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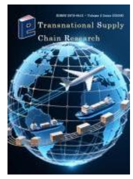

Research Article

How Can Supply Chain Coordination Be Improved with the Help of Contractual Mechanisms: A Comparative Analysis of Wholesale Pricing and Quantity Discount

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ABSTRACT

Supply chains have evolved into networks since the 2000s, and as a result of this expansion, companies are facing major challenges. The alignment and coordination of value-creating processes are of unprecedented importance, as cooperative relationships – and thus the coordination of value-creating processes among supply chain members – have become even more crucial in a digitized and automated world. Among supply chain coordination tools, this study examines coordination mechanisms based on contracts, specifically comparing wholesale pricing and quantity discounts based on a set of parameters accepted in the literature. Using a case study, the researcher illustrates the operational mechanisms, advantages, disadvantages, and coordination strength of the two contract types through a specific example. Based on the results, if members wish to move toward a less distant relationship and establish a cooperative, collaborative relationship – one that already involves operational integration, shared goals, and decision-making mechanisms –, the quantity discount is potentially a good solution for strengthening coordination. The researcher also illustrates this with a numerical example.

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1. Introduction

Supply chain management has become a key strategic discipline for organizations in the twenty-first century. One of its primary objectives is to coordinate collaboration among supply chain members, a task that has evolved into a significant challenge for both researchers and practitioners. A general trend is that supply chains are becoming increasingly extensive, involving a growing number of participants, which substantially complicates the coordination of value-creating processes across organizational boundaries. Furthermore, modern supply chains increasingly incorporate organizations performing diverse roles and functions, such as third-party logistics providers responsible for outsourced logistics activities and financial institutions that facilitate interorganizational transactions or finance business operations. As a result, supply chains no longer exhibit the characteristics of traditional linear structures; instead, the contemporary literature increasingly refers to them as supply networks [1,2].

Achieving and maintaining a high level of customer satisfaction requires the effective integration and collaboration of every member within the supply chain. If even a single participant fails to perform at the expected level, the performance of the entire chain – or, more appropriately, the supply network – may be adversely affected. Consequently, customer requirements may not be fully satisfied, ultimately placing the organizations operating within the network at a competitive disadvantage.

For these reasons, supply chain management, and supply chain coordination in particular, has become an area of strategic importance. This study investigates the application of contractual mechanisms as a means of strengthening coordination among supply chain members. Through a practical case study, the performance of a buyer-supplier relationship operating under a traditional wholesale price contract is enhanced by introducing a quantity discount contract designed to improve coordination between the parties. A comparative analysis is then conducted to examine how the key performance measures commonly investigated in the contract-theoretic supply chain literature change when a contract that provides a higher level of coordination and cooperation is implemented.

2. Literature Review

The literature review focuses on supply chain coordination, with particular emphasis on the role of contractual mechanisms in coordinating supply chain members. Drawing on comparative studies reported in the literature, the key performance measures commonly used to evaluate contractual mechanisms are also identified.

2.1. Overview of Supply Chain Coordination

Based on a synthesis of the definitions proposed in the literature, supply chain coordination can be understood as the set of processes and mechanisms designed to align the activities and decisions of supply chain members [3]. Its primary objective is to ensure that participants do not exclusively pursue their individual interests but instead make decisions that contribute to optimizing the performance of the supply chain as a whole [4-6]. Insufficient coordination may give rise to several complex operational problems, including the bullwhip effect, inefficient capacity utilization, inventory shortages, and excessive inventory levels [4].

Since the beginning of the 2010s, supply chain coordination has become one of the key determinants of organizational competitiveness. During the early development of supply chain management, coordination primarily focused on cost reduction, inventory optimization, and service level improvement. Today, however, its scope has expanded considerably. The increasing emphasis on environmental sustainability, the widespread adoption of digital technologies and automation, the disruptions caused by the COVID-19 pandemic, and other international events with global implications have transformed coordination from a predominantly operational concern into a strategic capability. Consequently, the performance of supply chains increasingly depends not on the performance of individual organizations alone but on the effectiveness of their coordinated collaboration [6-8].

The technological advances associated with the Fourth Industrial Revolution have further facilitated coordination among supply chain members by accelerating digital transformation. A wide range of digital platforms, enterprise software solutions, and information technologies have enabled real-time information sharing, thereby supporting faster and more informed decision-making across organizational boundaries [9,10].

Research published after 2020 has demonstrated that the objective of supply chain coordination extends beyond maximizing operational efficiency. Recent disruptions have revealed the vulnerability of many supply chains to unexpected events, making supply chain resilience a central concern. Consequently, the ability to withstand, adapt to, and recover from disruptions has become one of the primary objectives of coordination. In this context, rapid information sharing, collaborative risk management, supplier diversification, flexible capacity management, and real-time decision support have emerged as essential components of effective coordination [8,11,12].

The growing emphasis on reducing environmental impacts and achieving sustainability objectives has also reshaped supply chain coordination mechanisms. Establishing shared environmental, social, and governance (ESG) objectives, harmonizing supplier audit processes, and developing joint emission reduction initiatives all contribute to the advancement of circular economy models and sustainable supply chain management. The literature consistently demonstrates that sustainability objectives cannot be achieved without integrated processes and close collaboration among supply chain partners [13,14].

2.2. Coordination Mechanisms

The primary objective of supply chain coordination is to align, connect, and integrate the processes of organizations participating in value creation. The literature generally distinguishes between two broad categories of coordination mechanisms: behavioral (soft) mechanisms and structural (hard) mechanisms.

Behavioral (soft) coordination mechanisms facilitate collaboration among supply chain partners from a behavioral and relational perspective. Their primary concern is whether the participating organizations are genuinely willing to cooperate. In this context, important questions include the motivational factors underlying the partnership, the level of mutual trust, the willingness of partners to share information, and whether the relationship is driven by common objectives or primarily by individual organizational interests. These factors constitute the foundation of behavioral coordination.

Trust is widely recognized as one of the most important relational assets within supply chains. A high level of trust reduces transaction costs, encourages information sharing, and ultimately contributes to improved supply chain performance. Greater information transparency also facilitates the development of long-term collaborative relationships. At the highest level of integration, cooperation is built upon shared objectives, which are essential for achieving coordinated decision-making across organizational boundaries. Nevertheless, not every supply chain relationship requires such a high degree of collaboration. For example, establishing long -term strategic partnerships with non-strategic suppliers is often neither necessary nor economically justified. In such relationships, behavioral coordination mechanisms are typically expected to play only a moderate role [15,5,11].

Structural (hard) coordination mechanisms primarily comprise formal contractual, technological, and organizational instruments that establish the institutional framework for collaboration. One important category consists of information systems, including enterprise resource planning (ERP) systems, standardized electronic data interchange (EDI) platforms, and various digital collaboration platforms supporting supply chain management. These technologies enable real-time information sharing and the virtual integration of business processes across supply chain partners. Consequently, they facilitate more accurate order quantities, better synchronization of replenishment decisions with market demand, and ultimately higher levels of customer satisfaction. Their fundamental purpose is to provide structured data exchange and process integration across organizational boundaries.

Closely related to these technologies are collaborative planning systems, which typically operate through integrated software solutions or cloud-based digital platforms. These systems enable supply chain members to jointly develop demand forecasts and inventory plans. Well-established examples include Collaborative Planning, Forecasting and Replenishment (CPFR), which supports collaborative demand planning, forecasting, and replenishment decisions, and Vendor Managed Inventory (VMI), in which the supplier assumes responsibility for managing the customer's inventory.

Contractual mechanisms represent another major category of structural coordination mechanisms. Their primary objective is to allocate risks and profits between supply chain partners in a mutually acceptable manner while creating incentives for coordinated decision-making. In supply chain management, contracts establish a formal framework within which the relevant contractual parameters are predefined, whereas the specific values assigned to these parameters may vary depending on the characteristics of the buyer–supplier relationship. For instance, relationships characterized by power asymmetry typically involve a less balanced distribution of profits, whereas partnerships between organizations with relatively equal bargaining power generally seek a more equitable allocation of both risks and returns. Accordingly, although the contractual framework and the relevant decision variables remain unchanged, their values can be adjusted through the selection of the contractual mechanism that best fits the characteristics of the relationship. The literature commonly evaluates contractual mechanisms using performance measures such as supply chain profit, sales volume, internal transfer prices, and market prices [16,17].

Contract-based supply chain coordination can be examined through a range of quantitative approaches that go beyond the simple identification or comparison of contractual forms. A well-established approach is to formulate centralized and decentralized optimization models and compare the resulting decisions, particularly order or production quantities, prices, and total supply chain profit. In such models, the contract parameters—such as wholesale prices, quantity discounts, revenue-sharing rates, buy-back prices or flexibility parameters—can themselves be treated as decision variables and optimized to align the incentives of the participating firms. This is particularly relevant because a wholesale price can create double marginalization, meaning that the internally agreed transfer price may lead to a quantity that differs from the system-optimal quantity. Consequently, the coordination of a buyer–supplier relationship should ideally be assessed simultaneously through the quantity decision, market selling price and internal transfer price, rather than through any of these variables in isolation. The interaction between quantity and market price is especially important when demand is price-dependent, as changes in the contract can affect both the optimal quantity and the economically sustainable selling price. From an economic perspective, the analysis should also distinguish between the individual profits of the contracting parties and the total profit of the integrated supply chain. The total supply chain profit indicates the efficiency of the coordination mechanism, whereas individual profits determine whether the contract is economically acceptable and provides sufficient incentives for each participant to cooperate. Thus, a useful quantitative framework can compare the decentralized equilibrium with the centralized optimum and then determine whether an appropriate contract can reproduce the system-optimal quantity while distributing the resulting profit between the parties. Multi-objective optimization provides a further extension when the parties simultaneously consider economic and operational objectives, such as profit, cost, service level and risk. Game-theoretic and bargaining approaches can additionally be used to examine how bargaining power, fairness preferences and the allocation of the generated surplus influence the feasible contract parameters and the resulting coordination outcome. Accordingly, the coordination problem can be represented as a quantitative relationship between contract parameters, market price, transfer price, quantity decisions and the profit functions of individual firms and the supply chain as a whole. Such an approach makes it possible not only to determine whether coordination is technically achievable, but also to identify the range of contract parameters under which coordination is economically viable for all parties. This perspective is particularly valuable because different contracts may generate the same system-level profit while producing substantially different profit allocations and incentives for the individual partners. Therefore, analyzing quantity, market price, internal transfer price, individual profit and total supply chain profit jointly provides a more comprehensive basis for evaluating whether a contractual relationship actually coordinates the economic interests of the participating firms [18-21].

3. Example of Contract Application

Contractual arrangements have been extensively examined in the literature and are widely recognized as effective mechanisms for improving coordination among supply chain partners. However, the effectiveness of a contractual arrangement primarily depends on whether the selected contract type is appropriate for the characteristics of the buyer–supplier relationship.

The present example examines two fictitious companies that currently maintain a transactional market relationship. Their cooperation is short-term in nature, with transactions concluded on an ad hoc basis. The companies consist of a supplier and a manufacturer, where the supplier provides a non-strategic raw material. The contractual arrangement governing their relationship is based on a wholesale price contract.

Wholesale price contracts represent one of the most commonly applied contractual forms in supply chain management. Under this arrangement, the buyer purchases the required quantity at a wholesale price determined by the supplier and subsequently sells the product to the next member of the supply chain according to its own pricing policy. However, this contractual mechanism does not necessarily ensure supply chain-wide optimal performance. Owing to the independent pricing decisions of the parties, wholesale price contracts are susceptible to the problem of double marginalization, whereby each supply chain member independently maximizes its own profit rather than the overall profit of the supply chain. Consequently, supply chain performance and total system profit are reduced. Therefore, this contract type generally provides limited support for long-term collaboration and higher levels of supply chain coordination [22-24].

Subsequently, one of the manufacturer's suppliers becomes unavailable. This supplier had previously provided a substitute material at a considerably lower internal transfer price. As a result, the manufacturer is forced to increase ordering frequency while reducing the order cycle with the remaining supplier. This operational change also alters the nature of the relationship, shifting it from a purely transactional interaction toward a minimally cooperative partnership. Consequently, the existing contractual arrangement is reassessed, and in order to enhance cooperation and coordination, the wholesale price contract is replaced with a quantity discount contract.

A quantity discount contract enables the buyer to obtain a lower unit price by purchasing larger order quantities. This contractual mechanism can generate mutual benefits for both parties. From the supplier's perspective, it encourages larger purchase volumes, thereby reducing ordering costs, stabilizing demand, and improving capacity utilization. Nevertheless, the contract may also produce adverse effects. If the buyer focuses primarily on obtaining price discounts without adequately considering market trends and demand conditions, excessive inventory levels may accumulate. Likewise, the supplier may experience increased production intensity, which can negatively affect the firm's cost structure and place additional pressure on production resources, including both human and manufacturing capacities. These effects may ultimately contribute to the emergence of the bullwhip effect. Previous studies have also emphasized that quantity discount contracts are not employed solely to stimulate purchasing behaviour. In many supply chain settings, they are implemented to strengthen supplier relationships, facilitate centralized procurement, and reduce logistics costs [24-26].

The corresponding section of the supply chain examined in this example is illustrated in Figure 1.

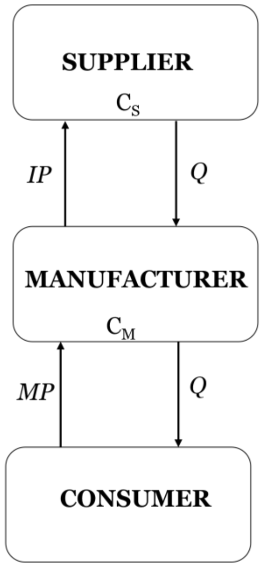

Figure 1. Supply chain segment used in the illustrative example (Source: authors' own elaboration)

The symbols presented in Figure 1 denote the parameters used for comparing the two contractual arrangements. Their definitions and interpretations are summarized in Figure 2.

$x ; y$	$\rightarrow$	*constants*
C_S	$\rightarrow$	*cost of the supplier*
C_M	$\rightarrow$	*cost of the manufacturer*
$\sum C$	$\rightarrow$	*sum of the manufacturer*
q	$\rightarrow$	*quantity*
IP	$\rightarrow$	*internal price*
MP	$\rightarrow$	*market price*
Π_S	$\rightarrow$	*profit of the supplier*
Π_M	$\rightarrow$	*profit of the manufacturer*
$\sum \Pi$	$\rightarrow$	*sum of the profit*

Figure 2. Symbols and definitions of the parameters used for the comparative analysis (Source: authors' own elaboration)

As the level of cooperation increases, the companies agree to share a predetermined proportion of their revenue, thereby reflecting the transition toward a more collaborative relationship.

It should be noted that the calculated parameters are intended for comparative analysis on an order-of-magnitude basis. In other words, they provide a numerical framework for comparing the operational characteristics of different contractual arrangements. By analysing these parameters, the operating mechanisms, limitations, advantages, and disadvantages of individual contract types can be identified. Furthermore, the comparison reveals the type of interorganizational relationship supported by each contractual arrangement. In the present example, the traditional, non-cooperative wholesale price contract must be replaced by a contractual arrangement that supports a higher level of cooperation, as the firms are required to shift from a distant transactional relationship toward closer collaboration.

The methods used to calculate these parameters are presented in the following section.

3.1. Parameter Calculation Method

A wholesale price contract can be applied in both cooperative and arm's-length buyer–supplier relationships. Since the present example represents an arm's-length relationship, the operational mechanism of the wholesale price contract is formulated as follows.

Based on [18,27,28] the equations to calculate the parameters are the following.

The full cost of this section of the chain is calculated by the sum of the individual costs (Equation (1)).

$$\sum C = C_S + C_M \tag{1}$$

The analysis begins with the characterization of the consumer market. Market conditions are represented by predefined constants. Accordingly, the market is described by a linear demand function, which also determines the market price, as shown in Equation (2).

$$MP = x - y * q \tag{2}$$

Within this contractual arrangement, each supply chain member pursues its own objectives independently. Consequently, there is no common objective or integrated decision-making process, as each company focuses exclusively on its own value-creating activities. Since each member seeks to maximize its individual profit rather than the total profit of the supply chain, different profit-maximization variables emerge. This divergence gives rise to the problem of double marginalization, as each member optimizes its own objective function using different decision variables.

Accordingly, the profit of Supplier A can be calculated using Equation (3). In this formulation, revenue is generated from the internal transfer price paid by the manufacturer, while production cost represents the supplier's expenditure. Both components depend on the quantity ordered by the manufacturer.

$$\Pi_S = (IP - C_S) * q \tag{3}$$

Consequently, the supplier's profit-maximization variable is the internal transfer price determined by Supplier A.

The manufacturer, in contrast, maximizes its profit based on the quantity of products sold. This illustrates the existence of different optimization variables, which ultimately results in double marginalization. A relevant question is why profit maximization is not based directly on the market price. The rationale is that the manufacturer cannot fully control the market price, as it is influenced by consumer preferences, competitors' pricing strategies, and various external market factors to which firms must adapt. Therefore, market price cannot serve as the manufacturer's primary decision variable. Instead, the manufacturer has substantially greater influence over the quantity of products sold. Although sales volume is likewise affected by market demand, the manufacturer exercises considerably more control over product sales than over market price formation.

The manufacturer's profit function is presented in Equation (4). Following the same logic, revenue is determined by the market price paid by the consumer, while costs consist of the internal transfer price paid to Supplier A and the manufacturer's own production cost. Both revenue and costs depend on the quantity sold.

$$\Pi_M = (MP - IP - C_M) * q \tag{4}$$

The total profit of the supply chain segment is obtained as the sum of the profits earned by the two participating firms.

Based on the different profit-maximization variables, both the optimal sales quantity and the internal transfer price can be determined. The optimal quantity is obtained from the manufacturer's profit function. By taking the partial derivative of the profit function with respect to quantity and rearranging the resulting expression, the optimal quantity can be calculated as a function of the demand parameters, the internal transfer price, and the manufacturer's production cost, as shown in Equation (5).

$$q = \frac{x - IP - C_S}{2 * y} \tag{5}$$

The internal transfer price is determined exclusively by Supplier A and therefore represents the supplier's decision variable. Taking the partial derivative of Supplier A's profit function with respect to the internal transfer price yields the optimal transfer price presented in Equation (6).

$$IP = \frac{x - \sum C}{2} \tag{6}$$

Based on the above equations, the calculated parameter values for the wholesale price contract operating under an arm's-length relationship are summarized in Figure 3. The reported values are expressed in thousand euros and thousand units, respectively.

Contractual Mechanism of Wholesale Pricing

x; y	C_A	C_S	$\sum C$	*q*	*MP*	*IP*	Π_S	Π_M	$\sum \Pi$
200; 1.5	***40***	***25***	***65***	***22.5***	***166.25***	***107.5***	***1518.75***	***759.375***	***2278.125***

Figure 3. Results of wholesale pricing (Source: authors' own elaboration)

To achieve a higher level of collaboration, the supply chain members replace the wholesale price contract with a quantity discount contract. To ensure a fair distribution of the jointly generated revenue, the parties agree on a revenue-sharing ratio of 45%–55% and the symbol of it is αS (=45%) and αM (=55%).

Under this contractual arrangement, purchasing larger quantities results in a lower unit transfer price. However, beyond a certain order quantity, additional purchases become counterproductive, as excessive ordering and production negatively affect the remaining performance parameters. Consequently, the objective of the quantity discount contract is to determine the optimal order quantity at which the internal transfer price is minimized without deteriorating the performance of the other contractual parameters.

Establishing a common profit-maximization objective forms the basis of this collaborative arrangement. Unlike the wholesale price contract, where each firm independently maximizes its own profit, the objective here is to maximize the total profit of the supply chain through the achievement of common goals. Accordingly, the aggregate profit function is obtained by combining the individual profit functions of the two firms. Taking the partial derivative of this aggregate profit function with respect to the order quantity yields the optimal solution. Consequently, Equation (7) determines the sales quantity that provides the best overall performance across all evaluated parameters.

$$q = \frac{x - \sum C}{2 * y} \tag{7}$$

To determine the quantity-dependent internal transfer price, both the agreed revenue-sharing ratio and the total sales revenue must be incorporated into the calculation. Total revenue is obtained as the product of the market price and the sales quantity. Based on these relationships, the internal transfer price can be calculated using Equation (8).

$$IP = (1 - \alpha_B) * \frac{(MP * q)}{q} - C_M + \alpha_B * \sum C \tag{8}$$

The calculation procedures for the market price and the individual profit functions remain unchanged. Therefore, Equations (1), (2), (3) and (4) are directly applicable under the quantity discount contract as well.

The parameter values obtained using the above calculation procedure are presented in Figure 4.

Contractual Mechanism of Quantity Discount

x; y	C_A	C_S	$\sum C$	*q*	*MP*	*IP*	Π_S	Π_M	$\sum \Pi$
200; 1.5	**40**	**25**	**65**	**45**	***132.5***	***70.375***	***1366.875***	***1670.625***	***3037.5***

Figure 4. Results of quantity discount (Source: authors' own elaboration)

The researcher compares the two contractual arrangements based on the order quantity, internal transfer price, market price, and profit values, including both individual firm profits and total supply chain profit. The interpretation of the results is presented in the following section.

3.2. Interpretation of the Results

Based on the results presented in Figures 3 and 4, substantial differences can be observed between the two contractual arrangements across the evaluated performance parameters. These comparative results are summarized in Figure 5.

	Wholesale Pricing		Quantity Discount
q	*22.5*	<	*45*
MP	*166.25*	>	*132.5*
IP	*107.5*	>	*70.375*
Π_S	*1518.75*	>	*1366.875*
Π_M	*759.375*	<	*1670.625*
Π	*2278.125*	<	*3037.5*

Figure 6. Comparison of the results of wholesale pricing and quantity discount (Source: authors' own elaboration)

The fundamental principle of the quantity discount contract is clearly reflected in the results. Compared with the wholesale price contract, the quantity discount contract achieves a lower internal transfer price while simultaneously supporting a higher sales volume. Although the transfer price decreases, the lower price provides an incentive for the buyer to purchase larger quantities, resulting in higher total supply chain profit.

The distribution of individual profits, however, deserves particular attention. Under the quantity discount contract, the distribution of profits is reversed compared with the wholesale price contract: the manufacturer realizes the higher profit, whereas Supplier A receives a lower profit. This outcome can largely be attributed to the agreed revenue-sharing ratio and therefore is not necessarily expected to generate conflict between the contracting parties.

From another perspective, the quantity discount contract provides a more balanced distribution of profits between the partners, which is likely to contribute positively to the long-term stability of the collaborative relationship. In contrast, the wholesale price contract produces a highly asymmetric profit distribution, suggesting the presence of a supplier with a strong bargaining position and considerable market power, as Supplier A realizes approximately twice the profit earned by the manufacturer. Based on the information provided in the case study, however, this interpretation should be regarded only as a plausible explanation, since no direct evidence regarding the existence or extent of supplier dominance is available.

In summary, wholesale price contracts represent one of the simplest and most commonly observed forms of vertical coordination; however, the literature consistently demonstrates that a wholesale-price-only mechanism generally fails to coordinate decentralized supply chains because each party optimizes its own profit, resulting in the well-known double-marginalization effect. Quantity discount contracts provide a potentially more effective alternative because the transfer price becomes dependent on the quantity purchased, thereby creating an explicit economic incentive for the downstream partner to increase its order quantity and move closer to the system-wide optimum. Their relevance is particularly strong in settings where demand is price-sensitive, since quantity discounts can simultaneously influence the buyer's purchasing decision, the market selling price and the resulting sales volume. Previous research has shown that quantity discount mechanisms can improve coordination and increase total supply chain profit compared with decentralized decision making, although their effectiveness depends strongly on the structure of demand, pricing and the contractual parameters. Against this background, replacing a conventional wholesale-price contract with a quantity discount contract offers an appropriate framework for investigating whether contractual incentives can improve both individual and system -level economic performance. The present approach extends the conventional coordination analysis by jointly examining four interrelated economic dimensions: the optimal quantity, the market selling price, the internal transfer price, and the resulting profits of both individual partners and the supply chain as a whole. This integrated perspective is important because coordination cannot be adequately characterized solely by the maximization of total supply chain profit: a contract must also generate economically acceptable outcomes for the individual firms participating in the relationship. The distinction between system efficiency and individual profitability is well established in the contract-coordination literature, where different contractual mechanisms may achieve the same system-level objective while producing substantially different allocations of the resulting surplus. Accordingly, the main contribution of the proposed analysis lies in the simultaneous comparison of the quantity, market price, internal transfer price, individual profits and total supply chain profit under alternative contractual arrangements. To the best of our knowledge, although these individual dimensions have been investigated separately or in various combinations in the existing supply chain coordination literature, an integrated quantitative comparison of all five dimensions in the context of replacing a wholesale-price contract with a quantity discount contract has not been identified in the reviewed Scopus-indexed literature. The proposed framework therefore provides a more comprehensive assessment of contractual coordination by linking operational decisions with market outcomes, internal pricing and the distribution of economic value between supply chain partners. This enables the analysis to determine not only whether a quantity discount contract increases total supply chain profit, but also how the contract changes the economically optimal quantity, market price, internal transfer price, and the distribution of profit between the individual firms and the supply chain as a whole. Such an approach can therefore reveal coordination effects that remain invisible when contractual performance is evaluated solely on the basis of total supply chain profit or order quantity.

4. Recommendations and Limitations

The quantity discount contract represents a more balanced coordination mechanism capable of supporting a higher level of collaboration between supply chain partners. The comparative analysis demonstrates improvements in performance at both the individual firm level and the overall supply chain level. Furthermore, the adoption of a common profit-maximization objective leads to a more balanced allocation of economic benefits among the participating firms. One of the principal advantages of this contractual arrangement is that it effectively mitigates the problem of double marginalization. These findings help the decision-makers of supply chain management to improve the purpose of the supply chain management: improved efficient business operations can increase the customer service level. Beside that, the increasing complexity of the structure of supply chains or networks needs serious coordination mechanisms. In the example, a supplier-manufacturer relationship was presented – in this dyadic relation the changing circumstances led to change in the nature of the cooperation. They have a contractual relationship with a very low information-sharing mechanism and a very weak cooperation. Because they have to make a stronger relationship, it is needed to change the contract within the relationship. This would be the quantity discount.

Based on the findings of the illustrative case study, replacing the wholesale price contract with a quantity discount contract is recommended. As a coordination mechanism, the quantity discount contract is better suited to supporting collaborative relationships and is therefore expected to facilitate a higher level of supply chain coordination than the wholesale price contract. When supply chain partners intend to strengthen their relationship from a purely transactional interaction to at least a basic level of cooperation, a quantity discount contract constitutes an appropriate contractual solution.

Nevertheless, determining the appropriate discount level remains a critical challenge. Excessively large discounts, resulting in very low transfer prices, are not always desirable. Owing to the interaction among the model parameters, overly aggressive price reductions may adversely affect the performance of the remaining contractual variables and consequently reduce the overall system optimum. The scenario presented in the case study represents the optimal solution, where the selected order quantity and corresponding discounted transfer price jointly maximize supply chain profitability.

It should also be emphasized that quantity discount contracts are not appropriate for every buyer-supplier relationship. While they constitute an effective coordination mechanism in conventional supplier-manufacturer relationships, partnerships involving suppliers of strategic raw materials may require contractual arrangements that support substantially higher levels of collaboration and integration. The comparative analysis presented in this study indicates that the quantity discount contract is most suitable for establishing and coordinating a moderate level of interorganizational cooperation. Its application is recommended when the partners have already established a sufficient level of mutual trust, maintain a moderate degree of information sharing – that is, they exchange the operational information necessary for effective collaboration – and are willing to agree upon a fair revenue-sharing mechanism. Under these conditions, the quantity discount contract can significantly enhance coordination and cooperation between supply chain partners.

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Conflict of Interest

The author declares no conflict of interest.

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