

Literature Review on Decision-Making and Coordination of Closed-loop Supply Chain

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Abstract: Effective treatment and recycling of waste products in the operation of closed-loop supply chain can not only save resources and energy, reduce environmental pollution, but also reduce costs and increase profits for enterprises. All participants in closed-loop supply chain often make decisions with the goal of maximizing overall benefits. This paper aims at summarizing the research progress of decision-making and coordination of closed-loop supply chain, summarizing the factors that affect the decision-making of closed-loop supply chain from the non-economic behavior of decision-makers, green investment, uncertainty, government and policy, and summarizing the commonly used coordination mechanism of closed-loop supply chain, so as to explore the future research direction.

Keywords: Closed-loop supply chain, decision-making, coordination mechanism.

1. Introduction

With the rapid development of science and technology and social economy, a variety of environmental problems have emerged, threatening the natural ecology and human survival. For the manufacturer-led supply chain, in order to reduce the environmental pollution of the whole supply chain, the effective treatment and recycling of waste products are emphasized. Reverse logistics is a kind of logistics activity including product return, material substitution, material reuse, waste treatment, reprocessing, maintenance and remanufacturing. The closed-loop feedback circulation process of "resources-survival-consumption-renewable resources" based on the traditional forward supply chain and considering the reverse supply chain is called closed-loop supply chain. Because the recycling and remanufacturing of waste products involved in closed-loop supply chain can greatly save resources and energy and reduce environmental pollution, it is an effective way for many enterprises to reduce costs and increase profits, and the related research of closed-loop supply chain has been paid more and more attention and studied.

For a simple closed-loop supply chain structure composed of manufacturers, retailers, remanufacturers and end consumers, all independent decision-makers always make decisions such as commodity pricing, production quantity, technology investment and other variables based on maximizing their own interests, but the result of such decisions is often not the optimal decision-making strategy for the whole supply chain. In addition, the concept of strategic partner and alliance in supply chain is put forward, and the supply chain is gradually moving towards horizontal integration and vertical integration cooperation structure, instead of making decisions only from the perspective of independent participants. Another important issue under the cooperative alliance is the interest coordination among the participants in the closed-loop supply chain. By formulating a fair and efficient profit distribution coordination mechanism,

the interaction and win-win among the decision-making participants can be realized, which is conducive to the optimal operation of the whole closed-loop supply chain system.

When studying the decision-making and coordination of closed-loop supply chain, scholars usually consider the special properties of products, various non-economic factors of decision-makers and the uncertainty of external environment to build a more complex closed-loop supply chain structure. This paper attempts to sort out the research progress of closed-loop supply chain decision-making and coordination, in order to find the direction that can be further expanded in the future, and combine the existing research at home and abroad to think about the direction that can be innovated or improved. The structure of the rest of this paper is roughly as follows: Section 2.1 discusses the overall research trend of closed-loop supply chain decision-making and coordination at home and abroad; Section 2.2 analyzes the research content of closed-loop supply chain decision-making in detail; Section 2.3 then expounds the coordination mechanism of closed-loop supply chain; Section 2.4 summarizes and comments on the existing research status and shortcomings at home and abroad; Finally, future research.

2. Literature Review

2.1. Overall research trends

This paper analyzes and summarizes the overall research trend of decision-making and coordination of closed-loop supply chain at home and abroad in recent years from the annual number of papers, main themes and keywords.

2.1.1. Domestic periodical-China Knowledge Network (CNKI)

In China CNKI, 466 academic journals were searched with the key words of "closed-loop supply chain decision-making", and 465 academic journals were searched with the key words of "closed-loop supply chain coordination". The annual post volume is shown in the following figure:

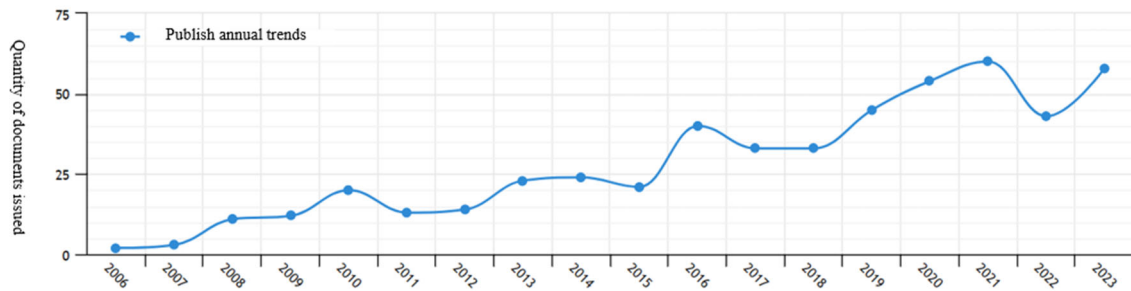


Figure 1. Annual trend of "closed-loop supply chain decision-making"

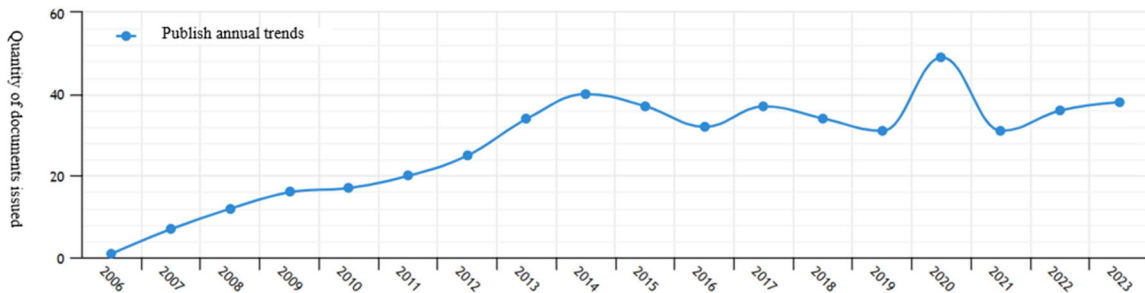


Figure 2. Annual trend of "closed-loop supply chain coordination"

From the above analysis, it can be seen that the research on decision-making and coordination of closed-loop supply chain has always shown an upward trend, and reached the peak of annual papers in 2021 and 2020 respectively, which is still one of the research directions that can not be ignored in academic circles and has considerable research prospects.

Then, the academic journals from 2018 to 2023 were selected, and 247 journals on the theme of "closed-loop supply chain decision-making" and 116 journals on the theme of "closed-loop supply chain coordination" were obtained, and the main keywords in the research on closed-loop supply chain decision-making and coordination in recent years were analyzed.

From the word cloud diagram analysis of closed-loop supply chain decision-making and coordination, closed-loop supply chain decision-making and closed-loop supply chain

coordination are often studied at the same time. On the closed-loop supply chain decision-making, the factors such as fairness concern, reciprocal preference, green preference, green degree, corporate social responsibility, carbon trading, government regulation and power structure are considered to build a closed-loop supply chain operation system, and then the pricing decision is solved by stackelberg game model. Closed-loop supply chain coordination mostly adopts revenue sharing and cost sharing contract, two-part pricing contract and differential pricing to formulate coordination mechanism.

2.1.2. Foreign journals-web of science (WOS)

According to the retrieval rule of "(TS = (closed-loop supply chain decision)) or TS = (closed-loop supply chain coordination)", 1396 core journals were obtained. The annual post volume is shown in the following figure:

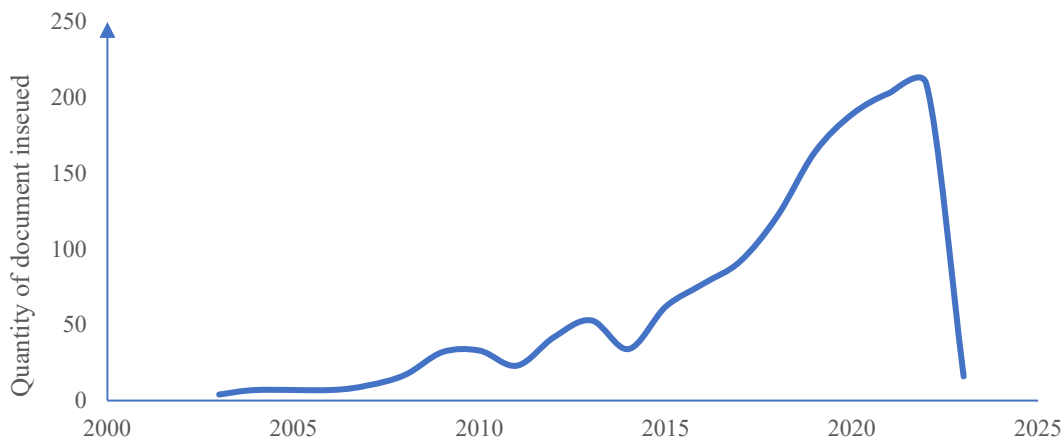


Figure 3. Closed-loop supply chain decision-making and coordination of the trend of annual publication volume of foreign periodicals

As can be seen from the figure, the research on decision-making and coordination of closed-loop supply chain in foreign journals has shown an obvious growth trend since 2014, and this research field has attracted more and more attention with the attention of ecological environment.

Then, 913 core journals published in 2018-2023 were selected for keyword analysis, and their keyword cloud images were obtained as follows:

followers think that they have been unfairly treated and make unfavorable behaviors, which not only hinders the overall profit improvement of the closed-loop supply chain, but also undermines the sustainable cooperation among the members of the closed-loop supply chain, so it is particularly important to consider the issue of fairness concern. These concerns include fairness of manufacturers, fairness of retailers, fairness of consumers and fairness of various parties. Jian et al.[7] constructed a green closed-loop supply chain composed of manufacturers and retailer, and the fairness of manufacturers is considered. It shows that when manufacturers have fair attention, it is not conducive to the environmental performance of green products, leading to waste of resources, but it also forces retailers to reduce sales efforts and increase the retail price of products. Li Xinran et al.[8] constructed four decision-making models of whether to consider the improvement of service level under retailer's fairness neutrality and whether to consider the improvement of service level under retailer's fairness concern, and discusses the influence of retailer's service level and fairness concern behavior on the decision-making of closed-loop supply chain. Sun Jiayi et al.[9] based on consumers' preference and concerns about consumers' fairness, the decision-making models of single-channel and double-channel closed-loop supply chain are established, and the equilibrium results in different situations are compared and analyzed. The influence of consumers' acceptance of recycled products and concerns about fairness on members' decision-making and profits is discussed.

(2) Corporate social responsibility

Corporate social responsibility (hereinafter referred to as CSR) means that enterprises attach importance to the interests of shareholders, partners, employees, consumers and other parties while maximizing their own interests. Li Xinran et al.[10] constructed four closed-loop supply chain models with or without retailers' corporate social responsibility and manufacturers' quality efforts, discusses their influence on closed-loop supply chain profits, prices and other factors, and puts forward corresponding countermeasures.

(3) Double-channel closed-loop supply chain-hitchhiking behavior

With the development of online and offline dual-channel sales model, on the one hand, it is conducive to improving customer satisfaction and loyalty, on the other hand, it also produces the "hitchhiking behavior" of consumers experiencing online purchases offline, and the research on this behavior has gradually attracted attention. Li Xinran et al.[11] considered the double-channel closed-loop supply chain system composed of a single manufacturer and a traditional retailer, and the free-riding behavior of consumers widely exists in the market, this paper compares and analyzes the influence of free-riding behavior of consumers on the decision-making and profits of closed-loop supply chains with different power structures. Li et al.[12] modeled and analyzed the price decision in the dual-channel closed-loop supply chain of risk-averse retailers and risk-neutral manufacturers. Wang et al.[13] considered the multi-channel supply chain in which manufacturers open online direct sales channels, retailers open offline channels and online channels, and studies their hitchhiking behavior.

2.3.2. Green investment-green closed-loop supply chain

In addition to the non-economic behavior of decision makers, especially after the strategic goal of "double carbon" was put forward, the supply chain structure gradually

transformed to green environmental protection, which resulted in the concept of green closed-loop supply chain. Green manufacturers invested in green operation and designed green products, green retailers invested in environmental marketing and promotion of green products, and green recyclers recycled discarded green products, thus producing a class of consumers with green product preferences. Xing Guangjun et al.[14] included the green preference of consumers in the study, and the closed-loop supply chain model under the influence of the green degree that the third party is responsible for recycling and the closed-loop supply chain model under the influence of no green degree are constructed respectively, and the influence of consumers' green preference on the optimal production pricing decision of closed-loop supply chain is discussed. Su et al.[15] took the environment-friendly green closed-loop supply chain as the research object, a two-stage closed-loop supply chain game model is established, considering the influence of environmental protection investment on the whole supply chain.

2.3.3. Uncertainty-fuzzy closed-loop supply chain

The uncertainty in decision-making of closed-loop supply chain mainly includes three types: uncertainty of recycling quality, uncertainty of recycling quantity and uncertainty of consumer demand. Zeng Xin et al.[16] established a closed-loop supply chain decision-making model for remanufacturing of new energy vehicles considering the quality of recycled products. Manufacturers remanufactured or scrapped products according to the quality of recycled products, and the influence of the quality level of recycled products on supply chain decision-making was studied. Li Fang et al.[17] constructed a closed-loop supply chain decision-making model based on the differential pricing of new products and reproductions recycled by third parties under the influence of government regulation under the uncertainty of recycling. It shows that the greater the uncertainty of recycling, the greater the possibility of profit loss for members. Li Changbing et al.[18] considered the balanced decision-making problem of closed-loop supply chain with advertising effect under uncertain demand, the optimal conditions of decision-makers at all levels are derived by using the equilibrium theory and variational inequality method, and the independent decision-making behavior of decision-makers at all levels and their interaction are analyzed.

2.3.4. Government and policy

Policy influence is also one of the factors that must be considered in the decision-making of closed-loop supply chain, including carbon tax, carbon trading and other policies to help the implementation of the "double carbon" strategy, as well as the government's subsidy model to encourage decision-makers in closed-loop supply chain to make better green investment decisions. Yi Shanshan et al.[19] studied the closed-loop supply chain system under the dual participation of government subsidies and carbon tax policies. The results show that the dual participation policy can better reduce the carbon emissions of enterprises and improve their profits compared with government subsidies and carbon tax policies. Zhang Lingrong et al.[20] considered the difficulty of manufacturers' recycling efforts under the carbon quota trading policy and the information asymmetry of unit carbon emissions of new products, this paper discusses manufacturers' false reporting behavior under different power structures and its influence on supply chain performance.

Lou Gaoxiang et al.[1] considered in the closed-loop

supply chain of power batteries for new energy vehicles, the effectiveness of government subsidies according to the amount of recovered batteries and subsidies according to the capacity of recovered batteries in improving the recovery rate of closed-loop supply chain of new energy power batteries is considered. Cao Qingkui et al.[21] according to the characteristics of consumers' free-riding behavior and different government subsidy models, this paper constructs three models: no government subsidy, government subsidy manufacturer and government subsidy retailer, and discusses the influence of free-riding behavior and government subsidy on the pricing decision of closed-loop supply chain. Shang et al[22] constructed four different scenarios, namely, no government intervention scenario, government sharing the cost of manufacturers' carbon emission reduction efforts, government sharing the cost of manufacturers' recycling efforts and government sharing the cost of retailers' advertising efforts, which affect the optimal decision-making of closed-loop supply chain.

2.4. Closed-loop supply chain coordination mechanism

From the research summary of closed-loop supply chain coordination at home and abroad, the common coordination mechanisms of closed-loop supply chain can be divided into two categories, one is contract, and the other is cooperative game theory.

2.4.1. Contract

Quantity discount, repurchase, two-part tariff (TPT), cost sharing (CS) and revenue sharing (RS) contracts have been widely used in closed-loop supply chain coordination. Chen Yuke et al.[23] constructed the mathematical model of mean-CVaR measuring retailers' risk characteristics, and the optimal decisions of closed-loop supply chain members in decentralized decision-making and joint decision-making are analyzed. It is shown that under the mean-CVaR measurement criterion, revenue sharing-cost sharing contract can coordinate the closed-loop supply chain of risk-averse decision makers, and also can improve the recycling amount of waste products. Li Xinran et al.[24] aimed at the closed-loop supply chain system with differential pricing of new products and recycled products composed of a manufacturer and a retailer, a combined contract model with quantity discount and CSR performance cost sharing is established. Wang Daoping et al.[25] introduced the wholesale price contract to urge manufacturers to transmit real cost information, and it is proved that it can effectively improve the profits of supply chain members, reduce the losses caused by decentralized decision-making and information asymmetry, and make the supply chain realize Pareto improvement. Ghosh and Shah[26] investigated the influence of cost sharing contract on green supply chain in two States: one is to provide contracts from retailers; The other is to determine the proportion of cost allocation through Nash bargaining model. Li et al[27] discussed the influence of different pricing strategies and two-part tariff coordination contracts on the economic and environmental goals of closed-loop supply chain and green manufacturers and two competitive retailers selling green products.

2.4.2. Cooperative Game Theory

Alliance is a practical strategy in many industries, so many researchers in the literature have adopted the coordination mechanism based on cooperative game method. The

phenomenon of competition and cooperation in supply chain makes game theory a good tool to analyze the two. Since the 1940s, game theory has been widely used in anthropology, auction, biology, commerce, economy, management, philosophy, politics, sports and wealth, and since the 1960s, it has been applied in the field of operation and management[28]. According to the relationship between participants, game theory models can be divided into non-cooperative games and cooperative games. Cooperative game emphasizes group rationality, efficiency, justice and fairness, while non-cooperative game emphasizes individual rationality and individual optimal decision-making, and the result may be efficient or inefficient[29]. Nash and Stackelberg equilibria are the two most important solutions in non-cooperative bo.

Compared with non-cooperative game, cooperative game lies in that participants can communicate and promise in order to get better results. Nash bargaining is common in two-person cooperative games. When the number of participants is three or more, most cooperative games represent the alliance benefits in the form of characteristic functions, and their solutions include Shapely value, nucleolus, core and core of alliance structure. The core was first used by Gililes as a tool to study definite sets in the early 1950s. Shapley and Shubik developed it into a concept of solution, and together with Shapley value, it became the most important and common two in cooperative games[30].

Tian et al[31] analyzed a recycling plan composed of multiple manufacturers. The structure of recycling network depends on the willingness of producers to form alliances. Alliance leads to recycling products in an effective way, reducing recycling costs and improving social welfare.. Liu et al[32] studied the problem of cooperative profit distribution by considering the condition of incomplete information. The structure of recycling network depends on the willingness of producers to form alliances. Alliance leads to recycling products in an effective way, reducing recycling costs and improving social welfare. Zheng et al[33] extended the variable weighted Shapley value mechanism based on classical Shapley value to coordinate CLSC and find a fair profit distribution in centralized method. Zheng Xin et al.[34] based on the cooperative game theory, a three-level closed-loop supply chain income distribution model composed of manufacturers, third-party logistics and retailers is constructed, and the reasonable equilibrium solution of the three-level closed-loop supply chain income distribution is obtained by Shapley value method. Finally, an example is given to analyze and demonstrate it. Lan Longhui et al.[35] in order to explore an appropriate profit distribution scheme and then coordinate the supply chain system and the reciprocal preference problem, after calculating the corresponding characteristic function by using the cooperative game theory, a scheme based on the classical Shapley value and nucleolar solution is proposed, and a coordination mechanism based on balanced satisfaction is innovatively proposed.

2.5. Literature Review

The research on closed-loop supply chain at home and abroad is mostly considered with key words such as circular economy, reverse logistics, product recycling, remanufacturing price decision, green supply chain, stackelberg game, fair concern, social welfare, carbon emission/carbon tax, government, etc. The construction model includes stochastic programming, mixed linear

programming, multi-objective optimization, etc. Its ultimate goal is to reduce environmental pollution and improve economic performance at the whole supply chain level.

When constructing the decision-making model of closed-loop supply chain, the factors to be considered include non-economic behaviors of decision-makers such as fairness concern, corporate social responsibility (CRS), hitchhiking behavior, green investment behaviors of supply chain participants, uncertain factors such as uncertain recycling quality, uncertain recycling quantity and uncertain consumer demand, government subsidies for green investment and related policies, etc., and more decision-making models with different variables under all possible alliance structures under non-cooperation and partial cooperation are constructed and equilibrium solutions are solved.

In order to ensure the cooperation stability of the closed-loop supply chain, the research on the coordination of the closed-loop supply chain has been paid more and more attention. The coordination mechanism adopted is the combination of traditional contract, such as TPT, RS and CS, and the cooperative game theory, such as Shapley value, nucleolar solution and extended value based on the traditional Shapley value.

From the existing research, when constructing the closed-loop supply chain model, only the simple supply chain structure under the condition of single stage and single cycle is considered, and the uncertain environmental factors of channel members are less considered. There are still unresolved problems about how to properly distribute the surplus profits in the centralized system to promote cooperation among members. In addition, the existing CLSC research rarely brings non-economic behaviors (for example, fairness) into the CLSC coordination problem, and then there are a few related studies on the coordination of closed-loop supply chain by cooperative game theory.

3. Future Research

In the future research of closed-loop supply chain, one area worthy of attention is the green closed-loop supply chain formed by considering the green investment of each participant, and another aspect that has to be considered is the problem that the government subsidizes the green investment, thus affecting the decision-making of participants, and the existing research model is extended to the multi-cycle complex closed-loop supply chain structure with multiple participants at all levels. In the related research of closed-loop supply chain coordination, the application of cooperative game theory with better coordination benefit is considered. In the traditional cooperative game theory, the corresponding expansion is carried out in combination with the actual problem, for example, the green investment level is included in the weight determination of profit distribution.

References

- [1] Lou Gaoxiang, Lei Peng, Ma Haicheng, et al. Research on the operation decision of closed-loop supply chain of power battery of new energy vehicles under different recycling subsidy policies [J]. *Journal of Management*, 2023, 20(02): 267-77.
- [2] Xing Guangjun, Yang Chongqing. Research on production decision of closed-loop supply chain under consumers' green preference [J]. *Logistics Engineering and Management*, 2021, 43(04): 39-44.
- [3] Mars, Ma Zhichao. Research on decision-making of closed-loop supply chain considering hitchhiking under patent protection [J]. *China Storage and Transportation*, 2023, (01): 113-4.
- [4] Li Wenlong, Wang Xue, Li Lulu, et al. Research on the Selection of Recycling Mode in Closed-loop Supply Chain Considering Price Sensitivity [J]. *Ecological Economy*, 2020, 36(08): 206-12.
- [5] Cao Qingkui, Mars, Ren Xiangyang, et al. Research on decision-making of closed-loop supply chain considering different recovery modes under hitchhiking behavior [J]. *Journal of Hebei University of Engineering (Natural Science Edition)*, 2022, 39(01): 106-12.
- [6] Wang J, Jiang H, Yu M. Pricing decisions in a dual-channel green supply chain with product customization [J]. *Journal of Cleaner Production*, 2020, 247.
- [7] Jian J, Li B, Zhang N, et al. Decision-making and coordination of green closed-loop supply chain with fairness concern [J]. *Journal of Cleaner Production*, 2021, 298.
- [8] Li Xinran, Wang Qi. Research on decision-making of closed-loop supply chain considering retailer's service level and fairness concerns [J]. *Management Review*, 2019, 31(04): 228-39.
- [9] Sun Jiayi, Chen Wei, Yang Shuangfei, et al. Research on decision-making of closed-loop supply chain considering consumer preferences and fairness concerns [J]. *Computer Integrated Manufacturing System*, 2022, 28(12): 4011-21.
- [10] Li Xinran, Xu Yuqing. Research on decision-making of closed-loop supply chain considering CSR and quality efforts [J]. *Scientific Research Management*, 2020, 41(06): 256-67.
- [11] Li Xinran, Liu Yuanyuan, Yu Mingnan. Research on decision-making of closed-loop supply chain considering hitchhiking behavior under different power structures [J]. *Scientific Research Management*, 2018, 39(03): 45-58.
- [12] Li C-F, Guo X-Q, Du D-L. Pricing Decisions in Dual-Channel Closed-Loop Supply Chain Under Retailer's Risk Aversion and Fairness Concerns [J]. *Journal of the Operations Research Society of China*, 2021, 9(3): 641-57.
- [13] Wang S, Chang D, Luo T. Pricing strategy in multi-channel apparel supply chain with showrooming effect [J]. *American Journal of Industrial and Business Management*, 2020, 10(4): 749-74.
- [14] Xing Guangjun, Zhang Shengjie. Research on production decision of closed-loop supply chain considering consumers' green preference and quality of recycled products [J]. *Logistics Engineering and Management*, 2021, 43(09): 65-9.
- [15] Su J, Li C, Zeng Q, et al. A Green Closed-Loop Supply Chain Coordination Mechanism Based on Third-Party Recycling [J]. *Sustainability*, 2019, 11(19).
- [16] Zeng Xin, Lai Chenyun. Research on decision-making of closed-loop supply chain for remanufacturing of new energy vehicles with uncertain recycling quality [J]. *China Storage and Transportation*, 2023, (02): 103-4.
- [17] Li Fang, Chen Ling, Ma Xin. Research on decision-making of closed-loop supply chain with uncertain recycling quantity under government regulation [J]. *Computer Application Research*, 2021, 38(04): 1128-32+44.
- [18] Li Changbing, Li Meiping, Song Meiyi. Research on the decision-making of closed-loop supply chain with advertising effect under uncertain demand [J]. *Journal of Chongqing University of Technology (Natural Science)*, 2019, 33(04): 219-26.
- [19] Yi Shanshan, Chen Yong. Research on production decision-making of closed-loop supply chain with dual participation of

- government subsidies and carbon tax policies [J]. *Logistics Engineering and Management*, 2022, 44(11): 31-4+20.
- [20] Zhang Lingrong, Liu Xiaoyan, Wang Feng, et al. Research on false reporting decision and coordination of closed-loop supply chain under carbon quota trading policy [J]. *Journal of industrial engineering and engineering management*: 1-10.
- [21] Cao Qingkui, Mars, Ren Xiangyang, et al. Research on decision-making of closed-loop supply chain considering government subsidies and hitchhiking [J]. *Management Engineer*, 2021, 26(06): 49-59.
- [22] Shang M, Li H, Wang Y-p, et al. Optimal decisions in a closed-loop supply chain under different policies of government intervention [J]. *Sustainable Energy Technologies and Assessments*, 2021, 47.
- [23] Chen Yuke, Xiong Long, Dong Jingrong. Coordination Mechanism of Closed-loop Supply Chain Based on Mean - CVaR [J]. *China Management Science*, 2017, 25(02): 68-77.
- [24] Li Xinran, Li Gang. Research on coordination mechanism of two-stage closed-loop supply chain considering corporate social responsibility [J]. *China Management Science*, 2020, 28(12): 77-86.
- [25] Wang Daoping, Liang Sihan, Wang Tingting. Closed-loop supply chain coordination considering manufacturer's recycling behavior under asymmetric information [J]. *Control and decision*, 2021, 36(07): 1723-31.
- [26] Ghosh D, Shah J. Supply chain analysis under green sensitive consumer demand and cost sharing contract [J]. *International Journal of Production Economics*, 2015, 164: 319-29.
- [27] Li P, Rao C, Goh M, et al. Pricing strategies and profit coordination under a double echelon green supply chain [J]. *Journal of Cleaner Production*, 2021, 278.
- [28] Leng M M. Game theoretic applications in supply chain management: A review [J]. *Infor*, 2005, 43(3): 187-220.
- [29] Zhang Weiyang. *Game Theory and Information Economics* [M]. Shanghai People's Publishing House, 2004.
- [30] Dong Baomin. *Cooperative Game Theory: Solution and Cost Allocation* [M]. China Market Press, 2008.
- [31] Tian F, Susic G, Debo L. Stable recycling networks under the Extended Producer Responsibility [J]. *European Journal of Operational Research*, 2020, 287(3): 989-1002.
- [32] Liu J-C, Sheu J-B, Li D-F, et al. Collaborative profit allocation schemes for logistics enterprise coalitions with incomplete information * , ** [J]. *Omega-International Journal of Management Science*, 2021, 101.
- [33] Zheng X-X, Li D-F, Liu Z, et al. Coordinating a closed-loop supply chain with fairness concerns through variable-weighted Shapley values [J]. *Transportation Research Part E-Logistics and Transportation Review*, 2019, 126: 227-53.
- [34] Zheng Xin, Zhu Xiaoxi, Ma Weimin. Profit distribution model of three-level closed-loop supply chain based on Shapley value method [J]. *Logistics and Management*, 2011, 20(04): 17-22.
- [35] Lan Longhui, Zheng Xiaoxue, Li Dengfeng, et al. Cooperative game model of closed-loop supply chain considering reciprocal preference [J]. *Computer Integrated Manufacturing System*, 2020, 26(12): 3458-70.