Study on Charging for Comprehensive Port and Shipping Services Based on Collector Investigation Data

Tianchao Guan[1], Guoqing Liu[1,*], Zhehui Zhang[1,*], Xin Guo[2]
[1]Economic Policy and Development Strategy Research Center (Legal Research Center), China Waterborne Transport Research Institute, Beijing, China
[2]Zhejiang Seaport Logistics Group Co., Ltd., Ningbo, Zhejiang, China
**Corresponding Author*

Abstract: Ports and shipping are fundamental components of waterborne transportation, serving as the connecting points of socio-economic activities. Price is a crucial manifestation of how the market and regulatory authorities play their roles. This study adopts a user survey approach to collect data on the fees charged by major market participants involved in port and shipping operations, and related sectors associated with container port and border activities. It systematically categorizes the primary fee items and analyzes their share of total logistics costs. The study further validates these findings through a case analysis of container shipping from China to the U.S. West Coast. Results indicate that the majority of total fees is paid to shipping companies, while port enterprises receive only a small fraction of the total charges. This research provides a theoretical basis for policymakers and port authorities to pursue reforms in the fee structures of comprehensive port and shipping services.

Keywords: Container Transportation; User Survey Data; Comprehensive Port and Shipping Services; Pricing Entities.

1. Introduction

Ports and shipping are indispensable components of the waterborne transportation system, serving as critical nodes that link domestic and international economic cycles and ensure the stability of industrial and supply chains. They represent foundational and leading industries that support the steady operation of the national economy. As the primary mode of global cargo transport, ports and shipping handle over 90% of China's foreign trade cargo, including 98% of imported iron ore, 90% of imported crude oil, 98% of imported grain, and more than 800 million tons of coal transported along the coast. The cost-effectiveness and efficiency of port and shipping services directly influence the overall competitiveness of foreign trade logistics and play a vital role in stabilizing the supply and prices of key domestic commodities, thereby impacting the broader real economy [1].

In the context of building a unified national market, reforms aimed at market-driven resource allocation have been steadily advancing. A key goal is to establish a price formation mechanism based on market supply and demand, reduce inappropriate administrative intervention, and promote the market-oriented pricing reforms in competitive sectors such as water, energy, and transportation. Since port operation package fees are subject to market regulation, port operators can autonomously adjust fee standards according to market conditions, operational costs, and the scope of services provided, reflecting genuine market behavior [1,2].

On January 1, 2022, several major coastal ports in China implemented varying degrees of increases in container operation package fees, attracting broad attention from government authorities and port enterprises. In recent years, rising social costs, including increases in labor, raw materials, and environmental protection expenses, combined with additional costs from pandemic prevention measures, have placed financial strain on port operators. These operators are facing declining revenues and investment returns, which challenge the sustainable and efficient operation of terminals. Furthermore, continuous fee increases risk fostering unhealthy competition among port enterprises, complicating governmental regulatory oversight. To address these issues, strengthen price regulation within the port

sector, cultivate a fair market environment, and promote sustainable improvement in port service quality and capacity, this study conducts a questionnaire survey. The survey focuses on the comprehensive port and shipping service fees associated with foreign trade 20-foot loaded containers at China's coastal ports. By identifying the key stakeholders responsible for fee collection and quantifying their respective revenues, this research analyzes the interactions between charging entities and compares their share within total logistics costs. The insights gained offer a theoretical foundation for port managers to implement reforms in comprehensive port and shipping service fee structures.

2. Literature Review

International shipping accounts for over 90% of China's international trade transport volume, playing an irreplaceable role in promoting economic development and integrating into the process of economic globalization. To remain competitive in the shipping market, stakeholders strive to enhance profits by reducing costs, while governments implement various measures to lower expenses, improve efficiency, and maintain social equity. Port and shipping fees are managed in accordance with relevant regulations, with pricing overseen through a dual system of central and local price catalogues. Centralized port price management falls under the jurisdiction of the Ministry of Transport and the National Development and Reform Commission. Port enterprises must balance economic interests with the need to design pricing structures tailored to different service recipients and service contents, aiming to maximize profits within reasonable bounds. China's port pricing mechanism is fundamentally based on prices generated in the course of port operations, guided by value laws that shape price-setting policies [3].

Research on port fees predominantly focuses on two aspects. The first is the analysis of the drivers behind port fee reforms. Zhai Huijuan [4] categorizes port charges into three main types and highlights that China's port pricing remains subject to strict regulatory controls, with market-driven charging structures not necessarily aligning with existing frameworks. Issues include prolonged stagnation in fee adjustments and inadequate price supervision and inspection mechanisms. Historically, China's port economic management operated under a "unified revenue-expenditure" and "separate accounting" system; ports underwent transitions from "revenue-offset-expenditure" and "port self-financing" models post-1978, eventually progressing to a "fund allocation to loan conversion" approach [5]. Regulatory frameworks for port price reform have gradually aligned with international standards, fostering price formation under supervision and competition. Comparative analyses with prominent international ports such as Hong Kong, Singapore, and Los Angeles reveal notable differences in fee schedules—for example, vessel port dues are relatively high in China, administrative fees constitute a significant proportion, and inspection and auxiliary service fees at customs are elevated, while procedural complexities exist in customs clearance and container release for imports [6]. To adapt to contemporary developments, China has integrated its domestic and foreign trade port fee structures, establishing a pricing mechanism that combines government guidance with market regulation, thereby safeguarding the sustainable growth of international trade [7]. The second research focus concerns the future trajectory of port fee reform. Some scholars advocate for establishing a legal framework to guarantee port pricing, improving pricing mechanisms, unifying domestic and foreign trade port rates, instituting regular fee adjustment mechanisms, and strengthening fee supervision to refine China's port pricing system [8]. Sui Ling et al. [9] propose a phased approach to port price reform, beginning with cargo and container labor fees, followed by vessel port dues reform, and finally addressing administrative fees such as tonnage taxes and harbor service fees. Yang Xiaoguang [10] reviews the background of port fee reforms, analyzing China's 2016 *Port Fee Charging Method*, assessing its core policies and implementation issues from a practical perspective, and identifying unresolved challenges. Zhang Qiang et al. [11] emphasize that the 2016 reform embodies market development principles and predict that market-oriented reforms will dominate port fee restructuring in the medium to long term. Jia Dashan and Xu Di [12] argue that successive revisions to the charging method have optimized the port business environment and aided container shipping growth, while calling for future efforts to increase the share of clean

energy usage in ports and enhance pollution control and energy conservation. Other scholars focus on specific port fee issues. Khondoker and Hasan [13] developed a cost-benefit model for Mongla Port in Bangladesh to assess the economic viability of port fee items. Song et al. [14] studied how liner shipping companies select cooperation models when faced with heterogeneous port charges, constructing equilibrium models to guide strategic choices. In a subsequent study, Song et al. [15] developed mathematical models to describe the optimal strategies of liner companies under conditions of heterogeneous pricing and service competition. The above literature reveals a predominant focus on macro-level analyses of the causes and directions of port fee reforms, with greater emphasis on describing broad social phenomena. In contrast, there is relatively limited attention devoted to micro-level empirical studies involving data-driven analyses of port and shipping enterprises, as well as investigations into the fee structures among various market participants within the port and shipping sectors.

3. Analysis of Comprehensive Port and Shipping Service Charges Based on User Survey Data

3.1 Data Source

To address the issue of fees within the comprehensive port and shipping service system, this study conducted a questionnaire survey focusing on coastal ports as a case example. A total of 350 questionnaires were distributed to, and 336 valid responses were collected from six types of fee-charging entities providing comprehensive port and shipping services, achieving a remarkably high validity rate of 96%. The survey excluded charges such as ocean freight, land transportation fees, and container stuffing fees, instead concentrating on the composition of charging entities, business tariff rates, bases for charging, and fee rate standards. Through this questionnaire, the study obtained a systematic overview of the principal fee-levying bodies involved in comprehensive port and shipping services. Among the six categories, freight forwarding companies and ship agency enterprises accounted for the largest proportions of respondents, whereas yard operators, shipping companies, and port enterprises had relatively lower representation. The detailed distribution is presented in Table 1.

Table 1. The Proportion Analysis of the Charging Principle of the Comprehensive Port and Shipping Service

Charging Entity	Number of Valid Questionnaires	Proportion
Freight Forwarding Companies	109	32.44%
Yard Operators	23	6.84%
Ship Agency Enterprises	85	25.30%
Collection and Distribution Enterprises	77	22.92%
Shipping Companies	17	5.06%
Port Enterprises	25	7.44%
Total	336	100%

3.2 Analysis of Charging Entities in Comprehensive Port and Shipping Services

This section examines the charging entities involved in comprehensive port and shipping services. By combining the scope of fees charged by each entity, the study surveys aspects such as the nature of these entities, the average comprehensive fees for import and export containers, the fee bases employed, and the standards of fee rates. The questionnaire clarifies the principal fee-levying parties (excluding ocean freight, land transport, and container stuffing fees), evaluates their average comprehensive charges per container, the extent of adherence to prescribed fee bases and rate standards, and assesses stakeholder satisfaction. Additionally, the survey investigates the predominant criteria governing fee determination under current operational scales.

3.2.1 Freight forwarding enterprises and shipping agency enterprises

Among the freight forwarding enterprises surveyed, the majority of port clients are Chinese-owned enterprises (totaling 107), with a single company each representing Sino-foreign joint ventures and wholly foreign-owned enterprises. Regarding ship agency firms, 95.29% are Chinese-owned, 3.53% are Sino-foreign joint ventures, and 1.18% are wholly foreign-owned enterprises. Over 80% of freight forwarding companies base their fees and rate standards on items listed in the officially published fee catalogues, while only 5.5%

employ internally formulated rules. The remaining companies adhere to prevailing industry conventions when setting fees. For a single 20-foot container, over 85% of freight forwarding companies report average comprehensive export charges (excluding sea freight, land transport, and stuffing fees) within the 1,500 to 2,000 RMB range. Similarly, 86.24% report import container charges falling within this same band, as illustrated in Figure 1. Currently, the port's fee bases and rate standards manifest in three forms: internal company-specific charge rules, conventional industry charging practices, and adherence to publicly disclosed fee catalogues. The proportional usage of these bases is 5.5%, 13.76%, and 80.73%, respectively. When compared with other ports, approximately 78.57% of freight forwarding enterprises and 73.02% of ship agency companies considered the current service fee rates for freight forwarding and ship agency operations reasonable and aligned with market expectations.

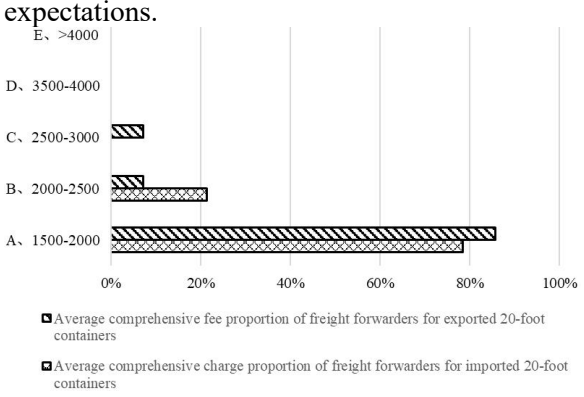

Figure 1. Analysis of Average Comprehensive Fees for Single 20-foot Import and Export Containers

3.2.2 Shipping companies

From the perspective of shipping providers, the survey included responses from 17 shipping companies, with 58.52% operating more than six routes at a single port and maintaining a route frequency of over six sailings per week. The questionnaire further revealed that shipping companies place a high priority on port operational efficiencies, including the level of port informatization, cargo-handling performance, and the efficiency of customs inspections and clearance at the port. Conversely, issues such as cargo composition and disorderly market competition emerged as significant impediments to their business operations. Assessment of the informatization level of Chinese ports by shipping companies shows considerable satisfaction with ports like SH and GZ, which possess advanced container handling capabilities. However, ports with relatively underdeveloped container operations, such as XM and DL, fail to meet the expectations of shipping firms in terms of informatization. Shipping companies evaluated nine key challenges grouped into four categories that affect their port business expansion. Scores denote the degree to which each factor influences business operations, with higher scores indicating greater impact. The detailed evaluation is presented in Table 2. The evaluation highlights that port operation and service levels constitute critical decision factors for shipping companies when expanding their business. Notably, high port charges and opaque pricing, while scored lowest among concerns, remain significant factors impinging upon their willingness to increase port business.

Table 2. The Table of the Comprehensive Evaluation of the Main Problems of Shipping Companies Operating

Category	Key Issue	Composite Evaluation Score
Hinterland Conditions	Geographic location and regional economic development	4.2
Yard Services	Yard service efficiency and fee levels	3.48
Port Operational Efficiency	Low port informatization and a lack of interconnectivity	4
	Inefficient port operations and a shortage of skilled labor	3
	Inefficient customs clearance and a poor inspection environment	4.2
Market Practices	Disordered freight market competition leading to low freight rates	5
	Single cargo structure with predominance of low-value bulk cargo	6.6
Port Service Quality	Institutional rigidity and bureaucratic passivity of port enterprises	3.2
	Insufficient port facilities, inadequate supporting yards, and trucking services	4.4
	High port charges and a lack of price transparency	2

3.2.3 Port collection and distribution operators

Among the 77 Port Collection and Distribution Operators surveyed, 96.1% are local companies operating within the relevant ports. Regarding the scale of their fleets, 42.86% of these operators possess between 10 and 30 collection and distribution trucks, while 38.96% operate fewer than 10 vehicles. Large-scale enterprises—those with fleets exceeding 50 trucks—constitute merely 3.9% of the sample, as illustrated in Figure 2. These port collection and distribution operators frequently encounter challenges related to container deposits and the retrieval of empty containers when conducting their port operations. Currently, the predominant methods of container deposit handling involve 72.73% using bank collection or deposit payment agreements, and 27.27% charging a direct container deposit fee. Furthermore, the most pressing concern for collection and distribution companies is the reasonableness of collection and distribution transportation prices; over 90% of local port collection and distribution operators operating within ports identify this as the principal factor influencing their business activities.

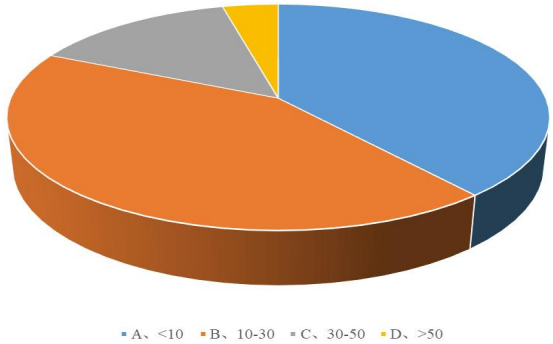

Figure 2. Proportion of Port Collection and Distribution Operators

3.2.4 Port enterprises

The level of attention that port enterprises of varying scales devote to the needs of shipping companies, port collection and distribution operators, and container yard operators differs significantly. This section examines the annual container throughput of port enterprises alongside the key concerns these enterprises have in conducting their operations, based on a questionnaire survey. The survey reveals that 40% of coastal port enterprises handle an annual container throughput of between 2 and 3 million TEUs, while 28% surpass 4 million TEUs annually, as illustrated in Figure 3. Additionally, the challenges faced by port enterprises during their business activities—stemming from shipping companies, collection and distribution services, and port service capabilities—were ranked to calculate composite scores. Higher scores indicate greater concern from port enterprises for the corresponding issue when conducting business at the port; lower scores suggest lesser attention. The detailed results are presented in Table 3. It becomes evident that the conduct and performance of shipping companies represent the foremost focus for port enterprises, with shipping freight rates constituting the core factor influencing their operations.

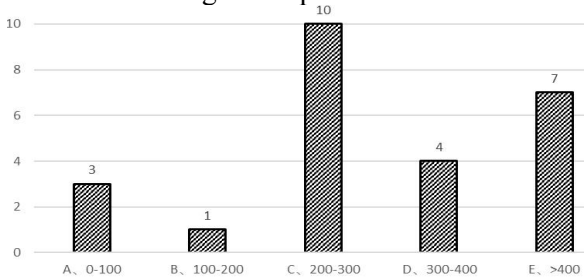

Figure 3. Statistics on Container Throughput of Port Enterprises

Table 3. The Table of Comprehensive Evaluation of the Main Problems of Port Companies Operating

Category	Major Issue	Composite Evaluation Score
Collection & Distribution	Collection and distribution services	3.59
Shipping Companies	Shipping company berth guarantees	7.12
	Shipping company ocean freight rates	6.88
	Shipping company container source assurances	6.11
	Number of shipping routes	5.03
	Shipping route frequency	4.24
Logistics Services	Logistics costs	4.57
	Logistics timeliness	3.72
Port Enterprises	Port operational efficiency	5.77
	Port informatization level (real-time cargo tracking)	5.74
	Terminal structure and grade	3.53
	Conditions of port supporting facilities	2.17

3.2.5 Container yard operators

Among the 23 container yard operator enterprises surveyed, 96.23% affirmed that the current fee standards are strictly implemented in accordance with the publicly announced charging items and rates. Additionally, 84.91% regarded their fees as comparatively reasonable within the industry. This study employed a scoring method to analyze the paramount concerns of container yard operators when conducting business, examining five aspects: collection and distribution service levels, shipping company services, market behavior, logistics services, and port enterprises. The analysis reveals that the foremost issues preoccupying yard operators are, in descending order: the quality of port collection and distribution services within the port area; comprehensive container tracking and real-time monitoring of cargo status; competition within the peer industry; the efficiency of customs inspection and clearance at the port; and transparency in shipping companies' selection of service providers, as detailed in Table 4.

Table 4. The Table of the Comprehensive Evaluation of the Main Problems of Stockpile Companies Operating in Ports

Category	Principal Issue	Composite Evaluation Score
Collection & Distribution	Collection and distribution service level	3.4
Shipping Companies	Transparency of shipping companies' supplier selection	2.43
Market Behavior	Competition among industry peers	2.83
Logistics Services	Real-time container tracking and cargo status monitoring	3.11
Port Enterprises	Conditions of port supporting facilities	2.64

4. Modeling of Comprehensive Port and Shipping Service Charges

4.1 Symbols and Basic Assumptions

Based on the foregoing analysis, Freight Forwarding Enterprises (FFEs) and Shipping Agency Enterprises(SAEs) expressed satisfaction with the current port and shipping charges, whereas port collection and distribution enterprises, shipping companies, and terminal operators regard fees as pivotal and critical factors influencing their business operations. Comprehensive port and shipping services encompass a multi-stakeholder service system involving port enterprises, shipping companies, freight forwarders, ship agents, and port collection and distribution entities. The pricing framework within these services constitutes an interconnected and interactive system of fees. Clarifying the distinctions and interrelations among charges levied by various stakeholders and overall logistics costs provides enhanced guidance for rationalizing port and shipping service fees and optimally allocating service resources. To better characterize the charging behaviors of port and shipping service stakeholders, elucidate the actors and fee structures, and systematically analyze the relationship between port and shipping service charges and logistics costs, this study establishes a user survey-based model of comprehensive port and shipping service fees. The foundational assumptions and symbol definitions are as follows (see Table 5 for notation):

A1: The model focuses exclusively on export cargo trade conducted via containerized shipments, disregarding the influence of cargo value, heterogeneity, variations in trade terms, and fees incurred at destination ports.

A2: The analysis considers normal conditions and the existing standard fee items and rates; it excludes impacts arising from extraordinary circumstances such as geopolitical tensions, hydrological or meteorological anomalies.

A3: The model assumes a vessel size of 335 meters in length and 48.6 meters in width, with a capacity of 10,000 TEUs and a deadweight tonnage of 50,000 to 60,000 tons. Port handling is set at 2,500 TEUs, with a handling rate of 200 natural containers per hour, using two tugboats during berthing and departure operations.

A4: Charges from port and shipping service providers and ocean freight rates are increasing functions of transport distance, shipment volume, and average unit sea distance. Freight forwarding and ship agency fees rise as functions of shipment volume; yard operation fees are functions of container dwell time.

Table 5. The Input Parameters in the Numerical Example

Symbol	Description
TC_0	Comprehensive port and shipping service charges (excluding ocean freight, land transport fees, stuffing fees, etc.)

TC_1	Total logistics cost
C_0	Ocean freight charges
C_1	Freight forwarding charges
C_2	Ship agency charges
C_3	container yard service charges
C_4	Average port collection and distribution charges
C_5	Other service charges (fees outside those listed above)
p_0	Average ocean freight charge per ton-nautical mile
p_1	Unit freight forwarding charge per TEU
p_2	Unit ship agency charge per TEU
p_3	Container yard service charge per TEU
p_4	Port collection and distribution charge per ton-kilometer
t	Cargo storage duration (Unit: Days)
Q	Cargo volume
L_1	Average ocean transportation distance
L_2	Average port collection and distribution distance

4.2 Model Construction

According to assumption A4, the ocean freight charges (C_0) is an increasing function of the average ocean freight charge per ton-nautical mile, the ocean transportation distance, and the cargo volume [16,17]; it satisfies the functional relationship expressed by Equation (1):

$$C_0 = C_0(p_0, L_1, Q) = p_0 Q L_1 + \frac{1}{2} p_0 Q L_1^2 \tag{1}$$

The charges for comprehensive port and shipping services (excluding ocean freight charges, land transportation fees, container stuffing fees, etc.) primarily comprise freight forwarding charges, ship agency charges, container yard service charges, average port collection and distribution charges, and other service charges [18-20]. This relationship is described by Equation (2), where freight forwarding and ship agency charges are increasing functions of cargo weight, as represented in Equations (3) and (4), respectively. Container yard service charges are expressed as a piecewise function dependent on cargo storage duration, shown in Equation (5). Average port collection and distribution charges increase as functions of both transport distance and cargo weight, as expressed in Equation (6). Other service charges encompass expenditures beyond those listed above.

$$TC_0 = C_1 + C_2 + C_3 + C_4 + C_5 \tag{2}$$

$$C_1 = p_1 Q \tag{3}$$

$$C_2 = p_2 Q \tag{4}$$

$$C_3 = \begin{cases} 0, & t \le 7 \\ p_3 t, & t > 7 \end{cases} \tag{5}$$

$$C_4 = p_4 Q L_2 \tag{6}$$

Substituting Equations (3) through (6) into Equation (2) yields the explicit expression for comprehensive port and shipping service charges, as shown in Equation (7):

$$TC_0 = \begin{cases} (p_1 + p_2)Q + p_4 Q L_2 + C_5, t \le 7 \\ (p_1 + p_2)Q + p_3 t + p_4 Q L_2 + C_5, t > 7 \end{cases} \tag{7}$$

The total logistics cost TC_1 is the sum of the comprehensive port and shipping service charges and the ocean freight, i.e., $TC_1 = TC_0 + C_0$ where ocean freight is an increasing function of both ocean transportation distance and cargo volume, thereby satisfying the condition $C_0 = p_0 Q L_1$. Incorporating Equations (7) and $C_0 = p_0 Q L_1$ into $TC_1 = TC_0 + C_0$ yields the total logistics cost presented in Equation (8):

$$TC_1 = \begin{cases} (p_1 + p_2)Q + p_4 Q L_2 + C_5 + p_0 Q L_1, t \le 7 \\ (p_1 + p_2)Q + p_3 t + p_4 Q L_2 + C_5 + p_0 Q L_1, t > 7 \end{cases} \tag{8}$$

5. Case Study

To vividly illustrate the fee collection status of various market participants at ports, as well as the proportion of each participant's fees within the total logistics costs, this section organizes the principal fee items charged by major market entities involved in foreign trade container transportation at ports. It further applies a specific case study analyzing the logistics expenses for shipments from China's central region to the U.S. West Coast. Taking 20-foot containers exported from central China to the U.S. West Coast as an example, this study, based on the computational methods outlined in Section 4, examines the logistics costs borne jointly by Chinese exporters and overseas buyers under regular conditions and different trade terms, as summarized in Table 6. Notably, ocean freight charges, terminal handling charges (THC), documentation fees, sealing fees, telex release fees, equipment interchange receipt fee (EIR fee), and other ocean freight surcharges are levied by shipping companies. Fees including EDI transmission fees, documentation fees and

booking service fees are charged by shipping agency enterprises. Port enterprises are the charging entities for fees such as port facility security fees, harbor dues on cargo and storage fees, as well as for the port collection and distribution transportation fees that are subsequently paid to port collection and distribution enterprises.

Table 6. Detailed List of Logistics Costs for Sea Freight Exports to the West Coast of the United States

No.	Fee Item	Pricing Type	Charging Entity	Fee (CNY/TEU)
1	Ocean Freight and Other Surcharges	Market-regulated prices	Shipping Companies	18460
2	Terminal Handling Charge (THC)	Market-regulated prices	Shipping Companies	640
3	Documentation Fee	Market-regulated prices	Shipping Companies	450
4	Sealing Fee	Market-regulated prices	Shipping Companies	30
5	Telex Release Fee	Market-regulated prices	Shipping Companies	250
6	Equipment Interchange Receipt (EIR) Fee	Market-regulated prices	Shipping Companies	30
7	EDI Transmission Fee	Market-regulated prices	Ship Agency Enterprises	100
8	Documentation Fee	Market-regulated prices	Ship Agency Enterprises	25
9	Booking Service Fee	Market-regulated prices	Ship Agency Enterprises	100
10	Port Facility Security Fee	Government-set prices	Port Enterprises	8
11	Cargo harbor dues	Government-set prices	Port Enterprises	17
12	Storage Fee	Market-regulated prices	Port Enterprises	20
13	Port collection and distribution transportation Fee	Market-regulated prices	Port collection and distribution enterprises	1000
14	Lifting Fee	Market-regulated prices	Container yard operators	50
15	Warehousing Fee	Market-regulated prices	Container yard operators	20
16	Inspection Agency Fee	Market-regulated prices	Customs Brokers	200
17	Customs Declaration Fee	Market-regulated prices	Customs Brokers	200
18	Agency Fee	Market-regulated prices	Freight Forwarding Companies	300
Total				21900

Notes: (1) Data compiled from publicly disclosed charging standards and survey data of representative port enterprises as of July 2020. (2) Ocean freight and other surcharges do not include terminal handling charges, documentation fee, sealing fee, telex release fee, and equipment interchange receipt fee. (3) The fees do not account for charges incurred at destination ports.

Container yard operators are the charging entities for fees such as lifting charges and storage fees; customs brokers are the charging entities for fees such as customs declaration agency fees and inspection and quarantine agency fees. Freight forwarding charges are charged by freight forwarders. Shipping companies collect fees such as ocean freight charges, terminal handling charge (THC), documentation fees, seal fees, telex release fees, equipment interchange receipt fees (EIR fees) and other ocean freight surcharges from shippers or overseas buyers, and are required to make payments to port enterprises, pilotage authorities, tugboat companies, tally companies and customs authorities for the completion of port operations. To show the share of total export logistics costs paid by Chinese shippers and overseas buyers collected by each entity, this study breaks down shipping companies' pass-through fees and allocates them to actual charging parties such as ports and pilotage authorities, as shown in Table 7. In summary, for 20-foot containerized goods exported from central China to the U.S. West Coast, under typical circumstances and varying trade terms, the largest share of total export logistics costs is paid to shipping companies, accounting for approximately 88%. Port collection and distribution enterprises account for approximately 4.6%, while port enterprises account for approximately 2.4%. In the cost structure, government-priced fees account for about 0.26%, government-guided prices for 0.21%, and vessel tonnage tax for 0.07%; all other fees adopt market-regulated pricing. Under regular conditions, excluding ocean freight and other surcharges (covering terminal handling

charge, documentation fee, seal fee, telex release fee, and equipment interchange receipt fee), the fees of port collection and distribution enterprises account for approximately 29%, shipping companies 24%, and port enterprises 15%. Of these, government-set prices account for approximately 1.64%, government-guided price account for approximately 1.32% of the total cost, and vessel tonnage tax 0.46%; all other items adopt market-adjusted pricing.

Table7. Detailed List of Sea Freight Export Costs after the Shipping Company Transfers Payments

	Export to the U.S. West Coast		Export to the U.S. West Coast	
Charging Entity	Including Ocean Freight and Surcharges (CNY/TEU)	Proportion	Excluding Ocean Freight and Other Surcharges (CNY/TEU)	Proportion
Shipping Companies	19310.2	88.20%	850.2	24.49%
Ship Agency Enterprises	225	1.03%	225	6.48%
Port Enterprises	521.8	2.38%	521.8	15.03%
Port Collection and Distribution Enterprises	1000	4.56%	1000	28.80%
Container Yard Operators	70	0.32%	70	2.02%
Customs Brokers	400	1.83%	400	11.52%
Freight Forwarding Companies	300	1.37%	300	8.64%
Pilotage Authority	21	0.10%	21	0.60%
Tugboat Companies	18	0.08%	18	0.52%
Tally Companies	18	0.08%	18	0.52%
Vessel Tonnage Tax Collected on Behalf by Customs	16	0.07%	16	0.46%
Total	21900	100.00%	3440	100.00%

Notes: (1) Excluding ocean freight and other surcharges refers to the exclusion of ocean freight, but includes terminal handling charge, documentation fee, sealing fee, telex release fee, and equipment interchange receipt fee; other surcharges beyond these five fees are excluded. (2) The above fees do not account for charges incurred at destination ports.

6. Conclusion

This study addresses the issue of fee structures within the comprehensive port and shipping service system by conducting a survey-based investigation focusing on coastal ports. A total of 350 questionnaires were distributed among six categories of charging entities involved in providing comprehensive port and shipping services. Through this survey, the charging practices of key market participants-including shipping companies, ship agency enterprises, port enterprises, collection and distribution companies, yard operators, customs brokers, freight forwarders, pilotage agencies, towage companies, and tally service providers-were systematically examined. Furthermore, these findings were validated through a practical case study. The results reveal that within the comprehensive port and shipping service fee system, the predominant fee collector is the shipping company, while the proportion attributable to port enterprises remains comparatively modest.

Acknowledgments

This work was financially supported by the Research Project of the National Social Science Fund of China (Grant No. 24VHQ001).

References

[1] Sheng Jinlu, Wan Yiyang. The Comparison of Port Construction Dues Collection and Utilization of Major Shipping Countries of the World. China Maritime Safety, 2021, (05): 16-20. DOI:10.16831/j.cnki. issn1673-2278. 2021.05.005

[2] Sui Ling. Interpretation of the Revision of "Port Charging and Billing Measures". China Ports, 2017, (11): 14-15.

[3] Sui Ling. Theory and Practice of Port Charging Reform in China, 2020. Beijing:

People's Transportation Publishing House.
[4] Zhai Huijuan. Historical Evolution and Urgent Issues of Port Charging in China. China Ports, 2011, (09): 5-8.
[5] Price Committee of China Port Association. Research on Port Pricing Mechanism. China Ports, 2001, (07): 40-41.
[6] Xu Jiayi. Many Doubts and Suggestions on Port Charges: Exploring Port Charging Reform from the Analysis of Port Fees in Shanghai Yangshan Free Trade Port Area. China Ports, 2012, (03): 16-23.
[7] Xu Xindi, Chen Jihong, Zeng Xin. Problems and Reform Countermeasures of Port Charges. Port Economy, 2015, (12): 31-33.
[8] Wang Yan. The Urgent Need to Improve China's Port Pricing Mechanism. China Water Transport, 2012, (04): 14-16.
[9] Sui Ling, Xu Ping, Yu Jing, Liu Yawen. Formation Mechanism and Development Trend of Port Prices in China. Water Transport Management, 2015, 37(1): 14-18.
[10] Yang Xiaoguang. Ongoing Port Charging Reform. China Ports, 2016, (04): 11-14.
[11] Zhang Qiang, Lu Yuhan, Wang Xuefeng. The study on the external motivation and internal logic of Chinese port charges reform. Price Theory and Practice, 2016, (08): 81-84.
[12] Jia Dashan, Xu Di, Cai Peng. Review of Coastal Port Development in 2022 and Outlook for 2023. China Ports, 2023, (01): 1-12.
[13] Nikola Mandi´, Anita Gudelj, Merica Sliškovi´, et.al Transposition of the PRF Directive in European Ports: Charging Models, Practices, and Recommendations. Sustainability 2025, 17, 9416.
[14] Song Z, Tang W, Zhao R. Cooperation mode for a liner company with heterogeneous ports: Business cooperation vs. port investment. Transportation Research Part E: Logistics and Transportation Review, 2018, 118: 513-533.
[15] Song Z, Tang W, Zhao R. Liner alliances with heterogeneous price level and service competition: Partial vs. full. Omega, 2021, 103: 102414.
[16] Xie Xinlian. Ship Transport Management and Operation. 3rd ed. Dalian: Dalian Maritime University Press, 2018.
[17] Adland R, Benth E F, Koekebakker S. Multivariate modeling and analysis of regional ocean freight rates. Transportation Research Part E, 2018, 113 194-221.
[18] Zhang Zhehui. Optimizing the Port and Shipping Business Environment: Based on Institutional Mechanisms and Cross-border Trade Facilitation. Wuhan: Wuhan University of Technology Press, 2020.
[19] Wang X P, Zhang Z M, Guo Z H, et al. Energy structure transformation in the context of carbon neutralization: Evolutionary game analysis based on inclusive development of coal and clean energy. Journal of Cleaner Production, 2023, 398: 136626.
[20] Jeong Y, Kim G. Reliable design of container shipping network with foldable container facility disruption. Transportation Research Part E: Logistics and Transportation Review, 2023, 169: 102964.

