

Low carbon efficiency of the port logistics service supply chain under the restriction of study

Xu xinrong

Harbin University of Commerce, Harbin Heilongjiang 150028

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Abstract: With the rapid development of logistics industry, sea transportation is now more and more business share. At present, about ninety percent of the trade is done by the maritime transport of goods, the increase in shipping business competition at the same time, also put forward higher request to the port logistics service. At present, the ports as the important part of global integrated transport network, in addition to a high level of service quality and efficiency of operation mode, there is an energy-efficient hard Numbers, this is "low carbon constraints". Therefore, on the basis of fully understand the traditional logistics industry many defects, must focus on the value of the port logistics supply chain integration and service integration and coordination of technical ability, to improve the efficiency of the port logistics service supply chain to achieve low carbon index on the basis of requirements, make the development of port logistics services as a modern, green, efficient, economic and trade service industry.

With the rapid development of logistics industry, maritime transport will occupy a higher share of the business, currently about ninety percent of the material trade is done by sea transport, which creates a national maritime day by day fierce business competition, and puts forward higher demands on port logistics services^[1]. Ports as the important part of global integrated transport network, in addition to a basic configuration, technical level, operation efficiency and management ability and the quality of service requirements, there is an energy-efficient hard Numbers, this is the "low carbon constraints". Many experts from various angles at different levels was carried out on low carbon logistics analysis and research, and put forward some valuable Suggestions and measures^[2]. However, if only from the Angle of reducing carbon emissions, to promote low-carbon logistics model is not fundamental, and should focus on the value of the port logistics supply chain integration and service integration and coordination of technical ability, to improve the efficiency of the port logistics service supply chain to achieve low carbon index on the basis of requirements, make the development of port logistics services as a modern, green, efficient, economic and trade service industry^[3].

Low carbon constraints port logistics services are faced with the problem

Low carbon economy refers to the concept of sustainable development guidance, through technology, system, the innovation of the industry, energy, development and utilization of traditional and reduce energy consumption and greenhouse gas emissions, so as to achieve the social economy and ecological environment harmonious coexistence of a form of economic development^[4]. Efficiency of port logistics services^[4] if they are not able to win, not only affect its efficiency increase, and will affect the construction of a low carbon economy mode, which is harmful to its long-term sustainable development^[5]. The efficiency of the port logistics is not only the embodiment of the port logistics service ability, is also the important indicators of low carbon

levels. Due to the logistics industry development in our country is relatively backward, late and low starting point determines the port logistics in infrastructure, technology and service level and the developed countries still have large gap, the formation of this mode of low carbon economy is clearly a hindrance^[6]. In response to climate change, energy conservation and emissions reduction, development of low carbon economy has become the consensus of the international community, and therefore some counter measures, such as low carbon tax on imports is one of them. Port logistics service mode innovation is not simply to reduce energy consumption, but a comprehensive, complex and complicated systematic process, including the port logistics service idea of ascension, port logistics service infrastructure upgrades, the update of technology in the service of port logistics, port logistics service supply chain integration, port logistics service supply chain coordination, port logistics service supply chain operation, port logistics service supply chain management, etc^[7].

Low carbon constraints under the basic model of ports and logistics service provider cooperation

In low carbon constraints to establish reasonable in port and basic model of logistics service provider to cooperation, to make the following assumptions:

(1) Facing the user's logistics demand x is negative, the continuous random variables, obey uniform distribution; Port within a logistics service cycle t order only a logistics service ability, and a unit of logistics capability corresponds to a unit of logistics service capability requirements ;

(2) Ports and logistics service providers to know all of the requirements and the information such as price, and both are perfectly rational and risk neutral, both with profit maximization as the decision objective; Ports and logistics service providers are allowed to logistics service ability, lack of logistics capability of the two unit costs $g_1 g_2$, respectively;

(3) If the port to the logistics service provider subscription logistics services than the user capacity Q random logistics services capacity needs x , then the ports can be because of the constraint of time remaining logistics services capacity v low-price transfer to other users.

(4) In order to conform to the reality, assuming $p > w > v$, including p for the port logistics service for the users of the unit price, w for logistics service providers to provide logistics services to port the unit price, v for the remaining logistics service ability to transfer price, called the salvage value of the port.

Suffer x said port logistics service demand; $F(x), f(x)$ respectively users logistics service demand distribution function and density function; Q said port number to order the logistics capability of logistics service providers; p said port logistics service capability to provide users with unit of measure; w said for port logistics service providers to provide service capacity price; v said the remaining logistics service ability to transfer price;

c_{sf} said logistics service provider's unit logistics service capability, discounted cost of the investment; c_{sv} said logistics service providers, unit logistics service ability operating costs; Unit

g_1 said port logistics service ability lack cost; g_2 show that the cost of logistics service providers (isps) unit logistics service ability; t said logistics service cycle, namely port deferred time; Π_p the expected profit of said port; Π_s said logistics service provider's expected profit; Π_{sc} said the expectations in the supply chain profit.

(1) Decentralized decision making model in the case of delay in payment

Port of expected revenue by sales, ordering cost and salvage value, lack of logistics capability of the loss cost and gains by deferred payment, expression is (4), (5) :

$$\frac{\partial \Pi'_s}{\partial r} = w\varphi(r) + w(1+r)A - (c_{sf} + c_{sv} - g_2)A + (c_{sv} - g_2)F(\varphi(r))A - wth_2A \quad (4)$$

$$\frac{\partial^2 \Pi'_s}{\partial r^2} = 2wA \quad (5)$$

$A = -wa/(p-v+g_1)$ and assuming $c_{sv} = g_2$, the existence rate $r^{/*}$ make logistics service provider's maximum profit. In this model, a numerical search using the related software r to come to meet the requirements of formula (6), (7) values.

$$\max \Pi'_s \quad (6)$$

$$s.t. \Pi'_s > \Pi_p, \Pi'_s > \Pi_s \quad (7)$$

In this model, the logistics service providers selection r the value of the expected profit not only to make themselves and port, get the corresponding value r this article through the concrete example. By searching the available $r^{/*}$, ports and logistics service provider's expected profits, profit of supply chain system as shown in formula (8) :

$$\Pi'_{sc}(Q^{/*}, r^{/*}) = \Pi'_p(Q^{/*}, r^{/*}) + \Pi'_s(Q^{/*}, r^{/*}) \quad (8)$$

(2) Integrated coordination model in the case of delay in payment

To port and logistics service provider as a whole, form the integrated supply chain to achieve the optimal expected profits, in the use of reasonable coordination mechanism to distribute the profits, the ports and logistics service providers expect to profit (9) 、 (10) :

$$\Pi''_p(Q^{/*}) = [p - w(1+r^{/*}) + g_1]Q^{/*} - (p-v+g_1)\int_0^{Q^{/*}} F(x)dx + wQ^{/*}th_1 - g_1\mu \quad (9)$$

$$\Pi''_s(Q^{/*}) = [w(1+r^{/*}) - c_{sf} - c_{sv} + g_2]Q^{/*} + (c_{sv} - g_2)\int_0^{Q^{/*}} F(x)dx - wQ^{/*}th_2 - g_2\mu \quad (10)$$

In the formula, $Q^{/*}$ Indicates that the optimal logistics services capacity quantity ordered,

Means that the interest rate, logistics services providers in determining the time r change to meet in the integrated logistics services supply chain the port and your profits is greater than the fragmentation of the Profits under. Only in this way can guarantee payment on a deferred the implementation of the policy so that the Harmonization of ports logistics services supply chain objectives had been attained.

This paper, taking a port of hebei cooperation with shipping company as an example, the

coordination model is valid. Assume that a port in hebei facing users random demand $x \sim U(0,10000)$, namely satisfy uniform distribution, other specific parameters are shown in table 1:

Table 1 basic parameter model

ρ /yu an	w /yu an	c_{sf} /yu an	c_{sv} /yu an	g_1 /yu an	g_2 /yu an	h_1 /% an	h_2 /% an	v /yuan an	t /Month an
80	50	30	15	10	20	0.4	0.25	20	0.5

Using matlab software can calculate the each model under the expected profit, the port of hebei a ship company expected profits and the composition of the gross profit of supply chain system. Model under the condition of delay in payment, can get the appropriate interest rate, make the supply chain system profit in hebei allocate a port and ship company. Table 2 is calculated in the basic model and deferred payment model under the expected profits of three parties:

Table 2. The optimal strategy under different supply chain structure compared with the corresponding expected profit

The type of supply chain	Transportation logistics service ability, the optimal quantity/ton	The interest rate r /%	A port expected profit/yuan	Ship company expected profit/yuan	Supply chain system expected profit/yuan
Ship company expected profit/yuan	5714.3	-	64286	34694	98980
Delay in payment under the decentralized supply chain	6428.6	0.10	94643	42384	136991
Deferred payment integrated supply chain	9166.7	0.01	109650	55452	165100

Low carbon, promote efficiency of port logistics service supply chain under the restriction of the effective strategy

1、 Optimization services integrated configuration and structure of the supply chain

Port logistics service supply chain is the necessity of developing logistics industry, which not only conforms to the trend of economic globalization, is also conducive to port logistics through

scale development and realizing the maximization of economic benefit, and large-scale development of port logistics is definitely building supply chain integration services.

Port logistics based on the traditional port facilities and operation, only as much as possible of related enterprises, to build form a complete and scale of service supply chain. Based on a common goal and overall benefit maximization and optimization of cooperation. Although independently of each enterprise in the business process of cooperation, but the business must be within the supply chain coordination strategy, should be in their respective business scope for supply chain play to their respective functions.

2、 Improve the service supply chain technology and management of affordable

Port logistics service chain technical mainly embodied in three aspects: one is the logistics equipment and the degree of the basic tools of advanced technology, the second is the logistics process reach the level of technical standards, three is the enterprise management level, the "software" technology, the three levels of technology will become an important guarantee of port logistics service supply chain. Port logistics companies in the supply chain service process should achieve the technical standards and requirements prescribed by the state. When each link can be in accordance with the unified standard operation, supply chain can be more cohesion and coordination, the whole process can be more smoothly, thus saving time and logistics costs and improve service efficiency. Due to the service operation of a supply chain is more complex, must be the use of modern management techniques and means of management, make each node enterprise more harmonious and consistent^[8].

3、 Strengthen the core position of the service supply chain and coordinating role

Throughout the supply chain coordination operation of port enterprises are undoubtedly the core and dominant position, and therefore must be to do a good job of coordination of all parties. Port enterprises should be the operation of the logistics service chain integration aspects information, shall, in conjunction with the government departments jointly set up systematic platform for the sharing of information, so that the regulation and supervision of the entire logistics system. In the port logistics center, under the unified dispatching of the coordination of the regional port logistics operation can be smoothly. Port enterprise's ability to use their coordination to all parties a fair distribution of benefits, to achieve mutual benefit and win-win results, it is to keep the coordination of supply chain operation smoothly and the basis of the fundamental.

Port logistics service supply chain under the restriction of low carbon through improving the efficiency of supply chain services and reduce energy consumption and emissions, is the surest way to sustainable development of the logistics enterprise. Logistics enterprises to seize the opportunities brought by the low carbon economy, for the promotion and development of the enterprise planning and decision-making. In the process of participate in the operation of port logistics service supply chain cooperation, interaction and mutual assistance, for the effective operation and harmonious development of port logistics supply chain to provide support and protection, achieve the low carbonization of port logistics supply chain, greening and modernization, to increase the logistics service industry to a new level.

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