualitative research component by employing a dual data collection strategy. The combination of an online platform and on-site interviews allowed for the use of a dynamic and multidimensional perspective to assess the complex interplay between government support and competition in the Shanghai port industry. This all-encompassing strategy aligns with the study's goal of revealing not only obvious insights, but also deeper understandings hidden beneath the narratives of government departments, business management, and operations personnel. The qualitative data will be collected using a mixed methods approach combining online surveys and in-person interviews. Potential participants including government officials, port managers, and technical experts will be invited to take part via email. The online survey will be distributed through Qualtrics to allow participants to provide initial perspectives on the relationship between government support and port competitiveness. After the initial online survey, in-depth semi-structured interviews will be conducted with select participants who agree to continue their participation. The interview participants will be purposively selected to ensure representation of key roles in the port industry. Interviews will take place in person when possible, or via video conferencing. The interviews will allow participants to expand on their perspectives and experiences in more detail. The combination of online surveys and in-person interviews provides complimentary data sources to develop a comprehensive understanding of the complex dynamics between government support and port industry competitiveness. The online survey offers accessibility and convenience for participants, while the interviews enable deeper exploration of personal experiences and narratives that questionnaires may not fully capture.

### **3.2 Sampling Method**

Purposive sampling method will be carefully used in the qualitative survey included in this study. The methodology is specifically designed for the purposeful and thoughtful selection of participants who demonstrate a significant amount of expertise and experiential wisdom that is closely related to the objectives of the research at hand. The deliberate use of the method is expected to produce rich insights for the participants that are particularly relevant to the subtle details of this research (Campbell et al., 2020). In the context of purposive sampling, the main focus will be on carefully selecting individuals that provide a unique and knowledgeable perspective on the issues. Governmental, managerial, and technical experts will be carefully selected as key participants in this study. The motivation for this decision is to discover and identify the many aspects of government support and competition in the port business. The research recognizes the range of experience and opinions inherent within firms by choosing to include governmental, managerial, and technological experts (Englund & Graham, 2019; Bayerlein, Knill & Steinebach, 2020). Due to their strategic perspectives and decision-making capabilities, management specialists have a unique perspective on the competitive dynamics and innovation strategies of their industry. On the other hand, technical experts provide a practical understanding that supports management concepts through their involvement in operational matters and government experts are familiar with policies and trends. It is predicted that purposefully

including these three distinct groups will open the door to a wealth of insights. The strategic goal of this approach is to create a narrative that skilfully combines the perspectives of those actively guiding the direction of the industry with those actively involved in the complexities of day-to-day operations. This interaction of perspectives is expected to produce a more comprehensive and nuanced picture of how innovation and competition coexist in port operations.

## 4. Results

### 4.1 Reliability Analysis

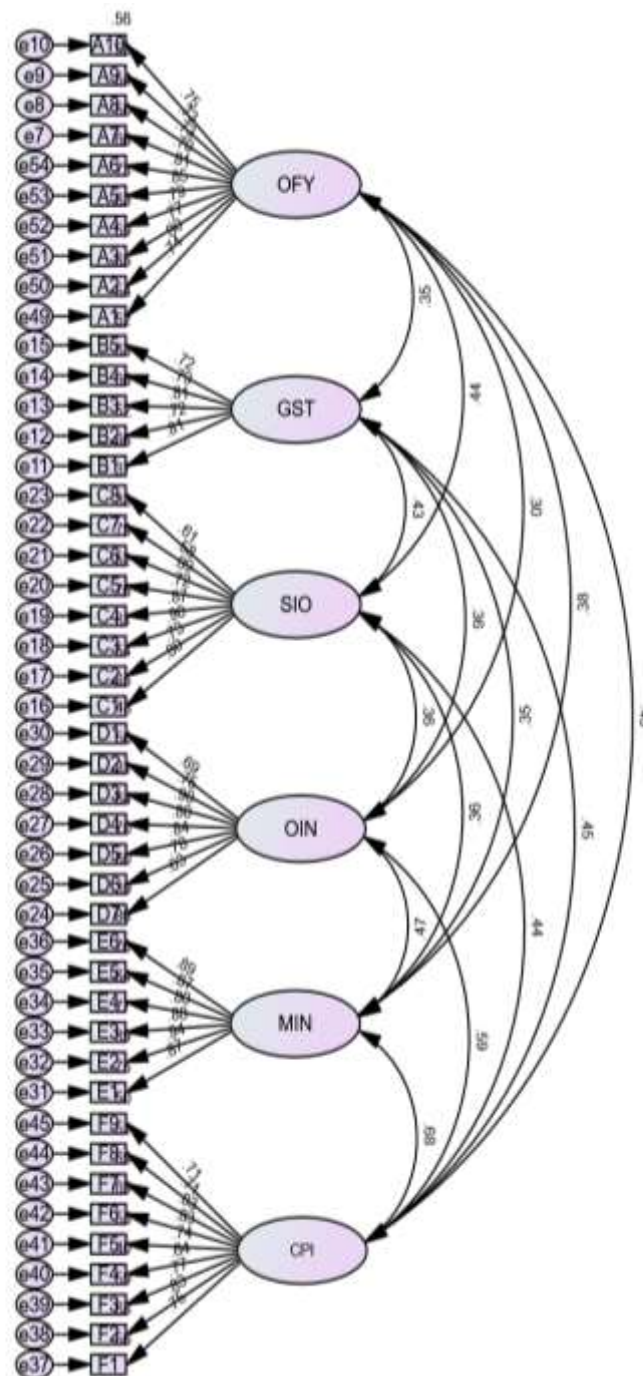
The reliability analysis results in Table 1 provide an in-depth understanding of the internal consistency of the measurement tools used in the study, utilizing Cronbach's  $\alpha$  as the evaluation indicator. This indicator reflects the reliability of the measurement tools, indicating whether the individual items in the measurement tools can achieve a consistent and reliable level. The reliability analysis results for each research variable are as follows: Firstly, the reliability analysis for OFY reveals that the measurement tool for this variable includes 10 items, with a Cronbach's  $\alpha$  value of 0.935. This suggests that the measurement tool for OFY demonstrates a high level of internal consistency when assessing employees' perceptions of OFY. The items are well-coordinated, providing a stable reflection of employees' views on OFY. The reliability analysis for GST shows that the measurement tool for this variable consists of 5 items, with a Cronbach's  $\alpha$  value of 0.879. Although slightly lower compared to other variables, this still indicates that the measurement tool for GST is reliable in terms of consistency, allowing for a relatively stable assessment of employees' perceptions of GST. The reliability analysis for SIO indicates that the measurement tool for this variable comprises 8 items, with a Cronbach's  $\alpha$  value of 0.920. This implies that the measurement tool for SIO exhibits high internal consistency when evaluating employees' perceptions of organizational structure, enhancing the reliability of measuring this variable. For OIN, MIN, and CPI, their reliability analysis results also demonstrate high internal consistency. The measurement tool for OIN includes 7 items, with a Cronbach's  $\alpha$  value of 0.908; MIN's measurement tool comprises 6 items, with a Cronbach's  $\alpha$  value of 0.951; and CPI's measurement tool consists of 9 items, with a Cronbach's  $\alpha$  value of 0.923. These results indicate that the measurement tools for these variables have high reliability and internal consistency when assessing the respective perceptions, allowing for a more accurate understanding of employees' views on each variable and providing robust support for organizational management and decision-making.

**Table 1 Reliability Analysis Results**

Variable	Item	Cronbach's $\alpha$
OFY	10	0.935
GST	5	0.879
SIO	8	0.920
OIN	7	0.908
MIN	6	0.951

4.2 CFA

To further examine the structural validity of the scale, the researchers conducted a confirmatory factor analysis (CFA) to assess the validity of the measurement tool. Firstly, the fit indices of the measurement model were examined, revealing a satisfactory fit ( $\chi^2/df=2.624$ , GFI=0.828, NFI=0.865, IFI=0.912, TLI=0.906, CFI=0.911, SRMR=0.050, RMSEA=0.057). Subsequently, tests were conducted to evaluate the convergent validity and discriminant validity of the variables in the scale. The specific testing procedures and results are detailed below:



**Figure 2 CFA**

Convergent validity refers to the degree of correlation between the expected latent variables and their corresponding observed variables. It is typically assessed using three indicators: factor loading, composite reliability (CR), and average variance extracted (AVE). The results of the convergent validity tests for each variable in this study are presented in the following table. From the table, it can be observed that the factor loadings of OFY, GST, SIO, OIN, MIN, and CPI with their respective measured variables are all above 0.5. Additionally, the composite reliability (CR) values are all above 0.7, and the average variance extracted values are above 0.5. These findings indicate that the convergent validity of the variables in the OFY, GST, SIO, OIN, MIN, and CPI scales is satisfactory in this study.

**Table 2: Convergent Validity Test Results**

Variables	Items	Mean	CR	AVE
OFY	A1	0.736	0.936	0.593
	A2	0.805		
	A3	0.771		
	A4	0.793		
	A5	0.854		
	A6	0.810		
	A7	0.704		
	A8	0.732		
	A9	0.731		
	A10	0.751		
GST	B1	0.813	0.881	0.598
	B2	0.720		
	B3	0.809		
	B4	0.794		
	B5	0.724		
SIO	C1	0.804	0.920	0.597
	C2	0.734		
	C3	0.901		
	C4	0.874		
	C5	0.720		
	C6	0.890		
	C7	0.579		
	C8	0.606		
OIN	D1	0.627	0.911	0.597
	D2	0.777		
	D3	0.837		
	D4	0.798		
	D5	0.899		

	D6	0.748		
	D7	0.690		
MIN	E1	0.867	0.952	0.767
	E2	0.943		
	E3	0.875		
	E4	0.798		
	E5	0.873		
	E6	0.893		
CPI	F1	0.747	0.924	0.576
	F2	0.828		
	F3	0.765		
	F4	0.636		
	F5	0.745		
	F6	0.832		
	F7	0.831		
	F8	0.714		
	F9	0.709		

### 4.3 Structural Equation Model

Based on the research hypotheses, this study constructed the initial structural equation model, comprising a total of 6 latent variables and 45 observed variables. The specific diagram of the initial structural model is illustrated in Figure 2 below:

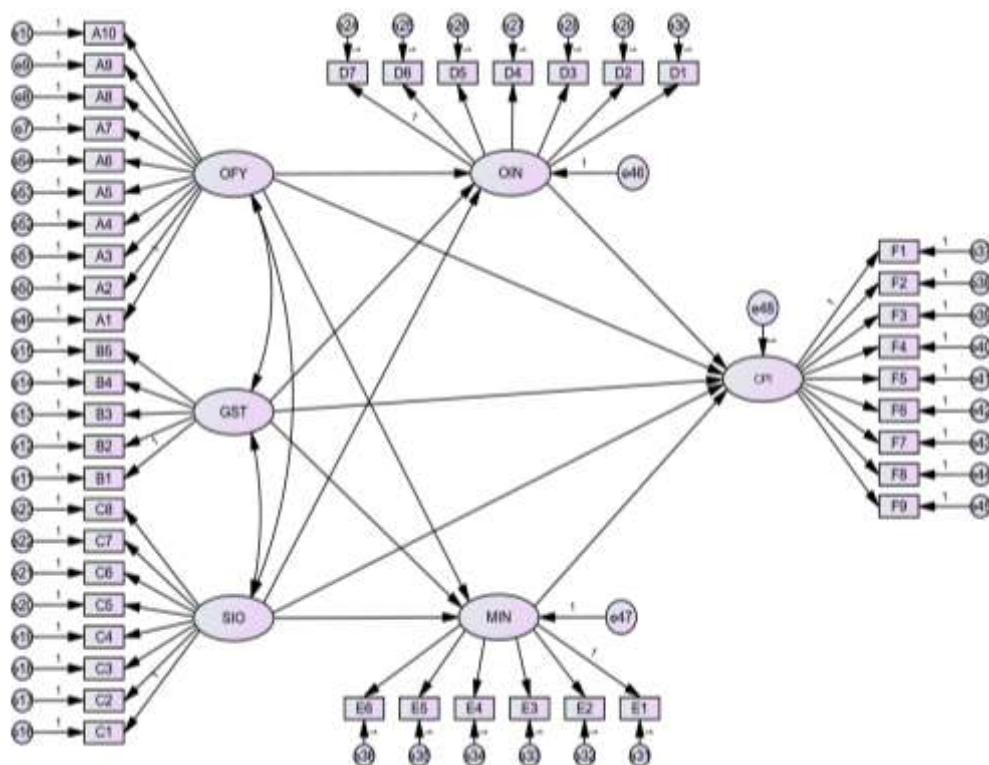


Figure 3 Initial Model Diagram



**1) Structural Model Fit**

The fit of the structural model was examined, and the results indicated that the fit indices for the structural model were as follows ( $\chi^2/df=2.674$ , GFI=0.825, NFI=0.862, IFI=0.909, TLI=0.903, CFI=0.909, SRMR=0.066, RMSEA=0.058). These results suggest that the fit of the structural model in this study is acceptable.

**Table 3 Structural Model Fit Indices**

Fit Indices	$\chi^2/df$	RMSEA	GFI	NFI	IFI	CFI	TLI	SRMR
Fit Results	2.674	0.058	0.825	0.862	0.909	0.909	0.903	0.066

**2) Path Analysis**

**Table 5 Results of Path Analysis**

No.	Relationship	Path	Non-Standardized	Standardized	S.E.	C.R.	P
H1	OFY	– CPI	0.092	0.100	0.037	2.46	0.014
H2	GST	– CPI	0.113	0.121	0.039	2.87	0.004
H3	SIO	– CPI	0.085	0.095	0.037	2.28	0.023
H4	OIN	– CPI	0.345	0.295	0.051	6.82	***
H5	MIN	– CPI	0.373	0.450	0.036	10.34	***
H6	OFY	– OIN	0.110	0.138	0.040	2.71	0.007
H7	OFY	– MIN	0.270	0.242	0.056	4.85	***
H8	GST	– OIN	0.185	0.232	0.043	4.32	***
H9	GST	– MIN	0.228	0.203	0.057	4.02	***
H10	SIO	– OIN	0.155	0.203	0.041	3.75	***
H11	SIO	– MIN	0.178	0.165	0.055	3.23	0.001

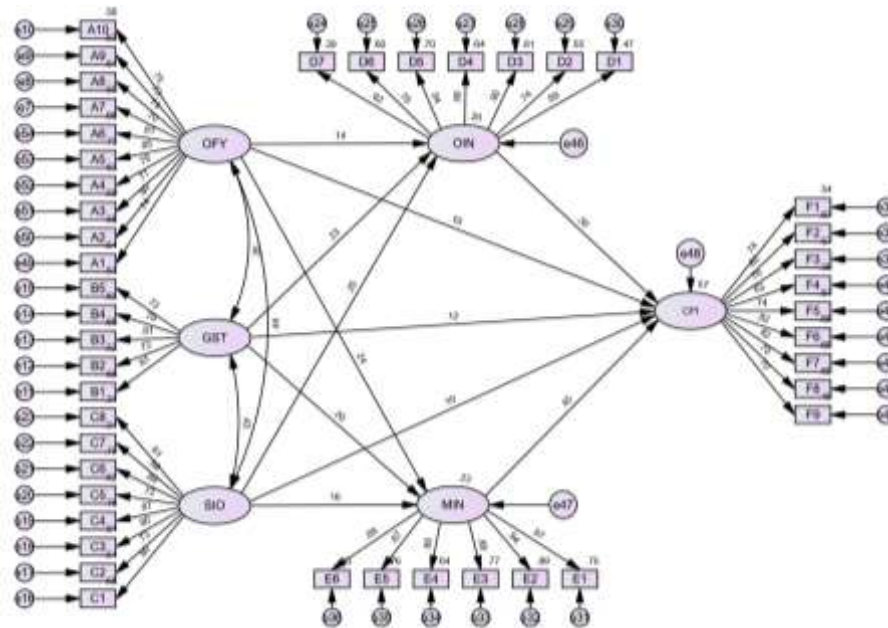


Figure 4: Standardized Path Coefficient Diagram

### 3) Mediation Analysis

Table 5 Mediation Analysis Results

Path Relationship	$\beta$	Lower	Upper	P
OFY→CPI	0.100	0.028	0.176	0.005
GST→CPI	0.121	0.041	0.205	0.003
SIO→CPI	0.095	0.008	0.188	0.032
OFY→OIN→CPI	0.041	0.011	0.082	0.009
GST→OIN→CPI	0.069	0.036	0.114	0.000
SIO→OIN→CPI	0.060	0.027	0.104	0.000
OFY→MIN→CPI	0.072	0.039	0.120	0.000
GST→MIN→CPI	0.060	0.030	0.102	0.000
SIO→MIN→CPI	0.049	0.018	0.090	0.003

### 5. Conclusion

Firstly, regarding the path relationships of each hypothesis: Impact of OFY on CPI (H1): OFY has a significant positive impact on CPI, with a standardized path coefficient of 0.100 and a p-value of 0.014. This implies that enhancing organizational flexibility (OFY) significantly promotes competitiveness in the port industry. Impact of GST on CPI (H2): GST also has a significant positive impact on CPI, with a standardized path coefficient of 0.121 and a p-value of 0.004. This indicates that government support is a crucial factor in enhancing CPI.

Impact of SIO on CPI (H3): The impact of SIO on CPI is also significant, with a standardized path coefficient of 0.095 and a p-value of 0.023. The results emphasize the importance of organizational structure in the competitiveness of the port industry. Impact of OIN on CPI (H4): OIN has a significant positive impact on CPI, with a standardized path

coefficient of 0.295 and a p-value less than 0.001 (\*\*\*). This suggests that OIN is a crucial factor in enhancing competitiveness in the port industry. Impact of MIN on CPI (H5): The positive impact of MIN on CPI is even more significant, with a standardized path coefficient of 0.450 and a p-value less than 0.001 (\*\*\*). This underscores the critical role of effective MIN in enhancing CPI. Next, the researchers examined the influences of OFY, GST, and SIO on OIN and MIN: Impact of OFY on OIN and MIN (H6, H7): Both H6 and H7 are supported, indicating that OFY has a significant positive impact on both OIN and MIN, emphasizing the importance of enhancing OFY in the port industry. Impact of GST on OIN and MIN (H8, H9): H8 and H9 are also supported, indicating that GST has a significant positive impact on both OIN and MIN, further highlighting the positive role of government support in promoting innovation. Impact of SIO on OIN and MIN (H10, H11): Both H10 and H11 are supported, showing that SIO has a significant positive impact on both OIN and MIN. This emphasizes the stimulating effect of organizational structure in the port industry on innovation activities.

In summary, the path analysis results reveal a complex and interconnected network of relationships among organizational flexibility (OFY), government support (GST), industrial organizational structure (SIO), organizational innovation (OIN), and management innovation (MIN) in the port industry. These findings provide crucial empirical support for enhancing competitiveness and driving innovation in the port industry, offering valuable guidance for developing effective strategies and policies.

Through examining the impact of OFY, GST, and SIO on OIN, and then through the path of organizational innovation (OIN) on port industry competitiveness (CPI), significant mediating effects were observed. Specifically, organizational flexibility (OFY) directly influences the path to port industry competitiveness (CPI) through perceived value ( $\beta=0.041$ ,  $P=0.009$ ), government support (GST) directly influences the path to CPI through perceived value ( $\beta=0.069$ ,  $P=0.000$ ), and industrial organizational structure (SIO) directly influences the path to CPI through perceived value ( $\beta=0.060$ ,  $P=0.002$ ). These results indicate a significant impact of organizational innovation (OIN) on port industry competitiveness (CPI) under the mediating role of perceived value. Furthermore, by examining the impact of OFY, GST, and SIO on management innovation (MIN), and then through the path of management innovation (MIN) on CPI, significant mediating effects were similarly observed. Specifically, organizational flexibility (OFY) influences the path to management innovation (MIN) and CPI through perceived value ( $\beta=0.072$ ,  $P=0.000$ ), government support (GST) influences the path to MIN and CPI through perceived value ( $\beta=0.060$ ,  $P=0.000$ ), and industrial organizational structure (SIO) influences the path to MIN and CPI through perceived value ( $\beta=0.049$ ,  $P=0.003$ ). These findings indicate a significant mediating role of organizational innovation (OIN) and management innovation (MIN) in enhancing port industry competitiveness (CPI). In conclusion, the mediation analysis results highlight the mediating effects of organizational innovation (OIN) and management innovation (MIN) in the relationships between organizational flexibility (OFY), government support (GST), industrial organizational structure (SIO), and port industry competitiveness (CPI). These findings provide empirical support for developing more targeted innovation strategies in the port industry, aiding in achieving sustainable and

outstanding competitive advantages in a highly competitive environment.

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