KMAN PUBLISHING INSTITUTE

Article history:
Received 30 January 2026
Revised 01 April 2026
Accepted 07 April 2026
Initial Publication 24 April 2026
Final Publication 01 December 2026

Journal of Resource Management and Decision Engineering

Volume 5, Issue 6, pp 1-26

Comparing the Effectiveness of Supply Chain under Two Contract Mechanisms: Buy-back and Wholesale Price

Pooria. Shekasteband[1], Mona. Ahmadi Rad[2*], Shervin. Asadzadeh[3]

[1] Ph.D. Student, Department of Industrial Engineering, NT.C., Islamic Azad University, Tehran, Iran
[2] Assistant Professor, Department of Industrial Engineering, NT.C., Islamic Azad University, Tehran, Iran
[3] Associate Professor, Department of Industrial Engineering, NT.C., Islamic Azad University, Tehran, Iran

*** Corresponding author email address**: ahmadirad.railways@gmail.com

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Shekasteband, P., Ahmadi Rad, M., & Asadzadeh, S. (2026). Comparing the Effectiveness of Supply Chain under Two Contract Mechanisms: Buy-back and Wholesale Price. *Journal of Resource Management and Decision Engineering*, *5*(6), 1-26.
https://doi.org/10.61838/kman.jrmde.279

© 2026 the authors. Published by KMAN Publication Inc. (KMANPUB). This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

A B S T R A C T

Buy-back and wholesale price contracts represent critical coordination mechanisms in supply chains, playing a significant role in enhancing supply chain effectiveness. This research, through a comparative analysis of theoretical frameworks and practical evidence, demonstrates that buy-back contracts generally outperform wholesale price contracts, particularly in reverse supply chains and for perishable products. This superiority originates from the higher flexibility of buy-back contracts in allocating risks among supply chain partners. In high-uncertainty environments, buy-back contracts exhibit stronger effectiveness through risk-sharing mechanisms, whereas in supply chains with stable demand, wholesale price contracts may be more suitable due to their simplicity in implementation. On the other hand, adopting a hybrid mechanism that combines both contract types can lead to improved coordination and greater overall effectiveness of the supply chain. Future studies may focus on behavioral factors, the influence of emerging technologies, and the adaptation of these mechanisms within more complex supply chain structures.

Keywords: *Supply Chain Coordination, Buy-back Contract, Wholesale Price, Contractual Mechanisms.*

1. Introduction

In increasingly volatile and competitive markets, supply chain performance is shaped not only by operational capabilities but also by the contractual architecture that governs relationships among manufacturers, suppliers, retailers, and recovery partners. Contemporary supply chains operate under persistent uncertainty arising from demand shocks, price fluctuations, sustainability pressures, platform-based competition, financing frictions, and information asymmetry. Under such conditions, decentralized decision-making often produces suboptimal outcomes because each member optimizes local objectives

rather than total chain performance. As a result, supply chain coordination has become a central concern in operations and logistics research, with contractual mechanisms serving as one of the most important tools for aligning incentives, sharing risks, and improving system-wide profitability and responsiveness (Dubey, 2024; Geng, 2025; Jiang et al., 2025; Rius-Sorolla et al., 2020; Vivaldini & Carli, 2025).

Supply chain contracts are designed to regulate transaction terms and influence ordering, pricing, inventory, recovery, promotion, quality, and information-sharing decisions across channel members. Their importance has increased as supply chains have become more interconnected and more exposed to behavioral, environmental, and financial disturbances. Recent studies show that the performance of a contract cannot be understood solely through static cost–revenue logic; rather, it depends on the interaction between contract design, market conditions, competitive structure, and the informational and behavioral characteristics of decision-makers (Hojjatimanesh & Mahmoodi, 2025; Jammernegg et al., 2025; Ketokivi & Mahoney, 2020; Vosooghidizaji et al., 2020; Xu et al., 2025). This makes the study of contract effectiveness especially relevant for both theory and practice, particularly when managers must choose among mechanisms that differ in simplicity, flexibility, and coordination potential.

Among the broad family of supply chain contracts, wholesale price and buy-back contracts remain two of the most widely discussed and practically relevant mechanisms. The wholesale price contract is structurally simple: the upstream firm sets a wholesale price and the downstream party decides how much to order, while bearing most of the market risk associated with unsold inventory. By contrast, the buy-back contract introduces a return provision under which unsold products can be repurchased by the upstream firm at a pre-specified amount, thereby redistributing demand risk and altering ordering incentives. Although both mechanisms are longstanding, they continue to attract scholarly attention because they represent two distinct philosophies of channel governance: one centered on transactional simplicity and decentralized responsibility, and the other centered on risk sharing and stronger coordination incentives (Canbulut & Köse, 2025; Chen et al., 2022; Doganoglu & Inceoglu, 2020; Shekasteband et al., 2024; Wang & Yin, 2025; Zhang & Wu, 2025).

The continued relevance of wholesale price contracts is understandable. Their implementation is straightforward, administratively efficient, and compatible with a wide range of market structures. In environments where demand is relatively stable and contractual transparency is valued, wholesale pricing may offer a practical mechanism for organizing transactions without excessive monitoring or reverse-logistics obligations. Recent work has extended the wholesale-price framework into new domains such as demand uncertainty, quality improvement, carbon-constrained supply chains, flexible supply, e-commerce, and behavioral pricing, confirming that this simple contract still has analytical and practical importance (Hosseini-Motlagh et al., 2019; Hu et al., 2024; Jammernegg et al., 2025; Jiang et al., 2025; Ren & Hu, 2024; Zhou et al., 2022; Zhu et al., 2023). At the same time, these studies repeatedly show that the wholesale price contract often struggles with double marginalization, weak risk sharing, and limited ability to coordinate decentralized decisions when uncertainty, competition, or asymmetric information intensify.

This limitation becomes more salient in modern supply chains characterized by volatile consumer demand, short product life cycles, returns, sustainability requirements, and capital constraints. Under such conditions, simple risk transfer to the retailer may discourage adequate ordering, reduce channel profitability, and amplify inefficiencies. Research on uncertainty, competition, and financing has demonstrated that wholesale price contracts can perform poorly when prices are demand-dependent, working capital is costly, or production disruptions and supply unreliability are present (Basith & Sajith, 2023; Ghaffari-Hadigheh & Mongeri, 2024; Xie et al., 2023; Zhang & Wu, 2025; Zhang et al., 2022). Even when adaptations such as penalties, service coordination, promotion compensation, or vendor-managed inventory are introduced, the wholesale contract often requires additional design elements to approach system-optimal performance (Hu et al., 2018; Nouri et al., 2018; Wang et al., 2022).

Buy-back contracts, in contrast, have attracted renewed attention because they directly address the incentive distortions that arise when downstream firms are reluctant to order under uncertainty. By allowing some degree of return or repurchase, buy-back contracts reallocate demand risk, encourage higher order quantities, and often improve total chain outcomes, especially in markets for perishable, seasonal, fashion, and recoverable products. Recent studies confirm their importance in uncertain-demand environments, differentiated salvage-value settings, three-stage supply chains, and coordination problems involving returns, remanufacturing, and closed-loop operations (Canbulut & Köse, 2025; Hariga et al., 2025; Momeni et al.,

2022; Salami et al., 2022; Wang & Yin, 2025; Zhang et al., 2024). The buy-back mechanism therefore remains highly relevant in sectors where overstock and understock risks coexist and where recovery or reuse has become economically and environmentally significant.

The advantages of buy-back contracts, however, do not imply universal superiority. Their implementation can be operationally demanding because they require reverse flow management, return inspection, settlement procedures, and sometimes refurbishment or regeneration capabilities. In addition, the effectiveness of buy-back arrangements depends on product type, return quality, information availability, and the behavioral responses of channel members. When return handling is expensive or quality uncertainty is severe, the gains from risk sharing may be offset by higher coordination and logistics costs (Hariga et al., 2025; Panjehfouladgaran & Lim, 2020; Yan, 2025). As reverse and circular supply chains expand, these operational trade-offs have become more important, making it insufficient to assume that buy-back contracts are always preferable merely because they offer stronger risk redistribution.

Another major reason for revisiting the comparison between wholesale price and buy-back contracts is the growing recognition that contract performance is shaped by information conditions. Information asymmetry affects pricing, ordering, trust, and perceived fairness, and it can undermine even theoretically efficient mechanisms if parties conceal private information or fail to coordinate forecasts. Recent research has examined asymmetric information in wholesale-price settings, advanced buy-back contracts, bilateral information environments, and the role of trust and information sharing, showing that contract outcomes depend not only on formal terms but also on the quality of informational exchange and relational governance (Alwan et al., 2023; Chlebicka, 2024; Hojjatimanesh & Mahmoodi, 2025; Vosooghidizaji et al., 2020; Wang et al., 2022). These developments suggest that any meaningful comparison of contract mechanisms must account for more than basic price and quantity logic.

Behavioral considerations further complicate the picture. Traditional coordination models often assume fully rational agents, but recent studies increasingly show that loss aversion, fairness concerns, bounded rationality, round-number bias, focus preferences, and other behavioral tendencies materially influence contract outcomes. Research on behavioral decision-makers under wholesale contracts, behavior-based pricing, fairness in closed-loop systems, and behavioral retailers under buy-back policies demonstrates that real-world contract performance may depart substantially from normative analytical predictions (Jammernegg et al., 2025; Sarkar & Bhala, 2021; Schiffels & Voigt, 2021; Sharifi et al., 2023; Vipin & Amit, 2021; Xu et al., 2025; Zhang et al., 2024). This body of work has shifted the contract literature away from purely structural comparisons and toward a more realistic understanding of how contractual mechanisms operate in practice.

Sustainability and circularity also now occupy a central place in supply chain contract research. Green quality, carbon limits, government subsidies, recycling behavior, product regeneration, and closed-loop recovery structures have all become important determinants of contract choice and coordination design. In such settings, the relevant performance criteria are no longer limited to profit maximization alone; they also include environmental efficiency, resource recovery, resilience, and long-term system viability. Recent contributions show that wholesale and buy-back contracts behave differently when evaluated through sustainability lenses, especially in low-carbon, circular, and recovery-intensive systems (Hariga et al., 2025; Jiang et al., 2025; Momeni et al., 2022; Nakhaeinejad et al., 2025; Ren & Hu, 2024; Salami et al., 2022; Xin et al., 2020). As a result, comparative assessment of these contracts must now incorporate broader performance dimensions than the classical newsvendor framework alone.

A related stream of research has emphasized the importance of context-specific hybridization and contractual combination. Rather than relying on a single mechanism, scholars increasingly explore how contracts can be complemented by flexibility clauses, pricing updates, revenue sharing, options, quantity commitments, penalties, or financing arrangements. This trend reflects recognition that no single contract dominates under all conditions. Mixed or combined structures may outperform pure forms when uncertainty, competition, returns, and channel asymmetries interact. Evidence from recent and earlier studies suggests that combined mechanisms can better balance incentive alignment, risk sharing, and administrative feasibility than isolated contractual tools (Chaharsooghi & Heydari, 2011; Hu et al., 2024; Liu, 2015; Shi et al., 2020; Yin & Xu, 2011; Zhang et al., 2023). Yet despite this insight, the direct comparative baseline between wholesale and buy-back contracts remains essential, because hybrid design begins with understanding the strengths and weaknesses of the constituent mechanisms themselves.

The literature therefore points to two parallel realities. First, both wholesale price and buy-back contracts remain foundational mechanisms in supply chain coordination theory and practice. Second, the conditions under which one outperforms the other have become more complex due to behavioral heterogeneity, sustainability concerns, information asymmetry, market competition, and reverse logistics. While many studies investigate one contract in isolation or compare it with other mechanisms such as revenue sharing, options, or flexibility contracts, relatively few studies provide a focused and comprehensive comparison of wholesale price and buy-back contracts across different supply chain conditions. This gap is especially visible when the comparison is expected to integrate recent developments in closed-loop systems, behavioral operations, sustainability, quality improvement, customer returns, and financing constraints (Ji & Liu, 2022; Liu et al., 2025; Song et al., 2023; Vivaldini & Carli, 2025; Wang et al., 2020; Yan, 2025; Yu et al., 2023).

The need for such a comparison is not merely academic. Managers must choose contractual mechanisms under conditions that rarely resemble the clean assumptions of canonical analytical models. They face practical questions regarding when simplicity should be prioritized over coordination depth, when risk sharing justifies higher return-management costs, and how contracts should be adapted in the presence of uncertain demand, reverse flows, and strategic behavior. A comparative evaluation of wholesale and buy-back contracts can therefore contribute both to theoretical clarification and to managerial decision support by identifying the settings in which each mechanism is most appropriate and by illuminating their relative strengths, weaknesses, and coordination implications (Ghaffari-Hadigheh & Mongeri, 2024; Ketokivi & Mahoney, 2020; Li et al., 2021; Shekasteband et al., 2024; Wang et al., 2021).

In view of these developments, the present study addresses an important gap by synthesizing the literature on wholesale price and buy-back contracts and comparing their efficiency and effectiveness under varying supply chain conditions, with particular attention to uncertainty, reverse supply chains, perishable products, behavioral considerations, and coordination performance. The aim of this study is to comprehensively compare the efficiency and effectiveness of wholesale price and buy-back contracts under different supply chain conditions and to identify the circumstances under which each mechanism provides superior profitability, risk allocation, and coordination among supply chain members.

2. Methods and Materials

The present study adopts a qualitative–comparative research design grounded in systematic literature review and bibliometric analysis to evaluate the effectiveness of wholesale price and buy-back contracts in supply chain coordination. The research is non-experimental and analytical in nature, relying on secondary data extracted from previously published scholarly works. The core analytical approach involves comparative evaluation of contractual mechanisms using both theoretical modeling insights and documented empirical evidence.

The sample of the study consists of 63 peer-reviewed research articles selected from valid scientific databases, including Web of Science, Scopus, ScienceDirect, and SpringerLink. The temporal scope of the sample spans from 1992 to 2025, ensuring comprehensive coverage of the evolution of supply chain contract literature. The inclusion criterion was strictly defined as the presence of the keywords “wholesale price contract” and “buy-back contract” within the title, abstract, or keywords of the articles. Notably, no restrictions were imposed based on publication year, citation count, or journal impact factor, allowing for maximal inclusivity and diversity in the sample. This strategy ensures that both foundational and recent contributions are represented, enabling a holistic comparative analysis of contractual mechanisms.

The selected studies encompass a variety of methodological approaches, including analytical modeling, game-theoretic analysis, empirical studies, and literature reviews. This heterogeneity enhances the robustness of the comparative framework by integrating multiple perspectives on contract performance, risk allocation, and coordination efficiency within supply chains.

Data collection in this study is based on structured document analysis and systematic extraction of information from the selected body of literature. The primary tool for data collection is a bibliometric and content analysis framework designed to capture both descriptive and analytical attributes of the studies. Specifically, relevant information was extracted regarding publication characteristics (such as year, journal, country, and institutional affiliation), methodological approaches, research themes, and key findings related to contract performance.

In addition to bibliometric indicators, a conceptual extraction matrix was employed to classify studies according to critical dimensions of supply chain performance,

including risk distribution, coordination efficiency, demand uncertainty, and operational complexity. This matrix enabled the systematic comparison of wholesale price and buy-back contracts across multiple criteria. Furthermore, thematic categorization was applied to identify dominant research areas such as supply chain coordination, pricing strategies, behavioral factors, reverse logistics, and sustainability considerations.

The data collection process also involved qualitative synthesis of theoretical models and empirical findings reported in the literature. This allowed for the integration of diverse forms of evidence into a unified analytical framework, facilitating deeper insights into the functional differences and performance implications of the two contract types.

The data analysis process combines bibliometric analysis, thematic analysis, and comparative evaluation techniques to address the research objectives. Initially, bibliometric analysis was conducted to examine publication trends, research distribution, and thematic evolution within the selected studies. Key indicators such as frequency of publications, research topics, geographical distribution, and institutional contributions were analyzed to provide a macro-level understanding of the research landscape.

Subsequently, a qualitative content analysis was performed to extract and synthesize findings related to the performance of wholesale price and buy-back contracts. This involved coding and categorizing study outcomes based on predefined analytical dimensions, including coordination effectiveness, profit optimization, risk-sharing mechanisms, and responsiveness to demand uncertainty. Through this process, patterns and consistencies across studies were identified, enabling a structured comparison of the two contractual mechanisms.

In the final stage, a comparative analytical framework was applied to evaluate the relative efficiency and effectiveness of the contracts under different supply chain conditions. This comparison was supported by conceptual scoring and synthesis of evidence derived from the literature. The analysis integrates both theoretical insights and empirical observations to determine the conditions under which each contract type performs optimally, as well as to explore the potential benefits of hybrid contractual approaches.

3. Findings and Results

In this section, a comprehensive bibliometric analysis is conducted on 63 research papers that examine the effectiveness of supply chains under two contractual mechanisms: the wholesale price contract and the buy-back contract. The selected papers were retrieved from reputable scientific databases, including Web of Science, Scopus, ScienceDirect, and SpringerLink, covering the period from 1992 to 2025.

The main selection criterion was the presence of the terms “wholesale price contract” and “buy-back contract” in the title, abstract, or keywords. In this process, factors such as publication year, citation count, or journal impact were not considered, and the focus was on collecting as many relevant studies as possible related to these two contract types. Subsequently, the bibliometric analysis examined indicators such as publication trends, research topics, publication types, and the geographical and institutional distribution of authors to provide a clear overview of the research landscape on wholesale price and buy-back contracts in supply chain management.

Table 1 presents the list of selected papers, where the “University” column indicates the institutional affiliation of the first author.

Table 1

Selected papers for bibliometric analysis

ID	Authors	Year	Title	Journal/conference title	University	Country	Methods	Citations (Nov. 20, 2025)
1	Tsay AA, Nahmias S, Agrawal N	1999	Modeling supply chain contracts: A review	Quantitative Models for Supply Chain Management	Santa Clara University	USA	Literature review	١١٢٦
2	Cachon GP	2003	Supply chain coordination with contracts	Handbooks in Operations Research and Management Science	Pennsylvania University	USA	Literature review, Analytical modeling	٤٥١٤

3	Li X, Wang Q	2007	Coordination mechanisms of supply chain systems	European Journal of Operational Research	Nanyang Technological University	Singapore	Analytical modeling	69٧
4	Dong L, Zhu K	2007	Two-wholesale-price contracts: Push, pull, and advance-purchase discount contracts	Manufacturing & Service Operations Management	Washington University	USA/ China	Comparative contract analysis	15١
5	Song Y, Ray S, Li S	2008	Structural properties of buy-back contracts for price-setting newsvendors	Manufacturing & Service Operations Management	Memorial University of Newfoundland	USA	Analytical modeling	18٦
6	Wang Y, Zipkin P	2009	Agents' incentives under buy-back contracts in a two-stage supply chain	International Journal of Production Economics	Hong Kong Polytechnic University	China / USA	Principal-agent modeling	6٤
7	Govindan K, Popiuc MN, Diabat A	2013	Overview of coordination contracts within forward and reverse supply chains	Journal of Cleaner Production	Clark University	Denmark/ UAE	Literature review	2٧٢
8	Wu D	2013	Coordination of competing supply chains with news-vendor and buy-back contract	International Journal of Production Economics	Chinese Academy of Sciences University	China	Competition analysis, Newsvendor model	15٨
9	Wang X, Wang X, Su Y	2013	Wholesale-price contract of supply chain with information gathering	Applied Mathematical Modelling	Southwest University	China	Information gathering, Mathematical modeling	3٧
10	Giri BC, Bardhan S	2014	Coordinating a supply chain with backup supplier through buy-back contract under supply disruption and uncertain demand	International Journal of Systems Science: Operations & Logistics	Jadavpur University	India	Disruption analysis, Uncertainty modeling	10٤
11	Zhang B, Lu S, Zhang D, Wen K	2014	Supply chain coordination based on a buy-back contract under fuzzy random variable demand	Fuzzy sets and systems	Wuhan Textile University	China	Fuzzy modeling, Uncertainty analysis	٥٦
12	Liu Y	2015	Buy-back and revenue-sharing contracts in global supply chain	Journal of Industrial Engineering and Management	Electronic Science and Technology University	China	Global supply chain analysis	٩
13	Wang F, Zhuo X, Niu B	2016	Sustainability analysis and buy-back coordination in a fashion supply chain with price competition and demand uncertainty Sustainability	Sustainability	Sun Yat-sen University	China	Mathematical modeling	٣٩
14	Zhao Y, Choi TM, Cheng TC, Wang S	2017	Mean-risk analysis of wholesale price contracts with stochastic price-dependent demand	Annals of Operations Research	International Business and Economics University	China	Mean-risk analysis, Stochastic modeling	31
15	Guo S, Shen B, Choi TM, Jung S	2017	A review on supply chain contracts in reverse logistics: Supply chain structures and channel leaderships	Journal of Cleaner Production	Hong Kong Polytechnic University	China/South Korea	Literature review, Reverse logistics	2٢٠
16	Ghandi A, Lawell CY	2017	On the rate of return and risk factors to international oil companies in Iran's buy-back service contracts	Energy Policy	Massachusetts Institute of Technology	USA	Risk analysis, Oil industry	3٣
17	Luo C, Tian X, Mao X, Cai Q	2018	Coordinating supply chain with buy-back contracts in the presence of risk aversion	Asia-Pacific Journal of Operational Research	University of Chinese Academy of Sciences	China	Mathematical modeling, Risk analysis	12

18	Hwang W, Bakshi N, DeMiguel V	2018	Wholesale price contracts for reliable supply	Production and Operations Management	Liberation, France, Regent's Park, London,, Utah University	France/ USA/UK	Game theory, Analytical modeling	٥٥
19	Duc TT, Loi NT, Buddhakulsomsiri J	2018	Buy-back contract in a risk-averse supply chain with a return policy and price dependent demand	International Journal of Logistics Systems and Management	Brunei Darussalam University	Brunei Darussalam/ Vietnam / Thailand	Risk analysis, Mathematical modeling	11
20	Liu X, Wang X, Dai L, Pan Y	2018	Research on supply chain performance based on retailers' fairness concerns: Wholesale prices versus cost sharing of efforts	PLOS ONE	Beijing Jiaotong University	China	Fairness concerns, Behavioral analysis	6
21	Hu B, Qu J, Meng C	2018	Supply chain coordination under option contracts with joint pricing under price-dependent demand	International Journal of Production Economics	Electronic Science and Technology University	China/ USA	Options contracts, Joint pricing	٥٣
22	Fang X	2018	Analysis of double marginalization effect on the wholesale price contract coordination	Asia-Pacific Journal of Operational Research	Chongqing Technology and Business University	China	Double marginalization, Analytical modeling	13
23	Niu B, Chen L, Zhuo X, Yue X	2018	Does buy-back induce more fashion sub-sourcing? Contract property and performance analysis	Transportation Research Part E: Logistics and Transportation Review	South China University of Technology	China/ USA	Contract property analysis, Fashion industry	١٩
24	Hu B, Meng C, Xu D, Son YJ	2018	Supply chain coordination under vendor managed inventory-consignment stocking contracts with wholesale price constraint and fairness	International Journal of Production Economics	University of Electronic Science and Technology of China	China/USA	VMI, Fairness analysis	٦٧
25	Nouri M, Hosseini-Motlagh SM, Nematollahi M, Sarker BR	2018	Coordinating manufacturer's innovation and retailer's promotion and replenishment using a compensation-based wholesale price contract	International Journal of Production Economics	University of Science and Technology	Iran/USA	Innovation, Promotion coordination	٨٧
26	Zhao H, Song S, Zhang Y, Gupta JN, Devlin AG, Chiong R	2019	Supply chain coordination with a risk-averse retailer and a combined buy-back and revenue sharing contract	Asia-Pacific Journal of Operational Research	Tsinghua University	China/USA/Australia	Risk analysis, Comparative contract analysis	19
27	Krapp M, Kraus JB	2019	Coordination contracts for reverse supply chains: a state-of-the-art review	Journal of Business Economics	Augsburg University	Germany	Literature review	١٥
28	Hosseini-Motlagh SM, Nouri-Harzvili M, Zirakpourdehkordi R	2019	Two-level supply chain quality improvement through a wholesale price coordination contract on pricing, quality and services	International Journal of Industrial Engineering & Production Research	Science andTechnology University	Iran	Quality management, Multi-level coordination	١٥
29	Doganoglu T, Inceoglu F	2020	Buy-back contracts to solve upstream opportunism	European Journal of Operational Research	WürzburgUniversity	Germany	Game theory, Analytical modeling	٢٢
30	Wang C, Chen J, Wang L, Luo J	2020	Supply chain coordination with put option contracts and customer returns	Journal of the Operational Research Society	Dalhousie University	China	Options contracts, Customer returns	٣٧
31	Xin C, Chen X, Chen H, Chen S, Zhang M	2020	Green product supply chain coordination under demand uncertainty	IEEE Access	Northeastern University	China	Green supply chain, Uncertainty modeling	٢٨

32	Shi J, Du Q, Lin F, Li Y, Bai L, Fung RY, Lai KK	2020	Coordinating the supply chain finance system with buy-back contract: A capital-constrained newsvendor problem	Computers & Industrial Engineering	Chang'an University	China	Supply chain finance, Capital constraints	٦١
33	Wang S, Gurnani H, Subramanian U	2021	The informational role of buy-back contracts	Management Science	Texas University	USA	Game theory, Information asymmetry analysis	3٨
34	Wang J, Fan X, Zhang T	2021	Behaviour-based pricing and wholesaling contracting under supply chain competition	Journal of the Operational Research Society	Shanghai University	China	Behavioral pricing, Competition analysis	٢٥
35	Vipin B, Amit RK	2021	Wholesale price versus buy-back: A comparison of contracts in a supply chain with a behavioral retailer	Computers & Industrial Engineering	Indian Institute of Technology Kanpur	India	Behavioral analysis, Comparative contract analysis	٣١
36	Sarkar S, Bhala S	2021	Coordinating a closed loop supply chain with fairness concern by a constant wholesale price contract	European Journal of Operational Production Research	Jamshedpur University	India	Closed-loop supply chain, Fairness concerns	٨٩
37	Li J, Luo X, Wang Q, Zhou W	2021	Supply chain coordination through capacity reservation contract and quantity flexibility contract	Omega	Electronic Science and Technology University	China	Comparative contract analysis	١١٠
38	Chen T, Liu C, Xu X	2022	Coordination of perishable product supply chains with a joint contract under yield and demand uncertainty	Sustainability	Yancheng Polytechnic College	China	Mathematical modeling, Numerical analysis	٥
39	Momeni MA, Jain V, Govindan K, Mostofi A, Fazel SJ	2022	A novel buy-back contract coordination mechanism for a manufacturer-retailer circular supply chain regenerating expired products	Journal of Cleaner Production	Persian Gulf University	Iran/ New Zealand/	Mathematical modeling, Circular economy	٢٨
40	Salami MS, Eslamipirharati M, Bakhshi A, Aghsami A, Jolai F, Yazdani M	2022	Does a buy-back contract coordinate a reverse supply chain facing remanufacturing capacity disruption and returned product quality uncertainty?	Sustainability	Tehran University	Iran/ Australia	Disruption analysis, Reverse logistics	16
41	Zhou Y, Liu J, Wu X	2022	How to Implement the Wholesale Price Contract: Considering Competition between Supply Chains	Journal of Systems Science and Systems Engineering	South China University	China	Competition analysis	٤
42	Wang D, Wang Z, Zhang B, Zhu L	2022	Vendor-managed inventory supply chain coordination based on commitment-penalty contracts with bilateral asymmetric information	Enterprise Information Systems	Science and Technology Beijing University	China	VMI, Information asymmetry	2٦
43	Sharma A, Singh S	2022	Coordinating socially responsible supply chain with fairness via simple wholesale price contract	Journal of Cleaner Production	Kharagpur University	India	Social responsibility, Fairness analysis	٨
44	Alwan LC, Yang C, Fang W	2023	An advanced buy-back contract and information asymmetry	Annals of Operations Research	Wisconsin-Milwaukee University	USA/China	Game theory, Information asymmetry analysis	٣
45	Sharifi R, Razavi H, Elahi E	2023	Investigation of the ordering behavior of a retailer in the revenue sharing and buy-back contracts considering round number bias	Journal of Retailing and Consumer Services	Ferdowsi University	Iran/ USA	Behavioral economics, Experimental study	3

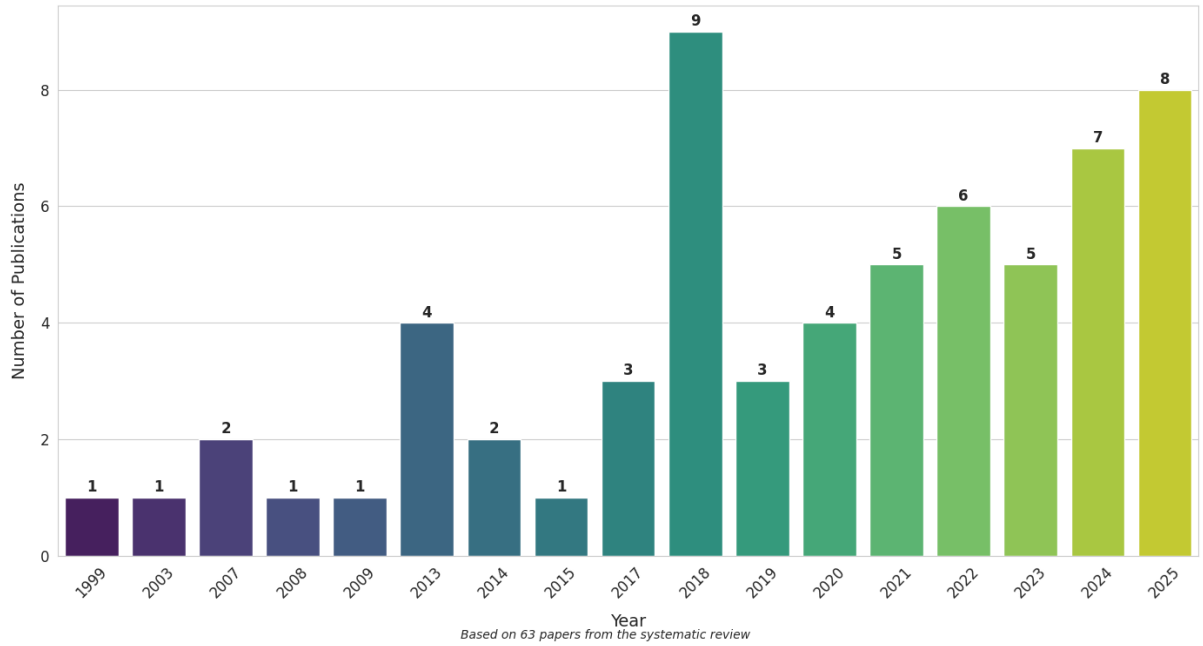
46	Zhu X, Song Y, Lin G, Xu W	2023	Pricing Decisions and Coordination in E-Commerce Supply Chain with Wholesale Price Contract Considering Focus Preferences	Journal of Theoretical and Applied Electronic Commerce Research	Shanghai University	China	E-commerce, Preference modeling	٨
47	Basith TAB, Sajith AA	2023	Impact of Wholesale Price Contracts in Two-echelon Supply Chains Under Production Disruptions	Proceedings of the International Conference on Industrial Engineering and Operations Management	Thrissur University	India	Disruption analysis, Two-echelon modeling	1
48	Zhang S, Tong X, Jin X	2023	Contract design and comparison under the opportunity cost of working capital: Buy-back vs. revenue sharing	European Journal of Operational Research	Tianjin University	China	Working capital analysis, Comparative contract analysis	٢٠
49	Hu S, Liu L, Liu X	2024	Wholesale Price Contract or Mixed Wholesale-Option-Contract? Procurement Strategy for a Contract Farming Supply Chain under Flexible Supply	Sustainability	Guangdong University	China	Mathematical modeling, Comparative analysis	0
50	Shekasteband P, Ahmadirad M, Asadzadeh S	2024	Wholesale Price and Buy-back Contracts under Fairness Concerns and Asymmetric Information: A Case Study of Kalleh Dairy Company, Khuzestan Province Branch	International Journal of Industrial Engineering: Theory, Applications and Practice	North Tehran BranchIslamic Azad University	Iran	International Journal of Industrial Engineering	0
51	Minghui Xu, Wei Bao, Dongsheng Yang	2024	Behavior-based pricing and wholesale contracting in competing supply chains with informative advertising	Operational Research Society	Hubei University of Arts and Science	China	Behavioral modeling	٢
52	Shengqiang Hu, Lou Liu, Xing Liu	2024	Wholesale Price Contract or Mixed Wholesale-Option-Contract? Procurement Strategy for a Contract Farming Supply Chain under Flexible Supply	Sustainability	Guangdong University of Finance and Economics	China	Equilibrium modeling	٠
53	Fuxia Ren, Benyong Hu	2024	Decisions and coordination in low-carbon supply chains with a wholesale price constraint under government subsidies	Production Economics	University of Electronic Science and Technology	China	Decision modeling	١٥
54	Yinghao Zhang, Peiwen Yu, Tianjun Feng	2024	Full Quantity or Full Credit? Choosing the Right Buyback Policy for a Behavioral Retailer	Manufacturing & Service Operations Management	University of Cincinnati	USA	Behavioral analysis	٤
55	Kailing Liu, Quanxi Li, Haowei Zhang et al.	2024	Trade-in strategies in closed-loop supply chain considering manufacturer entrustment behavior and wholesale price contract	Operational Research Society	Jilin University	China	Decision and game theory	٥
56	Nakhaeinejad M, Dehghan A, Vaziri NS	2025	Developing a supply chain coordination model through a revised revenue sharing contract: Incorporating sales efforts and green quality considerations	International Journal of Production Management and Engineering	Yazd University	Iran	Revenue sharing, Green quality	1
57	Bahmaei MA, Afshar E	2025	New Iran's Petroleum Contract "IPC" in comparison with Buy-back and Production Sharing Agreement	Energy Strategy Reviews	Shahid Beheshti University	Iran	Comparative contract analysis	0

58	Zhong-Zhong Jiang, Zeyu Lu, Zhongbin Wang	2025	The impact of contract types on carbon-capped food supply chains: options versus wholesale	International Journal of Production Research	Tianjin University	China	Statistical analysis	٤
59	Xiaobin Wang, Fanghao Yin	2025	Supply chain coordination with buyback contract under uncertain demand and salvage value differentiation	Fuzzy Optimization and Decision Making	Shandong University of Finance and Economics	China	Mathematical modeling	1
60	Xinghao Yan	2025	Coordination of the supply chain with quality improvement and customer returns	Computers & Industrial Engineering	University of Toledo	USA	Quantitative modeling	0
61	Chu Zhang, Junjie Wu	2025	Wholesale price confidentiality under demand uncertainty in competing supply chains	International Journal of Production Economics	Beihang University	China	Econometric analysis	0
62	Gülçin Canbulut, Erkan Köse	2025	Supply chain coordination under buyback contract in a three-stage supply chain: A game theory approach	Supply Chain Management Research	Nuh Naci Yazgan University	Turkey	Game theory	0
63	Werner Jammernegg, Peter Kischka, Lena Silbermayr	2026	Supply chain coordination with a wholesale price contract for behavioral decision-makers	European Journal of Operational Research	WU Vienna University, Friedrich Schiller University	Austria, Germany	Behavioral & mathematical	1

The publication trend of scientific papers in the field of effective supply chain management contracts, with a focus on buy-back and wholesale pricing contracts, is illustrated in Figure 1.

Figure 1

Number of publications by year

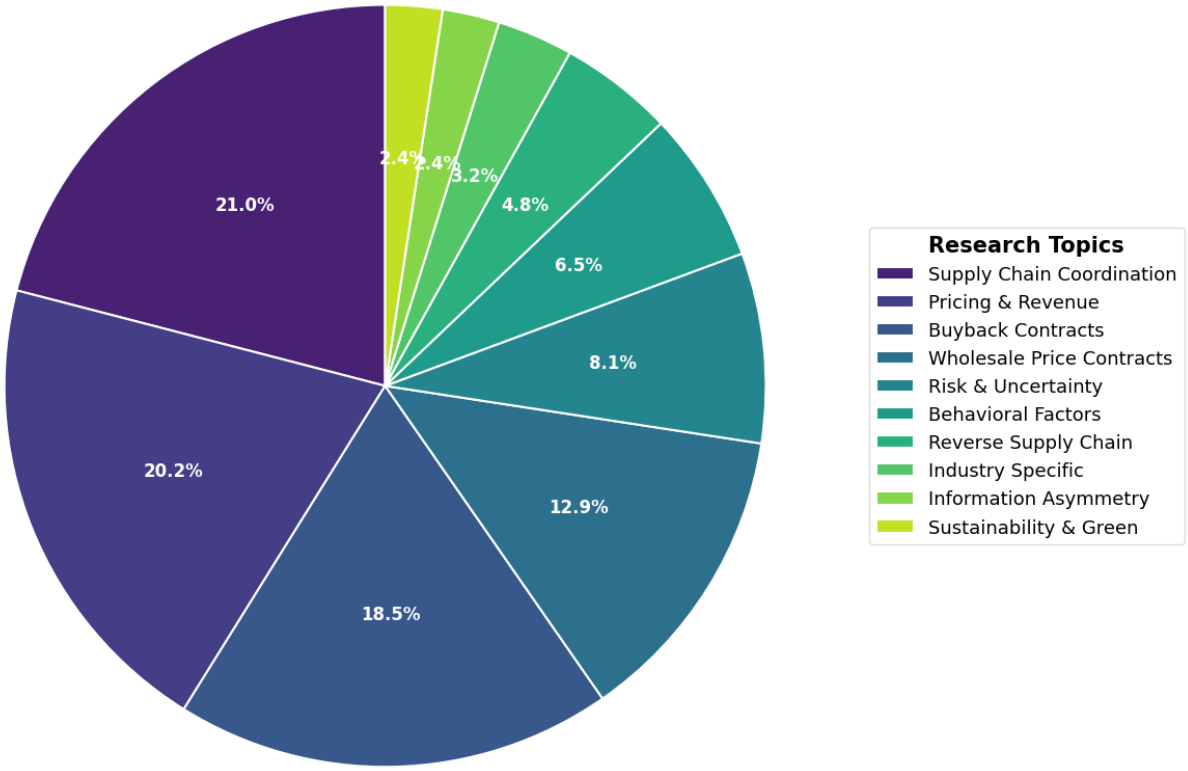


As observed in Figure 1, this chart demonstrates considerable research activity from 1999 to 2025. The year 2018 recorded the highest number of publications in this field, indicating the maturity of this research domain. The increasing complexity of global supply chains and the need for more efficient coordination mechanisms have been key driving factors behind the growth of this research area (Vivaldini & Carli, 2025). In addition to the temporal publication trends, the distribution of research topics in the supply chain contract literature is presented in Figure 2,

which demonstrates the diversity and breadth of study areas within this field.

Figure 2

Distribution of research topics in supply chain contracts literature



Based on analysis of 63 papers from the systematic review
Note: Papers may cover multiple topics

Fig. 2 illustrates the distribution of research topics in the supply chain contracts literature. The selected articles (63 papers) are all related to the two main contract types examined in this study, namely buy-back and wholesale contracts; however, not all papers are limited to only one contract. Some papers focus solely on one of these two contracts, while others examine the combination of these contracts with related topics such as behavioral factors and reverse supply chains. Therefore, the focus here is on this set of 63 papers relevant to these two contract types, rather than on the entire body of supply chain literature. Figure 2 shows that supply chain coordination has attracted the largest volume of studies, highlighting the importance of contracts in coordinating supply chain members. Pricing and revenue topics rank second. Buy-back and wholesale contracts indicate that researchers have mainly concentrated on these two types of contracts. Other topics examined include risk and uncertainty, human and behavioral factors, reverse supply chains, various industry characteristics, information asymmetry issues, and environmental and sustainability concerns, all of which have been addressed in the selected studies in relation to these contracts. In addition to research topics, the types of academic publications in this field are analyzed in Figure 3.

Figure 3

Distribution of publication types

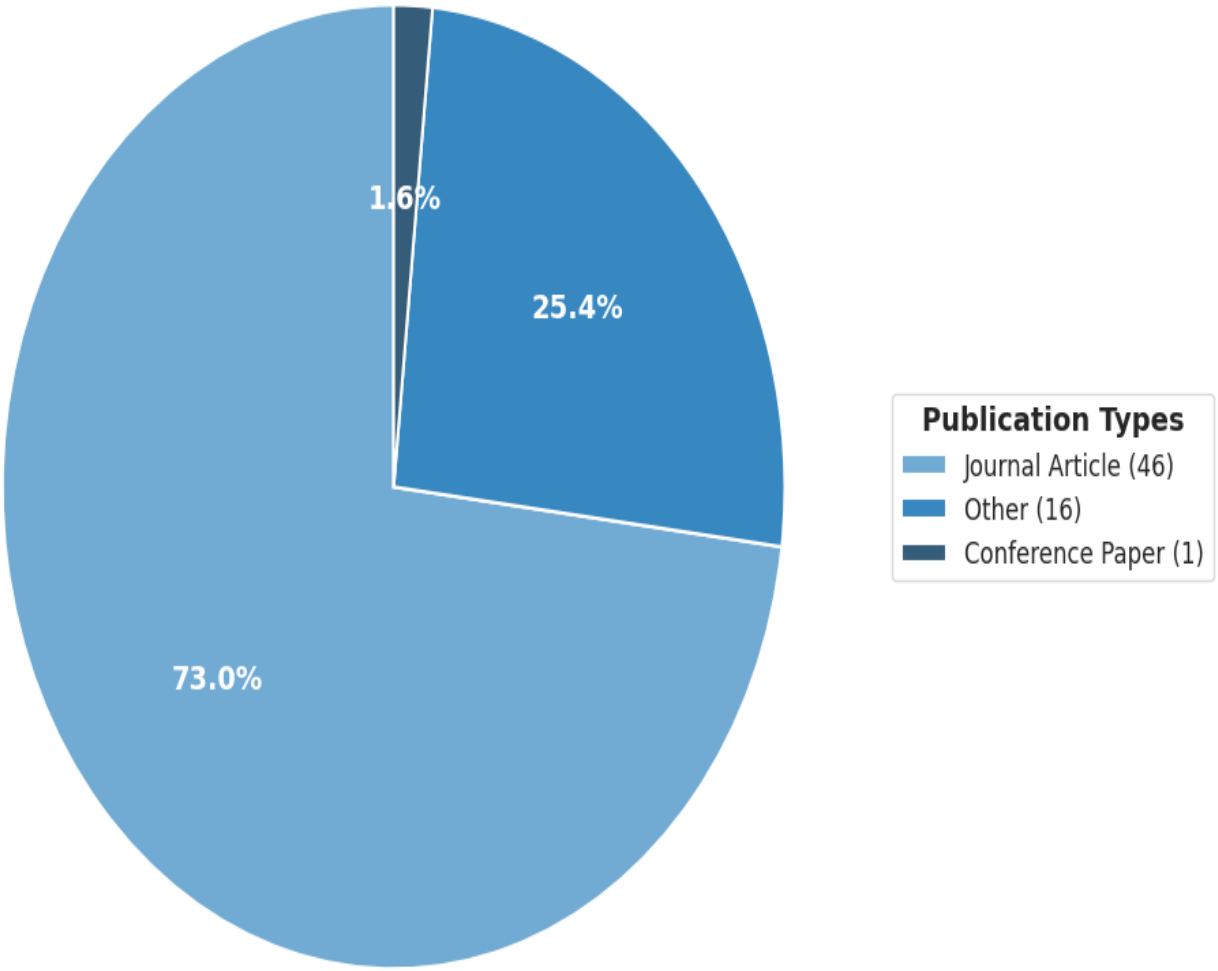
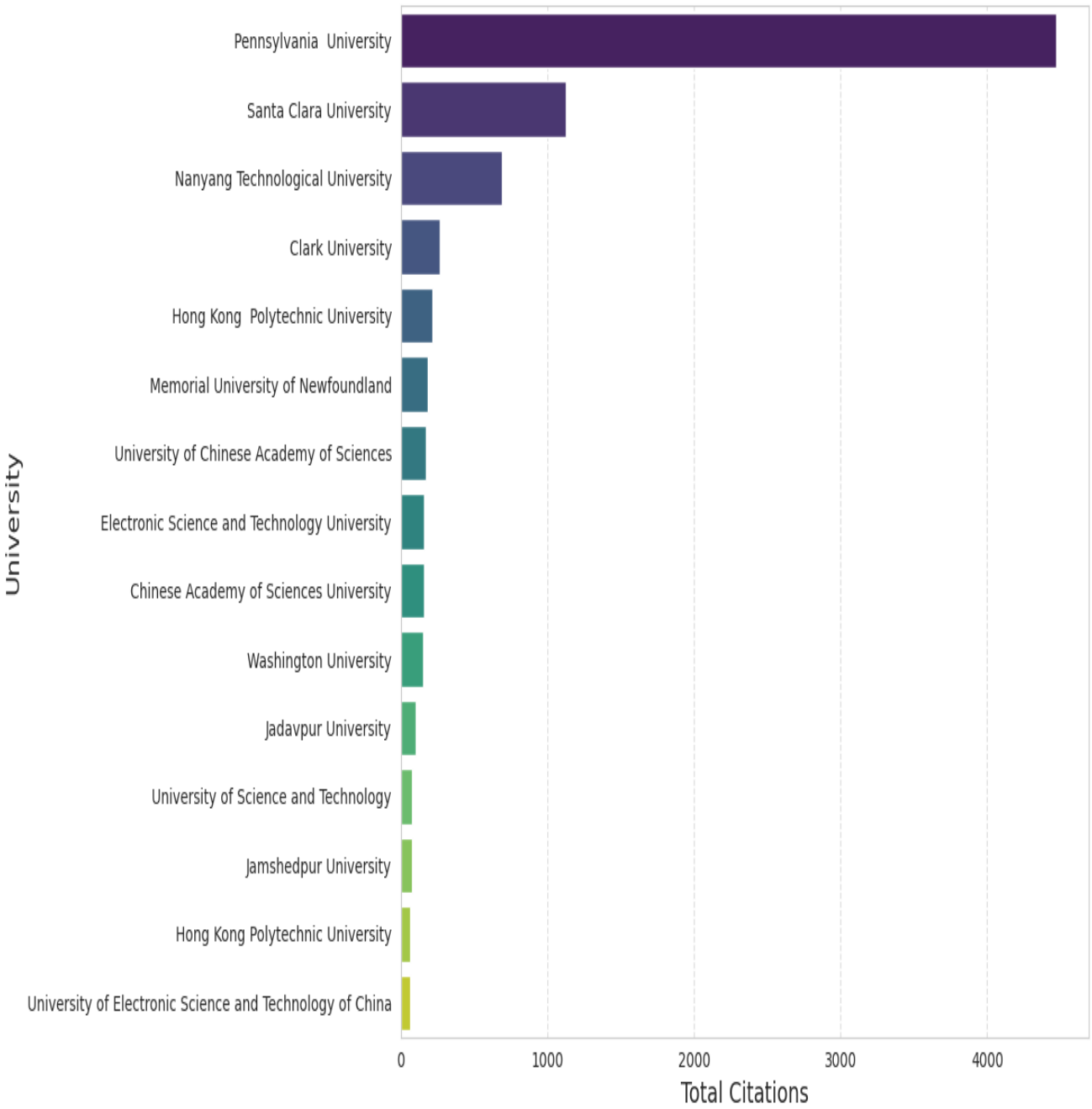


Figure 3 demonstrates that a significant portion of scientific resources in this field has been published in reputable academic journals, especially in trusted databases such as ScienceDirect, highlighting the scientific importance of this topic. Although conference papers also contribute, their number is smaller in this dataset because of the focus on journal-quality sources that undergo rigorous peer review. Including representative conference papers remains valuable for covering emerging research, but the emphasis on journal articles reflects their greater volume and impact. Following this, the leading universities in terms of citation counts are examined in Figure 4.

Figure 4

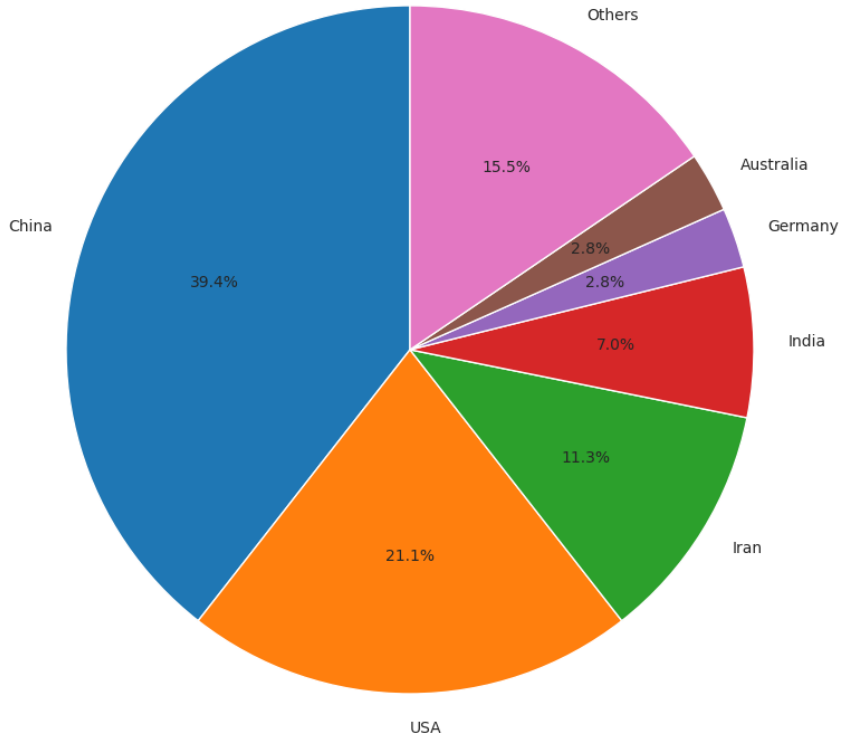
Top 15 universities by total citations



The analysis of authors' organizational affiliations in Figure 4 shows that the University of Pennsylvania leads the influential institutions in this field with 4,469 citations, followed by Santa Clara University with 1,124 citations, Nanyang Technological University with 692 citations, Clark University with 267 citations, and Hong Kong Polytechnic University with 216 citations. Following the organizational affiliation analysis, the geographical distribution of papers by country is examined in Figure 5.

Figure 5

Distribution of papers by country



In terms of geographical distribution, China holds the largest share of paper publications, followed by the United States, Iran, India, Germany, and Australia. This distribution demonstrates global interest in this research field and the particular focus of Asian countries on supply chain studies.

The bibliometric analysis of 63 selected papers in the field of wholesale pricing and buy-back contracts, as shown in Figure 2, indicates thematic diversity and increasing research interest in this area. It is important to note that while some of these papers directly focus on these two contract types, others address related topics within the broader supply chain context that are connected to these contracts. Supply chain coordination accounts for the largest share of studies at 21%, highlighting the central role of this concept in the design and implementation of supply chain contracts. This finding, together with pricing and revenue (20.2%) and buy-back contracts (18.5%), compared with wholesale price contracts (12.9%), shows that buy-back contracts have received greater attention and have been examined as a more efficient mechanism relative to wholesale pricing contracts.

The geographical distribution of studies reveals an interesting pattern: China accounts for 39.4%, the United States 21.1%, and Iran ranks third with 11.3%, indicating substantial regional interest in this topic. From an institutional perspective, a paper published by researchers at the University of Pennsylvania, with 4,469 citations, has had the highest citation impact among the reviewed articles, representing high-quality and influential research, although this does not necessarily reflect the overall focus of the university on supply chain coordination.

This section reports the results of the analysis of wholesale price and buy-back contracts based on the collected data and analytical framework. Following the bibliometric findings from the previous section, the characteristics, advantages, and limitations of each contract type are discussed based on the present analysis.

The analysis of research gaps reveals that, despite significant advances in this field, important areas remain overlooked. As illustrated in Figure 2, emerging technologies such as the Internet of Things and smart pricing in supply chain contracts have received limited attention. Additionally, transportation issues, distance constraints, and revenue sharing in wholesale pricing contracts remain underexplored. Behavioral factors, which comprise only 6.5% of studies, have also received less attention than expected considering their critical role in decision-making

(Vivaldini & Carli, 2025). These research gaps and underexplored topics are summarized based on the thematic categorization presented in Figure 2, which depicts the proportion of research addressing each subtopic within the supply chain contracts literature. In response to the research questions, findings from the reviewed papers indicate that buy-back contracts demonstrate higher efficiency and effectiveness than wholesale pricing contracts under conditions of demand uncertainty, perishable products, and reverse supply chains. This advantage arises from better risk distribution and stronger incentives for cooperation among supply chain members. Supply chain coordination has been analyzed predominantly as a function of profit, with buy-back contracts exhibiting superior coordination capability. However, wholesale pricing contracts still maintain adequate efficiency under stable and predictable demand conditions. These results are synthesized qualitatively from the content of the selected studies, with Figure 2 providing the primary visual overview of topic distribution.

In the following sections, the characteristics, advantages, and limitations of each of these two contract types are examined in detail to provide a better understanding of their performance under different supply chain conditions. Subsequently, a structural comparison of these two contract types is presented through analytical figures.

Wholesale Price Contracts in Supply Chain: Analysis of Applications and Limitations

Wholesale price contracts represent one of the simplest and most common types of contracts in supply chains and are widely adopted across various industries because of their simplicity of implementation and transparency (Cachon & Lariviere, 2001). Under this contract type, the manufacturer sells products to the retailer at a fixed price, after which all risks associated with product sales are transferred to the retailer (Cachon & Lariviere, 2001).

In wholesale price contracts, the manufacturer decides at the beginning of the sales season what price to set for products (Shekasteband et al., 2024). This pricing can be based on various factors, including production costs, market conditions, and competitive strategies. Subsequently, the retailer determines the order quantity based on its forecast of market demand (Shekasteband et al., 2024).

The simplicity of implementing these contracts represents a significant advantage, as they require no complex mechanisms and are easily executable (Nzuva, 2019). Additionally, manufacturers benefit from risk reduction because they face no uncertainty regarding final product sales (Adabi & Mashreghi, 2019). These contracts are particularly suitable for products with relatively stable and predictable demand patterns (Tsay et al., 1999). Research indicates that competition among retailers can lead to a preference for wholesale price contracts over other contract types such as revenue-sharing agreements (Bernstein & Federgruen, 2005).

Despite these advantages, wholesale price contracts present several challenges. The primary limitation is the double marginalization phenomenon, which reduces overall supply chain efficiency (Fang, 2018). Studies show that wholesale price contracts typically cannot achieve supply chain optimization through coordination mechanisms except under specific conditions (Cachon, 2003). Furthermore, if both demand and supply are uncertain, wholesale price contracts alone cannot effectively manage the entire supply chain (He & Zhao, 2012). The complete transfer of sales-related risks to retailers can also reduce their willingness to place high-volume orders (Glasmeier & Kibler, 1996).

To address these limitations, various hybrid approaches have been proposed. Under conditions in which both demand and supply are uncertain, combining return policies with wholesale price contracts can help coordinate the supply chain more effectively (He & Zhao, 2012). Recent research has examined supplier and manufacturer sales approaches in dual-channel distribution networks (Song et al., 2023), suggesting that the choice between wholesale price contracts and other contract types should take into account specific market conditions, product characteristics, and competitive structure (Zhou et al., 2022).

In conclusion, while wholesale price contracts offer simplicity and widespread applicability, they have inherent limitations in supply chain coordination. These contracts are most suitable for products with predictable demand and competitive retail markets (Cachon, 2003). However, under high uncertainty conditions, hybrid approaches or alternative contract types such as buy-back contracts may better improve overall supply chain performance (Salami et al., 2022). Decision-makers should carefully evaluate industry characteristics, product nature, and market structure when selecting appropriate contractual mechanisms (Tseng et al., 2009).

Buy-back Contracts: Risk Management and Performance Optimization

Buy-back contracts represent one of the most effective contractual mechanisms in supply chain management and have found widespread application in the distribution of diverse products such as books, media products, and apparel (Yue & Raghunathan, 2007). This type of contract involves

an agreement under which the manufacturer commits to repurchasing unsold goods from the retailer at a predetermined price (Momeni et al., 2022).

In this contractual mechanism, the manufacturer offers a wholesale price together with a buy-back option to the retailer. After actual market demand is realized, the retailer can return unsold products to the manufacturer at the specified buy-back price. This mechanism is particularly efficient under conditions of uncertain demand because it distributes the risk arising from demand uncertainty among supply chain members (Ji & Liu, 2022).

Buy-back contracts offer numerous advantages for supply chain coordination. These contracts can achieve optimal supply chain coordination and enable a more equitable allocation of profit between participants. By reducing excess inventory risk, retailers become more inclined to place larger orders (Cachon & Lariviere, 2005; Emmons & Gilbert, 1998). Research shows that buy-back contracts can generate greater profitability both at the overall supply chain level and for individual members compared with traditional contracts (Wu, 2013). These contracts are particularly suitable for products with unpredictable demand or short life cycles (Milner & Rosenblatt, 2002).

Despite these advantages, implementing buy-back contracts presents significant challenges. Widespread use can intensify competition among retailers, potentially creating negative consequences for both manufacturers and retailers (Bernstein & Federgruen, 2005). These consequences include reduced profit margins, increased marketing costs, and decreased incentives for service improvement (Smith & Hawkins, 2004).

Additionally, buy-back contracts involve product return costs that increase reverse logistics expenses (Panjehfouladgaran & Lim, 2020). These costs include transportation, inspection, re-warehousing, refurbishment, and administrative expenses. Managing reverse product flow requires complex information systems and specialized processes, which may in some cases offset the benefits of risk reduction (Toyasaki et al., 2013).

Research suggests that offering partial return options for unsold products may be most beneficial for the entire supply chain (Pasternack, 1985). Furthermore, combining return policies with sales discount and penalty contracts can contribute to effective supply chain management under unpredictable demand conditions (He et al., 2009).

In analytical models, channel participants are typically assumed to be risk-neutral and to operate so as to optimize expected revenue during specific sales periods (Shekasteband et al., 2024). In this environment, retailers face demand fluctuations and compete on the basis of selling prices.

Buy-back contracts represent an important tool for improving overall system performance by distributing demand uncertainty risk among chain members. Precise design of contract parameters, with consideration of industry-specific conditions, can lead to optimal outcomes for all stakeholders.

Structural Comparison of Wholesale Price and Buy-back Contracts in Supply Chain

Wholesale price and buy-back contracts are two of the most common contractual mechanisms in supply chain management, each with unique characteristics that enable different applications under various market conditions. This paper presents a comprehensive comparison of these two contract types from structural, functional, and effectiveness perspectives.

Wholesale price contracts represent the simplest type of supply chain contract, in which the manufacturer sells products to the retailer at a fixed price, after which all risks associated with product sales are transferred to the retailer (Cachon & Lariviere, 2001). In contrast, buy-back contracts involve an agreement whereby the manufacturer commits to repurchasing unsold goods from the retailer at a predetermined price (Yue & Raghunathan, 2007).

The fundamental difference between these two contract types lies in how risk is distributed among supply chain members. In wholesale price contracts, all risk is transferred to the retailer, whereas buy-back contracts distribute risk between the manufacturer and the retailer (Cachon, 2003).

To better understand the operational differences between wholesale price and buy-back contracts, a comprehensive comparative analysis based on nine key criteria is presented in Table 2. This analysis is conducted through a systematic review of 63 selected papers, with related paper numbers specified for each criterion.

Table 2

Comparative analysis of wholesale price and buy-back contracts

Row	Comparison criteria	Wholesale price contract	Buy-back contract	Related paper numbers from 63 papers
1	Risk Distribution	Complete risk transfer to retailer	Risk sharing between manufacturer and retailer	1, 6, 14, 16, 17, 19, 26, 29, 33, 35, 40, 44, 45, 47, 50, 57
2	Order Quantity	Retailers tend to order less than supply chain optimal quantity	Retailers have incentive to order quantities close to supply chain optimum	4, 5, 8, 11, 23, 32, 37, 51, 54, 61
3	Supply Chain Coordination	Weak (due to double marginalization effect)	Better (with appropriate buy-back price setting)	1, 2, 3, 6, 7, 10, 12, 17, 18, 20, 21, 22, 24, 25, 28, 30, 33, 34, 36, 37, 41, 42, 43, 44, 46, 47, 49, 50, 53, 56, 58, 59, 61, 62, 63
4	Implementation Complexity	Simple	Relatively more complex (requires return management)	7, 15, 24, 27, 36, 39, 40, 41, 42, 55, 60
5	Operational Costs	Lower	Higher (due to return management costs)	9, 15, 16, 18, 27, 32, 39, 40, 48, 51, 57, 58
6	Suitable For	Products with predictable demand	Products with uncertain demand and short life cycle	13, 19, 23, 31, 38, 46, 61
7	Flexibility	Less	More	12, 21, 30, 34, 37, 49, 52
8	Total Supply Chain Profit	Less than optimal	Closer to optimal	1, 2, 3, 8, 20, 22, 25, 28, 35, 37, 43, 48, 56, 60, 62, 63
9	Probabilistic Demand	Poor performance under high uncertainty conditions	Strong performance under uncertainty conditions	5, 10, 11, 14, 26, 31, 38, 45, 58, 59, 61

Table 2 presents a comprehensive comparative analysis of wholesale price and buy-back contracts across nine key performance dimensions, derived from a systematic review of the selected literature. This analysis reveals significant differences in contract performance characteristics.

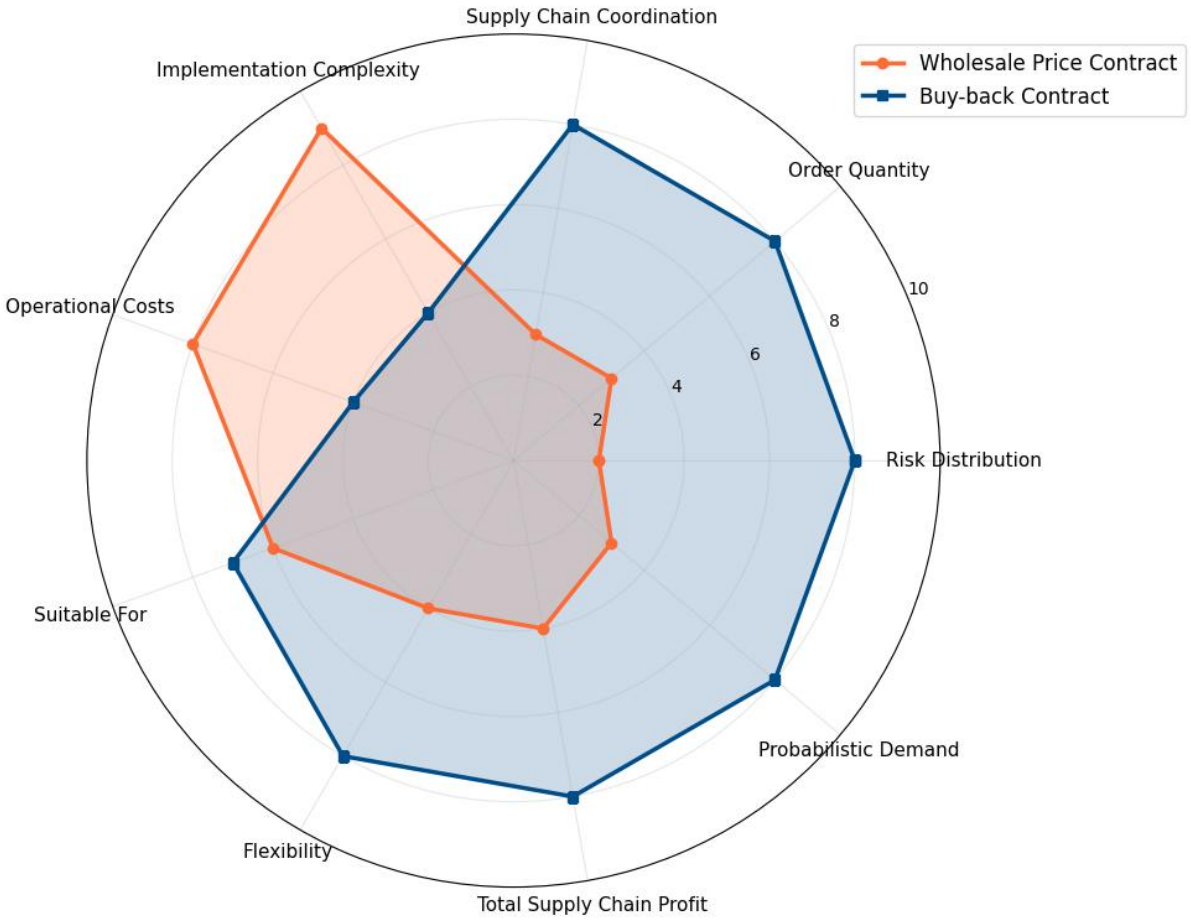
Supply chain coordination emerges as the most extensively examined criterion, highlighting its fundamental importance in contract design decisions. Risk distribution, examined in numerous studies, represents the second most critical factor, demonstrating the substantial difference between complete risk transfer in wholesale contracts and risk sharing in buy-back contracts.

The findings indicate that wholesale price contracts offer operational simplicity and lower implementation costs. In contrast, buy-back contracts provide superior coordination capabilities, greater flexibility, and better performance under demand uncertainty. Notably, buy-back contracts achieve total supply chain profits that are closer to the optimum and demonstrate stronger performance in probabilistic demand scenarios. However, this improved performance comes at the cost of greater implementation complexity and higher operational costs.

The analysis suggests that contract selection should depend on specific supply chain characteristics. Buy-back contracts are particularly suitable for products with uncertain demand and short life cycles, as evidenced in the research literature. For better visualization and deeper understanding of these performance differences, the following figures are presented. For the quantitative comparison of the two contractual approaches, the qualitative descriptions in Table 2 were converted into numerical scores using a 1-to-10 scale. Scoring was conducted based on the desirability of each characteristic in supply chain management through expert judgment. Positive descriptions such as “risk sharing,” “close to optimal,” “better,” and “greater flexibility” received higher scores (7–9). Negative descriptions such as “complete risk transfer,” “weak,” and “less than optimal” received lower scores (2–4). Moderate descriptions received middle-range scores (4–7). Descriptions containing both advantages and disadvantages, such as “implementation simplicity” versus “greater complexity,” were scored based on the relative importance of that criterion. Repetition of similar scores within these ranges was intended to provide flexibility and finer differentiation between features. The resulting radar chart comparing the performance of wholesale price and buy-back contracts is shown in Figure 6.

Figure 6

Performance comparison of key criteria in different contracts



As observed in Figure 6, buy-back contracts demonstrate superior performance compared to wholesale price contracts across most of the examined criteria. Wholesale price contracts show advantages only in the criteria of implementation complexity and operational costs. This finding indicates that, despite the multiple advantages of buy-back contracts, each approach possesses distinct strengths and weaknesses that must be considered in contract selection decisions.

Considering the distinct functional roles and inherent trade-offs of wholesale price and buy-back contracts, a hybrid contracting framework that leverages the operational efficiency of wholesale pricing alongside the risk-sharing and flexibility characteristics of buy-back contracts offers significant potential for supply chain coordination and performance enhancement. Wholesale price contracts are known for their straightforward implementation and cost efficiency, especially under stable market demand, whereas buy-back contracts introduce adaptive mechanisms to manage demand uncertainty, returns, and inventory risks more effectively (Chaharsooghi & Heydari, 2011; Yin & Xu, 2011). Empirical and theoretical studies emphasize that integrating these two forms of contracts into a hybrid design can mitigate individual drawbacks and capitalize on complementary strengths, thereby optimizing overall supply chain outcomes (Tsay et al., 1999).

To evaluate the performance of the proposed hybrid contractual approach, the score for each criterion was calculated as the simple average of the scores obtained from each individual contract type. This approach provides a preliminary and balanced assessment reflecting the potential combined performance achievable through the strategic integration of wholesale price and buy-back contracts. It should be noted that this averaging method is a heuristic simplification intended for illustrative purposes and to provide an initial insight into the hybrid mechanism. More sophisticated scoring and evaluation frameworks, such as weighted multi-criteria decision analysis or mathematical optimization models, have been developed in the literature to assess hybrid contract performance more rigorously

(Chaharsooghi & Heydari, 2011; Yin & Xu, 2011). Hence, the scoring approach used in this study is intended to reflect a conceptual middle ground derived from empirical scores of individual contracts, rather than to present an exact operational model. Further research could apply advanced methods to refine this assessment. The radar chart illustrating the combined approach performance is presented in Figure 7.

Figure 7

Efficiency of combined wholesale price and buy-back contracts

Figure 7 demonstrates that the combined approach achieves balanced performance across all criteria while avoiding the severe fluctuations observed in the two individual approaches. This hybrid strategy provides more stable and consistent performance by effectively balancing the advantages and disadvantages of both wholesale price and buy-back contracts.

Notably, the combined approach exhibits superior performance in criteria related to implementation simplicity and adaptability, indicating its robust implementation capability under diverse market conditions. The radar chart reveals that this balanced strategy eliminates the extreme weaknesses of individual contracts while maintaining reasonable performance levels across all dimensions.

This finding suggests that organizations seeking to optimize their supply chain contracts may benefit from adopting elements of both contractual mechanisms rather than relying exclusively on a single approach. The combined strategy offers a practical solution that can adapt to varying demand patterns, risk preferences, and operational requirements while maintaining manageable complexity and costs.

4. Discussion and Conclusion

The findings of this study demonstrate that buy-back contracts, in general, provide stronger coordination outcomes and higher overall effectiveness than wholesale price contracts across a wide range of supply chain conditions. The comparative analysis showed that this superiority is especially evident in settings characterized by demand uncertainty, reverse logistics, perishable products,

and elevated operational risk. In contrast, wholesale price contracts were found to perform relatively better in contexts with more stable demand, lower return complexity, and a managerial preference for implementation simplicity. These findings are highly consistent with the broader coordination literature, which has long argued that contract choice shapes the alignment of incentives, the allocation of risk, and the efficiency of decentralized decision-making in supply chains (Arshinder et al., 2011; Cachon, 2003; Dubey, 2024; Kanda & Deshmukh, 2008). The present study extends this logic by showing that the comparative performance of wholesale price and buy-back contracts is not merely a matter of formal structure, but of contextual fit. In other words, the contract that performs best is the one whose risk-sharing logic, informational assumptions, and operational requirements are aligned with the realities of the supply chain in which it is applied.

One of the central results of this study is that buy-back contracts outperform wholesale price contracts when the main coordination challenge stems from uncertainty and risk-bearing asymmetry between upstream and downstream members. This result is theoretically intuitive because the buy-back mechanism softens the retailer's exposure to overstock risk and thereby encourages order quantities closer to the system-wide optimum. Earlier foundational work showed that wholesale price contracts often suffer from double marginalization and under-ordering, whereas more sophisticated contracts can better align local decisions with total channel profit (Cachon, 2003; Lariviere, 1999; Tsay et al., 1999). The present findings align with more recent evidence indicating that buy-back arrangements remain effective under uncertain demand, differentiated salvage conditions, and risk-sensitive decision environments (Canbulut & Köse, 2025; Ji & Liu, 2022; Luo et al., 2018; Wang & Yin, 2025; Zhao et al., 2019). From this perspective, the stronger performance of buy-back contracts observed in the current study reflects their superior ability to redistribute risk in a way that supports coordination rather than simply shifting exposure downstream.

The results also indicate that wholesale price contracts retain practical value despite their weaker coordination capacity. Their strength lies in simplicity, transparency, and low implementation burden. This study found that wholesale price contracts are especially appropriate when demand is relatively predictable, product returns are limited, and managers seek straightforward administration with lower operational costs. This finding is in line with studies showing that wholesale contracts remain useful in competitive and conventional supply settings, particularly when uncertainty is not severe enough to justify more complex return-based arrangements (Adabi & Mashreghi, 2019; Hu et al., 2024; Hwang et al., 2018; Zhou et al., 2022). At the same time, the present results reinforce the established critique that wholesale price contracts frequently generate incomplete coordination because the retailer internalizes demand risk while the supplier retains pricing power (Fang, 2018; Ghaffari-Hadigheh & Mongeri, 2024; He & Zhao, 2016). Thus, the study does not suggest that wholesale pricing is ineffective in absolute terms; rather, it suggests that its usefulness is conditional and narrower than that of buy-back contracts under complex and uncertain environments.

Another important finding is that buy-back contracts are especially effective in reverse and closed-loop supply chains. In such systems, where returned goods, expired products, recycled items, or remanufacturing flows are central to value recovery, the buy-back mechanism provides a contractual basis for coordinating forward and reverse material flows. The current study showed that this function gives buy-back contracts a distinct advantage over wholesale price contracts in recovery-oriented systems. This interpretation is strongly supported by prior research in reverse logistics and circular supply chains, which has shown that buy-back contracts can enhance collection incentives, improve recovery efficiency, and reduce losses associated with returned or unsold goods (Govindan et al., 2013; Hariga et al., 2025; Hu et al., 2016; Krapp & Kraus, 2019; Liu et al., 2025; Momeni et al., 2022; Salami et al., 2022; Yoon & Jeong, 2016). The present study therefore confirms that the comparative advantage of buy-back contracts is not limited to classical inventory coordination, but extends into sustainable and regenerative supply chain configurations where reverse flow management is a core strategic issue.

The findings related to perishable and short life-cycle products also deserve attention. This study found that buy-back contracts generally provide better coordination in these settings because they reduce the retailer's reluctance to order under spoilage or obsolescence risk. When product value deteriorates rapidly, a contract that includes a return or repurchase provision becomes more attractive than one that fully transfers demand risk to the retailer. This result is compatible with earlier theoretical and empirical work on perishable products and short life-cycle goods, which showed that return-based and flexible contracts can better address inventory exposure than simple wholesale pricing (Chen et al., 2022; Chung & Erhun, 2013; Milner &

Rosenblatt, 2002; Pasternack, 1985). It is also consistent with recent work emphasizing that uncertainty in product quality, salvage value, and returns affects contract effectiveness and often strengthens the case for buy-back-style arrangements (Wang & Yin, 2025; Yan, 2025; Zhang et al., 2024). The present results therefore reinforce the idea that the economic logic of buy-back contracts is especially strong when demand timing, product freshness, and residual value are difficult to predict with confidence.

An additional contribution of this study is its attention to behavioral and informational factors. The results suggest that the comparative effectiveness of these contracts cannot be fully understood without considering the actual decision environment of supply chain actors. In particular, the study found that buy-back contracts tend to preserve their coordination advantage under many uncertain conditions, but their performance can still be influenced by behavioral biases, fairness concerns, and information asymmetry. This is consistent with recent behavioral operations research showing that contract outcomes are shaped by bounded rationality, round-number bias, fairness preferences, and competition-sensitive behavior (Jammernegg et al., 2025; Schiffels & Voigt, 2021; Sharifi et al., 2023; Vipin & Amit, 2021; Vivaldini & Carli, 2025; Xu et al., 2025). Likewise, the results of this study correspond with research demonstrating that information asymmetry changes the performance of both wholesale and buy-back contracts by altering incentives, bargaining behavior, and trust formation (Alwan et al., 2023; Chlebicka, 2024; Hojjatimanesh & Mahmoodi, 2025; Vosooghidizaji et al., 2020; Yang et al., 2017). Accordingly, the present study supports a more realistic interpretation of contract effectiveness: coordination is not solely a structural outcome of formal clauses, but also a behavioral and informational phenomenon.

The bibliometric results reported in the study also help explain why buy-back contracts appeared superior in the comparative synthesis. The reviewed literature gave greater emphasis to buy-back mechanisms than to wholesale price contracts, particularly in themes related to uncertainty, reverse supply chains, and advanced coordination settings. This pattern reflects the fact that contemporary supply chain research is increasingly focused on flexible and risk-sensitive mechanisms rather than purely transactional structures. In this sense, the results of the current study are aligned with the evolution of the literature itself, which has progressively moved from simple price-based coordination toward multi-dimensional contract design involving returns, sustainability, quality, and responsiveness (Jiang et al., 2025; Nakhaeinejad et al., 2025; Ren & Hu, 2024; Xin et al., 2020; Zhang & Wu, 2025). However, the study also makes clear that wholesale pricing has not become irrelevant. Its enduring presence in the literature and in practice suggests that simplicity, ease of implementation, and lower governance costs remain powerful considerations in contract choice (Höhn, 2009; Lewis & Roehrich, 2009; Nzuva, 2019).

One of the most interesting outcomes of this study is the identification of a combined or hybrid contractual perspective as a potentially superior strategic direction. The analysis showed that when the strengths of wholesale price and buy-back contracts are conceptually integrated, performance becomes more balanced across criteria such as coordination, flexibility, complexity, and cost. This result is important because it suggests that the real managerial choice may not always be between pure forms of contracts, but between alternative bundles of contract elements. The conclusion is consistent with prior work indicating that mixed or combined contracts may outperform single-mechanism designs when uncertainty, pricing, returns, and competition interact (Chaharsooghi & Heydari, 2011; Hu et al., 2024; Liu, 2015; Meng et al., 2017; Shi et al., 2020; Yin & Xu, 2011; Zhang et al., 2023). This also explains why the study found the hybrid approach to have smoother performance across criteria: by avoiding extreme dependence on a single coordination logic, the combined approach can better accommodate operational diversity and strategic trade-offs.

From a theoretical standpoint, the study supports the broader proposition that effective supply chain coordination requires matching contract design to environmental contingencies. This position echoes transaction-cost and coordination perspectives suggesting that the efficiency of a governance mechanism depends on the type of uncertainty, the difficulty of monitoring performance, the nature of asset specificity, and the degree of relational interdependence (Ketokivi & Mahoney, 2020; Li et al., 2015; Rius-Sorolla et al., 2020). The present results therefore contribute to the literature by showing that buy-back contracts dominate in conditions requiring stronger risk redistribution and adaptive coordination, whereas wholesale price contracts remain suitable when governance simplicity and low administrative burden are more valuable than maximum coordination intensity. This contingent interpretation is more useful than any universal claim that one contract type is always superior.

Taken together, the results of this study lead to a clear conclusion: buy-back contracts generally provide stronger coordination, greater flexibility, and better performance under uncertainty, while wholesale price contracts offer administrative simplicity and lower operational burden under stable conditions. The study also shows that hybrid approaches deserve serious attention because they can moderate the weaknesses of both mechanisms. These conclusions are consistent with both classical and recent research streams and demonstrate that the question is not whether one contract is universally best, but how contractual mechanisms can be aligned with the structure, uncertainty profile, and strategic objectives of the supply chain (Cachon, 2003; Doganoglu & Inceoglu, 2020; Dubey, 2024; Hariga et al., 2025; Shekasteband et al., 2024; Wang et al., 2021).

This study has several limitations that should be acknowledged. First, the analysis is based on a review and synthesis of published studies rather than on primary empirical data collected from firms or industries, which means that the conclusions depend on the quality, assumptions, and contexts of existing research. Second, although the comparative framework is comprehensive, many of the reviewed studies rely on analytical or game-theoretic models that simplify real-world supply chains and may not fully capture institutional, legal, cultural, and technological complexities. Third, the evaluation of the combined contractual approach is conceptual and heuristic rather than empirically validated through field data or simulation calibration. Fourth, the study focuses mainly on wholesale price and buy-back contracts, while other important contract types such as options, revenue sharing, and quantity flexibility contracts are discussed only insofar as they help contextualize the comparison. Finally, publication bias and uneven topical concentration in the literature may have influenced the weight of evidence in favor of certain contract forms or application areas.

Future research should move beyond purely conceptual or model-based comparison and test these contractual mechanisms in real industrial settings across sectors such as food, fashion, pharmaceuticals, retail platforms, and circular manufacturing. More longitudinal and case-based evidence is needed to determine how contract performance changes over time and under disruptions, inflationary episodes, regulatory change, or technological upgrading. Further studies should also develop more rigorous hybrid contract models that combine selected features of wholesale price and buy-back contracts with behavioral, financial, and environmental parameters. In addition, future scholarship would benefit from deeper analysis of digital technologies such as blockchain, AI-driven forecasting, and smart contract systems in monitoring returns, sharing information, and automating settlement terms. Greater attention should also be paid to multi-echelon supply chains, cross-border operations, and heterogeneous behavioral profiles among channel members.

In practice, managers should avoid selecting supply chain contracts solely on the basis of tradition, convenience, or imitation of industry norms. Instead, contract choice should be based on the uncertainty structure of the product, the reversibility of inventory, the degree of demand volatility, the expected cost of returns, and the behavioral characteristics of channel partners. For products with stable demand and limited reverse flow, a wholesale price contract may remain the most efficient and manageable option. For products exposed to high uncertainty, short life cycles, return risk, or circular recovery requirements, buy-back arrangements are likely to provide better incentives and stronger coordination. Where firms face mixed conditions, managers should consider hybrid structures that preserve the simplicity of wholesale pricing while incorporating selective return or flexibility provisions. Effective implementation also requires information transparency, partner trust, and the operational capability to manage returns and monitor contractual performance.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

References

Adabi, H., & Mashreghi, H. (2019). Coordination and competition in a duopoly with two manufacturers and two retailers with a wholesale price contract and demand uncertainty. *International Journal of Industrial Engineering & Production Research*, *30*(4), 465-476.

Alwan, L. C., Yang, C., & Fang, W. (2023). An advanced buy-back contract and information asymmetry. *Annals of Operations Research*, 1-21.

Arshinder, K., Kanda, A., & Deshmukh, S. G. (2011). A review on supply chain coordination: Coordination mechanisms, managing uncertainty and research directions. In *Supply Chain Coordination under Uncertainty* (pp. 39-82). https://doi.org/10.1007/978-3-642-19257-9_3

Basith, T. A., & Sajith, A. A. (2023). *Impact of wholesale price contracts in two-echelon supply chains under production disruptions* Lisbon, Portugal.

Bernstein, F., & Federgruen, A. (2005). Decentralized supply chains with competing retailers under demand uncertainty. *Management Science*, *51*(1), 18-29. https://doi.org/10.1287/mnsc.1040.0218

Cachon, G. P. (2003). Supply chain coordination with contracts. In *Handbooks in Operations Research and Management Science* (Vol. 11, pp. 227-339). https://doi.org/10.1016/S0927-0507(03)11006-7

Cachon, G. P., & Lariviere, M. A. (2001). Contracting to assure supply: How to share demand forecasts in a supply chain. *Management Science*, *47*(5), 629-646. https://doi.org/10.1287/mnsc.47.5.629.10486

Cachon, G. P., & Lariviere, M. A. (2005). Supply chain coordination with revenue-sharing contracts: Strengths and limitations. *Management Science*, *51*(1), 30-44. https://doi.org/10.1287/mnsc.1040.0215

Canbulut, G., & Köse, E. (2025). Supply chain coordination under buyback contract in a three-stage supply chain: A game theory approach. *Supply Chain Management Research*.

Chaharsooghi, S. K., & Heydari, J. (2011). Supply chain coordination under demand uncertainty using credit option. In *Supply Chain Coordination under Uncertainty* (pp. 403-425). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-19257-9_16

Chen, T., Liu, C., & Xu, X. (2022). Coordination of perishable product supply chains with a joint contract under yield and demand uncertainty. *Sustainability*, *14*(19), 12658. https://doi.org/10.3390/su141912658

Chlebicka, A. (2024). Solutions for overcoming information asymmetry and enhancing trust in supply chains. In *Trust and Supply Chains* (pp. 86-107). Routledge. https://doi.org/10.4324/9781032633725-6

Chung, Y. T., & Erhun, F. (2013). Designing supply contracts for perishable goods with two periods of shelf life. *IIE Transactions*, *45*(1), 53-67. https://doi.org/10.1080/0740817X.2012.654847

Doganoglu, T., & Inceoglu, F. (2020). Buy-back contracts to solve upstream opportunism. *European Journal of Operational Research*, *287*(3), 875-884. https://doi.org/10.1016/j.ejor.2020.05.021

Dubey, V. K. (2024). A comprehensive theoretical framework for sustainable network contracts: Contracting dimensions and contract classification. *Heliyon*, *10*(1), e23622. https://doi.org/10.1016/j.heliyon.2023.e23622

Emmons, H., & Gilbert, S. M. (1998). The role of returns policies in pricing and inventory decisions for catalogue goods. *Management Science*, *44*(2), 276-283. https://doi.org/10.1287/mnsc.44.2.276

Fang, X. (2018). Analysis of double marginalization effect on the wholesale price contract coordination. *Asia-Pacific Journal of Operational Research*, *35*(2), 1840005. https://doi.org/10.1142/S0217595918400055

Geng, Q. (2025). Selling on a marketplace with deceptive counterfeits: Agency or wholesale? *International Journal of Integrated Supply Management*, *18*(1), 54-86. https://doi.org/10.1504/IJISM.2025.147728

Ghaffari-Hadigheh, A., & Mongeri, N. (2024). Supply chain coordination with wholesale contract in an uncertain environment. *Journal of Industrial Engineering International*, *5*(4), 1.

Glasmeier, A. K., & Kibler, J. (1996). Power shift: The rising control of distributors and retailers in the supply chain for manufactured goods. *Urban Geography*, *17*(8), 740-757. https://doi.org/10.2747/0272-3638.17.8.740

Govindan, K., Popiuc, M. N., & Diabat, A. (2013). Overview of coordination contracts within forward and reverse supply chains. *Journal of Cleaner Production*, *47*, 319-334. https://doi.org/10.1016/j.jclepro.2013.02.001

Hariga, M., Ben-Daya, M., As'ad, R., & Saihi, A. (2025). Coordination of closed loop supply chains through buyback contract. *Supply Chain Forum: An International Journal*, *26*(3), 271-291. https://doi.org/10.1080/16258312.2023.2204992

He, Y., & Zhao, X. (2012). Coordination in multi-echelon supply chain under supply and demand uncertainty. *International Journal of Production Economics*, *139*(1), 106-115. https://doi.org/10.1016/j.ijpe.2011.04.021

He, Y., & Zhao, X. (2016). Contracts and coordination: Supply chains with uncertain demand and supply. *Naval Research Logistics*, *63*(4), 305-319. https://doi.org/10.1002/nav.21695

He, Y., Zhao, X., Zhao, L., & He, J. (2009). Coordinating a supply chain with effort and price dependent stochastic demand. *Applied Mathematical Modelling*, *33*(6), 2777-2790. https://doi.org/10.1016/j.apm.2008.08.016

Höhn, M. I. (2009). Literature review on supply chain contracts. In *Relational Supply Contracts: Optimal Concessions in Return Policies for Continuous Quality Improvements* (pp. 19-34). https://doi.org/10.1007/978-3-642-02791-8_2

Hojjatimanesh, F., & Mahmoodi, A. (2025). Information sharing decisions in a Manufacturer-Stackelberg supply chain under different contracts. *Journal of Industrial and Systems Engineering*, *17*(2), 166-195.

Hosseini-Motlagh, S. M., Nouri-Harzvili, M., & Zirakpourdehkordi, R. (2019). Two-level supply chain quality improvement through a wholesale price coordination contract on pricing, quality and services. *International Journal of Industrial Engineering & Production Research*, *30*(3), 287-312.

Hu, B., Meng, C., Xu, D., & Son, Y. J. (2018). Supply chain coordination under vendor managed inventory-consignment

stocking contracts with wholesale price constraint and fairness. *International Journal of Production Economics*, *202*, 21-31. https://doi.org/10.1016/j.ijpe.2018.05.009

Hu, S., Dai, Y., Ma, Z. J., & Ye, Y. S. (2016). Designing contracts for a reverse supply chain with strategic recycling behavior of consumers. *International Journal of Production Economics*, *180*, 16-24. https://doi.org/10.1016/j.ijpe.2016.06.015

Hu, S., Liu, L., & Liu, X. (2024). Wholesale price contract or mixed wholesale-option-contract? Procurement strategy for a contract farming supply chain under flexible supply. *Sustainability*, *16*(10), 4029. https://doi.org/10.3390/su16104029

Hwang, W., Bakshi, N., & DeMiguel, V. (2018). Wholesale price contracts for reliable supply. *Production and Operations Management*, *27*(6), 1021-1037. https://doi.org/10.1111/poms.12848

Jammernegg, W., Kischka, P., & Silbermayr, L. (2025). Supply chain coordination with a wholesale price contract for behavioral decision-makers. *European Journal of Operational Research*. https://doi.org/10.1016/j.ejor.2025.06.029

Ji, C., & Liu, X. (2022). Design of risk sharing and coordination mechanism in supply chain under demand and supply uncertainty. *Rairo - Operations Research*, *56*(1), 123-143. https://doi.org/10.1051/ro/2021186

Jiang, Z. Z., Lu, Z., & Wang, Z. (2025). The impact of contract types on carbon-capped food supply chains: Options versus wholesale. *International Journal of Production Research*, 1-30.

Kanda, A., & Deshmukh, S. G. (2008). Supply chain coordination: Perspectives, empirical studies and research directions. *International Journal of Production Economics*, *115*(2), 316-335. https://doi.org/10.1016/j.ijpe.2008.05.011

Ketokivi, M., & Mahoney, J. T. (2020). Transaction cost economics as a theory of supply chain efficiency. *Production and Operations Management*, *29*(4), 1011-1031. https://doi.org/10.1111/poms.13148

Krapp, M., & Kraus, J. B. (2019). Coordination contracts for reverse supply chains: A state-of-the-art review. *Journal of Business Economics*, *89*, 747-792. https://doi.org/10.1007/s11573-017-0887-z

Lariviere, M. A. (1999). Supply chain contracting and coordination with stochastic demand. In *Quantitative Models for Supply Chain Management* (pp. 233-268). Springer US. https://doi.org/10.1007/978-1-4615-4949-9_8

Lewis, M. A., & Roehrich, J. K. (2009). Contracts, relationships and integration: Towards a model of the procurement of complex performance. *International Journal of Procurement Management*, *2*(2), 125-142. https://doi.org/10.1504/IJPM.2009.023403

Li, G., Fan, H., Lee, P. K., & Cheng, T. C. (2015). Joint supply chain risk management: An agency and collaboration perspective. *International Journal of Production Economics*, *164*, 83-94. https://doi.org/10.1016/j.ijpe.2015.02.021

Li, J., Luo, X., Wang, Q., & Zhou, W. (2021). Supply chain coordination through capacity reservation contract and quantity flexibility contract. *Omega*, *99*, 102195. https://doi.org/10.1016/j.omega.2020.102195

Liu, K., Li, Q., Zhang, H., & Dong, Z. (2025). Trade-in strategies in closed-loop supply chain when considering manufacturer entrustment behavior and wholesale price contract. *Journal of the Operational Research Society*, *76*(2), 210-228. https://doi.org/10.1080/01605682.2024.2338845

Liu, Y. (2015). Buy-back and revenue-sharing contracts in global supply chain. *Journal of Industrial Engineering and Management*, *8*(4), 447-464. https://doi.org/10.3926/jiem.1391

Luo, C., Tian, X., Mao, X., & Cai, Q. (2018). Coordinating supply chain with buy-back contracts in the presence of risk aversion. *Asia-Pacific Journal of Operational Research*, *35*(2), 1840008. https://doi.org/10.1142/S0217595918400080

Meng, Q., Li, Z., Liu, H., & Chen, J. (2017). Agent-based simulation of competitive performance for supply chains based on combined contracts. *International Journal of Production Economics*, *193*, 663-676. https://doi.org/10.1016/j.ijpe.2017.08.031

Milner, J. M., & Rosenblatt, M. J. (2002). Flexible supply contracts for short life-cycle goods: The buyer's perspective. *Naval Research Logistics*, *49*(1), 25-45. https://doi.org/10.1002/nav.10002

Momeni, M. A., Jain, V., Govindan, K., Mostofi, A., & Fazel, S. J. (2022). A novel buy-back contract coordination mechanism for a manufacturer-retailer circular supply chain regenerating expired products. *Journal of Cleaner Production*, *375*, 133319. https://doi.org/10.1016/j.jclepro.2022.133319

Nakhaeinejad, M., Dehghan, A., & Vaziri, N. S. (2025). Developing a supply chain coordination model through a revised revenue sharing contract: Incorporating sales efforts and green quality considerations. *International Journal of Production Management and Engineering*, *13*(1), 102-121. https://doi.org/10.4995/ijpme.2025.20402

Nouri, M., Hosseini-Motlagh, S. M., Nematollahi, M., & Sarker, B. R. (2018). Coordinating manufacturer's innovation and retailer's promotion and replenishment using a compensation-based wholesale price contract. *International Journal of Production Economics*, *198*, 11-24. https://doi.org/10.1016/j.ijpe.2018.01.023

Nzuva, S. M. (2019). Smart contracts implementation, applications, benefits, and limitations. *Journal of Information Engineering and Applications*.

Panjehfouladgaran, H., & Lim, S. F. (2020). Reverse logistics risk management: Identification, clustering and risk mitigation strategies. *Management Decision*, *58*(7), 1449-1474. https://doi.org/10.1108/MD-01-2018-0010

Pasternack, B. A. (1985). Optimal pricing and return policies for perishable commodities. *Marketing Science*, *4*(2), 166-176. https://doi.org/10.1287/mksc.4.2.166

Ren, F., & Hu, B. (2024). Decisions and coordination in low-carbon supply chains with a wholesale price constraint under government subsidies. *International Journal of Production Economics*, *277*, 109407. https://doi.org/10.1016/j.ijpe.2024.109407

Rius-Sorolla, G., Maheut, J., Estellés-Miguel, S., & Garcia-Sabater, J. P. (2020). Coordination mechanisms with mathematical programming models for decentralized decision-making: A literature review. *Central European Journal of Operations Research*, *28*(1), 61-104. https://doi.org/10.1007/s10100-018-0594-z

Salami, M. S., Eslamipirharati, M., Bakhshi, A., Aghsami, A., Jolai, F., & Yazdani, M. (2022). Does a buy-back contract coordinate a reverse supply chain facing remanufacturing capacity disruption and returned product quality uncertainty? *Sustainability*, *14*(23), 15939. https://doi.org/10.3390/su142315939

Sarkar, S., & Bhala, S. (2021). Coordinating a closed loop supply chain with fairness concern by a constant wholesale price contract. *European Journal of Operational Research*, *295*(1), 140-156. https://doi.org/10.1016/j.ejor.2021.02.052

Schiffels, S., & Voigt, G. (2021). Capacity reservation and wholesale price contracts under forecast sharing: A behavioral

assessment. *Production and Operations Management*, *30*(10), 3579-3598. https://doi.org/10.1111/poms.13451

Sharifi, R., Razavi, H., & Elahi, E. (2023). Investigation of the ordering behavior of a retailer in the revenue sharing and buy-back contracts considering round number bias. *Journal of Retailing and Consumer Services*, *73*, 103361. https://doi.org/10.1016/j.jretconser.2023.103361

Shekasteband, P., Ahmadirad, M., & Asadzadeh, S. (2024). Wholesale price and buy-back contracts under fairness concerns and asymmetric information: A case study of Kalleh Dairy Company, Khuzestan Province Branch. *International Journal of Industrial Engineering: Theory, Applications and Practice*, *31*(5).

Shi, J., Du, Q., Lin, F., Li, Y., Bai, L., Fung, R. Y., & Lai, K. K. (2020). Coordinating the supply chain finance system with buy-back contract: A capital-constrained newsvendor problem. *Computers & Industrial Engineering*, *146*, 106587. https://doi.org/10.1016/j.cie.2020.106587

Smith, R., & Hawkins, B. (2004). *Lean maintenance: Reduce costs, improve quality, and increase market share*. Elsevier.

Song, C. J., Xu, B. J., & Xu, L. (2023). Dual-channel supply chain pricing decisions for low-carbon consumers: A review. *Journal of intelligent management decision*, *2*(2), 57-65. https://doi.org/10.56578/jimd020202

Toyasaki, F., Wakolbinger, T., & Kettinger, W. J. (2013). The value of information systems for product recovery management. *International Journal of Production Research*, *51*(4), 1214-1235. https://doi.org/10.1080/00207543.2012.695090

Tsay, A. A., Nahmias, S., & Agrawal, N. (1999). Modeling supply chain contracts: A review. In *Quantitative Models for Supply Chain Management* (pp. 299-336). https://doi.org/10.1007/978-1-4615-4949-9_10

Tseng, M. L., Chiang, J. H., & Lan, L. W. (2009). Selection of optimal supplier in supply chain management strategy with analytic network process and Choquet integral. *Computers & Industrial Engineering*, *57*(1), 330-340. https://doi.org/10.1016/j.cie.2008.12.001

Vipin, B., & Amit, R. K. (2021). Wholesale price versus buy-back: A comparison of contracts in a supply chain with a behavioral retailer. *Computers & Industrial Engineering*, *162*, 107689. https://doi.org/10.1016/j.cie.2021.107689

Vivaldini, M., & Carli, E. (2025). Behavioral intelligence in supply chains: Review, reflection and recommendations for future research. *Operations and Supply Chain Management: An International Journal*, *18*(3), 367-378. https://doi.org/10.31387/oscm0620479

Vosooghidizaji, M., Taghipour, A., & Canel-Depitre, B. (2020). Supply chain coordination under information asymmetry: A review. *International Journal of Production Research*, *58*(6), 1805-1834. https://doi.org/10.1080/00207543.2019.1685702

Wang, C., Chen, J., Wang, L., & Luo, J. (2020). Supply chain coordination with put option contracts and customer returns. *Journal of the Operational Research Society*, *71*(6), 1003-1019. https://doi.org/10.1080/01605682.2019.1599703

Wang, D., Wang, Z., Zhang, B., & Zhu, L. (2022). Vendor-managed inventory supply chain coordination based on commitment-penalty contracts with bilateral asymmetric information. *Enterprise Information Systems*, *16*(3), 508-525. https://doi.org/10.1080/17517575.2020.1827300

Wang, J., Fan, X., & Zhang, T. (2021). Behaviour-based pricing and wholesaling contracting under supply chain competition. *Journal of the Operational Research Society*, *72*(9), 1943-1959. https://doi.org/10.1080/01605682.2020.1750310

Wang, X., & Yin, F. (2025). Supply chain coordination with buyback contract under uncertain demand and salvage value differentiation environments. *Fuzzy Optimization and Decision Making*, *24*(3), 563-588. https://doi.org/10.1007/s10700-025-09457-x

Wu, D. (2013). Coordination of competing supply chains with news-vendor and buy-back contract. *International Journal of Production Economics*, *144*(1), 1-3. https://doi.org/10.1016/j.ijpe.2011.11.032

Xie, X., Zhang, F., Liu, L., Yang, Y., & Hu, X. (2023). Assessment of associated credit risk in the supply chain based on trade credit risk contagion. *PLoS One*, *18*(2), e0281616. https://doi.org/10.1371/journal.pone.0281616

Xin, C., Chen, X., Chen, H., Chen, S., & Zhang, M. (2020). Green product supply chain coordination under demand uncertainty. *IEEE Access*, *8*, 25877-25891. https://doi.org/10.1109/ACCESS.2020.2963944

Xu, M., Bao, W., & Yang, D. (2025). Behavior-based pricing and wholesale contracting in competing supply chains with informative advertising. *Journal of the Operational Research Society*, *76*(6), 1140-1155. https://doi.org/10.1080/01605682.2024.2415129

Yan, X. (2025). Coordination of the supply chain with quality improvement and customer returns. *Computers & Industrial Engineering*, *203*, 111057. https://doi.org/10.1016/j.cie.2025.111057

Yang, H., Cao, E., Lu, K. J., & Zhang, G. (2017). Optimal contract design for dual-channel supply chains under information asymmetry. *Journal of Business & Industrial Marketing*, *32*(8), 1087-1097. https://doi.org/10.1108/JBIM-01-2016-0007

Yin, L., & Xu, Q. (2011). Combined contract of buyback and pricing flexibility to coordinating supply chain under price updating. In *International Conference on Computer Science and Information Engineering* (pp. 73-79). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-21411-0_12

Yoon, S. W., & Jeong, S. J. (2016). Implementing coordinative contracts between manufacturer and retailer in a reverse supply chain. *Sustainability*, *8*(9), 913. https://doi.org/10.3390/su8090913

Yu, H., Yang, W., Xu, N., & Du, Y. (2023). Advertising strategy and contract coordination for a supply chain system: Immediate and delayed effects. *Kybernetes*, *52*(1), 235-261. https://doi.org/10.1108/K-03-2021-0185

Yue, X., & Raghunathan, S. (2007). The impacts of the full returns policy on a supply chain with information asymmetry. *European Journal of Operational Research*, *180*(2), 630-647. https://doi.org/10.1016/j.ejor.2006.04.032

Zhang, C., & Wu, J. (2025). Wholesale price confidentiality under demand uncertainty in competing supply chains. *International Journal of Production Economics*, 109804. https://doi.org/10.1016/j.ijpe.2025.109804

Zhang, J., Sethi, S. P., Choi, T. M., & Cheng, T. C. (2022). Pareto optimality and contract dependence in supply chain coordination with risk-averse agents. *Production and Operations Management*, *31*(6), 2557-2570. https://doi.org/10.1111/poms.13701

Zhang, S., Tong, X., & Jin, X. (2023). Contract design and comparison under the opportunity cost of working capital: Buy-back vs. revenue sharing. *European Journal of Operational Research*, *309*(2), 845-856. https://doi.org/10.1016/j.ejor.2023.01.051

Zhang, Y., Yu, P., & Feng, T. (2024). Full quantity or full credit? Choosing the right buyback policy for a behavioral retailer. *Manufacturing & Service Operations Management*, *26*(6), 2212-2230. https://doi.org/10.1287/msom.2023.0574

Zhao, H., Song, S., Zhang, Y., Gupta, J. N., Devlin, A. G., & Chiong, R. (2019). Supply chain coordination with a risk-

averse retailer and a combined buy-back and revenue sharing contract. *Asia-Pacific Journal of Operational Research*, *36*(5), 1950028. https://doi.org/10.1142/S0217595919500283

Zhou, Y., Liu, J., & Wu, X. (2022). How to implement the wholesale price contract: Considering competition between supply chains. *Journal of Systems Science and Systems Engineering*, *31*(2), 150-173. https://doi.org/10.1007/s11518-022-5522-z

Zhu, X., Song, Y., Lin, G., & Xu, W. (2023). Pricing decisions and coordination in E-commerce supply chain with wholesale price contract considering focus preferences. *Journal of Theoretical and Applied Electronic Commerce Research*, *18*(2), 1041-1068. https://doi.org/10.3390/jtaer18020053