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A Comparative Analysis of Coordination Success and Failure in Perishable Food Supply Chains: A Dual-Case Study of the Arctic Community and the Chinese Farmer-Supermarket Direct Procurement

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Abstract. Perishable food supply chains face persistent coordination difficulties due to product perishability, supply-demand uncertainty, and external shocks. Existing research predominantly focuses on mathematical models and optimal contract design, assuming contracts are enforceable, while neglecting qualitative comparative research on why coordination fails in practice. This paper investigates why some perishable food supply chains achieve effective coordination while others continue to experience coordination failures, and where the critical dividing line lies. Employing literature review, dual-case comparative analysis, and qualitative analysis, this study selects the Arctic community supply chain as a coordination failure case and the Chinese farmer-supermarket direct procurement model as a relatively successful counterpart. The analysis reveals that the critical dividing line between coordination success and failure lies not in the external environment, but in whether the three internal governance dimensions—contractual clarity, information transparency, and relational trust—are simultaneously in place. This finding suggests that future research should move beyond contract parameter optimization to examine how governance mechanisms interact in different perishable supply chain contexts. It also implies that policymakers should prioritize improving contractual clarity and information sharing before investing in cold chain infrastructure or subsidy programs.

Keywords: Perishable food supply chain, Supply chain coordination, Dual-case comparative analysis, Farmer-supermarket direct procurement, Relational governance

1. Introduction

Perishable food supply chains have long faced prominent coordination difficulties due to product perishability, long production cycles, and demand uncertainty. In recent years, external shocks such as frequent extreme weather events, logistics infrastructure disruptions, and geopolitical conflicts have further exposed the vulnerability of coordination mechanisms in perishable supply chains [1-5]. At the academic research level, existing literature has largely focused on designing optimal

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coordination contracts through mathematical models to address the double marginalization effect in decentralized decision-making [1, 6-8]. However, these studies commonly assume that contracts are enforceable and can be complied with. In reality, coordination failure in perishable supply chains often stems not from poorly designed contracts but from failures in the institutional and relational environment in which contracts are implemented—information asymmetry that facilitates opportunistic behavior, ambiguous contract terms that encourage buck-passing, and a lack of trust that undermines relationships [9]. Current literature lacks systematic qualitative investigation into the deep social and relational roots of such coordination failures, particularly cross-context comparative analyses [9, 10]. In response to this research gap, this paper proposes the following research question: Why do some perishable food supply chains achieve effective coordination while others persistently fail, and what is the critical dividing line between coordination success and failure? To answer this question, this paper adopts a literature review, dual-case comparative analysis, and qualitative analysis. This paper makes both theoretical and practical contributions. Theoretically, it fills the gap in existing research that emphasizes model derivation while lacking qualitative comparative analysis, providing an integrated analytical framework from the perspective of "contract-information-relationship-environment."

2. Literature review: factors affecting coordination in perishable food supply chains

2.1. The contract design dimension

The core of supply chain coordination lies in designing appropriate contracts that enable decentralized supply chain members to pursue their own interests while achieving system-wide optimality [11]. In the field of perishable supply chains, scholars have designed various coordination contracts for different contexts. Yu and Tian introduced manufacturers' risk-aversion preferences under the dual uncertainty of random yield and random demand, designing a credit guarantee contract to achieve supply chain coordination [1]. Yang et al. examined farmer overconfidence in off-season fresh produce supply chains and proposed a hybrid contract combining cost sharing and a two-part tariff, finding that a single contract fails to coordinate under behavioral biases [7]. Song et al. examined the impact of fairness concerns on coordination effectiveness in closed-loop supply chains, designing an improved two-part tariff contract [8]. Zhao et al. introduced a credit supervision mechanism in cross-regional fresh produce supply chains [6]. It should be noted that most of these quantitative studies implicitly assume that formal contracts are unambiguous and can be fully enforced. They mainly focus on optimizing contract parameters under ideal implementation conditions, yet pay limited attention to real-world coordination failures triggered by ambiguous contractual terms, fragmented information and lack of trust. This creates a research gap for our qualitative comparative analysis focusing on contract execution and governance.

2.2. External environmental barriers

The coordination effectiveness of perishable supply chains depends not only on contract design, but is also strongly affected by the external environment. These external barriers can be categorized into two types: natural shocks and operational disruptions. Natural shocks, such as extreme weather and natural disasters, alter the operational foundation of perishable supply chains and disrupt coordination mechanisms. Li and Zhao found that extreme weather crises can alter the trajectory of pollution accumulation in aquatic product supply chains, affecting the dynamic adjustment of coordination strategies [2]. Operational disruptions, such as infrastructure failures and channel

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breakdowns, directly interrupt the flow of goods and information among supply chain members. Aslani and Moradi examined the impact of sales and distribution infrastructure disruptions on coordination in dual-channel supply chains, finding that centralized decision-making can improve system profitability but may harm one party's interests [3]. These disruptions increase uncertainty and weaken the ability of supply chain members to coordinate effectively. Together, these studies indicate that external shocks—whether natural or operational—become important triggers of coordination failures by disrupting information flows and increasing uncertainty.

2.3. Relational governance and the research gap

In addition to contract design and the external environment, relational governance mechanisms among members have received increasing attention. The embedded case study of the Canadian Arctic community by Afif et al. reveals a key finding: coordination failures in perishable supply chains stem not only from harsh physical environments, but more fundamentally from opportunistic behavior and the absence of accountability caused by ambiguous contracts, unclear property rights, and fragmented information [9]. Even when government subsidies are provided, if governance gaps remain unfilled, coordination effectiveness stays limited. Usman et al. confirm that supply chain coordination capability affects sustainable performance through enhancing supply chain agility, a pathway highly dependent on information sharing and relationship quality [10]. Taken together, the existing literature has examined coordination issues from three perspectives—contract design, external environment, and relational governance—but lacks a unified analytical framework and cross-case comparison to reveal the critical dividing line between coordination success and failure. This is precisely the entry point of this paper.

3. Research design

This paper adopts literature review, dual-case comparative analysis, and qualitative analysis as research methods. Case selection follows the principle of maximum differentiation sampling: two cases with significant contextual differences yet both facing perishable coordination challenges are selected for comparison. Case A (coordination failure) is the perishable food supply chain of a Canadian Arctic community, with all data sourced from the embedded single-case study by Afif et al. in the British Food Journal [9], which obtained rich qualitative data through semi-structured interviews, focus groups, and field observations. Case B (relative success) is the Chinese farmer-supermarket direct procurement model, with data sourced from Wang Zixuan's empirical study of Jiajiayue Supermarket in Yantai, China [12]. The selection of these two cases is justified on three grounds. First, both cases face similarly severe external challenges—the Arctic's extreme climate and geographic isolation versus China's long-distance transportation and decentralized smallholder production—yet they exhibit sharply contrasting coordination outcomes. This "controlled comparison" design allows the study to isolate internal governance factors from external environmental factors. Second, the Arctic case represents an extreme case of coordination failure where external support has already been introduced but has proven insufficient, making it a critical test of whether external intervention alone can solve coordination problems. Third, the Chinese farmer-supermarket direct procurement model represents a case of relative success where standardized contracts, order-driven information sharing, and long-term cooperation coexist alongside remaining deficiencies, providing a realistic picture of how governance mechanisms function in practice. This paper constructs a four-dimensional comparative analytical framework: contractual clarity (the degree of standardization and clarity of formal agreements), information

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transparency (the efficiency and symmetry of supply-demand information transmission), relational trust (long-term cooperation orientation and level of opportunistic behavior), and external environmental support (the completeness of infrastructure, policy subsidies, and technical support).

4. Case analysis

4.1. Case A: the Arctic community coordination dilemma

Afif et al. reveal in detail the structural dilemma of the Arctic community perishable food supply chain [9]. At the contract level, the supply chain involves up to 11 handling points, and fresh produce may be handled as many as 50 times before reaching the community. Deliveries occur only twice per week with a five-day order-to-delivery lead time. Contracts between suppliers, carriers, and retailers contain ambiguous terms and lack clear definitions of quality standards, delivery times, and allocation of responsibility. "Weak contracts, unclear property rights, and fragmented information flows" render accountability mechanisms ineffective. When problems arise, parties shift blame to one another, and retailers have no recourse to recover losses from substandard shipments.

At the information level, three informants reported the absence of a formalized traceability system, making it impossible to identify where damage occurs. Information asymmetry is severe: retailers do not know which products receive subsidies; carriers do not know what condition goods are in; suppliers do not know what local demand actually is. One retail manager observed: "It is unclear to me where the subsidy funds are ultimately directed, nor which specific products receive subsidisation." From the perspective of industry-level relationships, just two airlines service this flight route, while more than 90 percent of remote Indigenous communities depend on one single corporate-run retailer. Such high market concentration creates room for opportunistic conduct. In 2019, merely 26 cents out of every dollar in subsidy was passed on to consumers in the form of lower prices. Suppliers ship low-grade fresh produce, given that retailers have no recourse to return damaged merchandise. As one retail manager put it: "Lodging a complaint often yields no response." An air freight provider further commented: "We lack effective measures to prevent goods from being damaged; this issue has persisted for many years." When considering the broader external environment, the community is home to roughly 2,000 inhabitants and can only be reached by air throughout the entire year. On average, retail prices for fresh fruit and vegetables are 140 % above those seen in major southern cities. A five-pound bag of apples can cost three to four times its price in southern urban centres. Product spoilage rates vary between 5 % and 20 %, and air freight expenses run as much as 30 % higher than in southern areas. Survey results indicate that 82 percent of respondents have come across expired food items, and 57 percent struggle to source fresh groceries. Even though the federal government offers food-related subsidies via the Nutrition North Canada initiative, these subsidies are unable to remedy deep-seated systemic flaws. One specialist in food transportation remarked: "Food subsidies are not the answer. The northern population is expanding quickly, and transportation costs keep rising. Consequently, subsidies will never be sufficient to close the gap."

4.2. Case B: Chinese farmer-supermarket direct procurement coordination practices

The farmer-supermarket direct procurement model is a representative practice of coordination in China's perishable food supply chains. Wang Zixuan's empirical study of Jiajiayue Supermarket in Yantai found that Jiajiayue, as one of the first batch of pilot enterprises designated by the Ministry of Commerce and the Ministry of Agriculture, has signed contracts with more than 2,000 agricultural

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cooperatives and farms, achieving over 80% direct source procurement of fresh agricultural products, with a circulation loss rate of approximately 4%, far below the national average of 20%-30% [12].

At the contract level, contracts typically include variety, quantity, quality standards, minimum guaranteed prices, and breach clauses, which are more standardized than traditional verbal agreements. Jiajiayue adopts a "supermarket + base + farmer" model, establishing bases at the source and hiring farmers for cultivation, signing purchase and sales contracts directly with base farmers [12]. At the information level, some leading enterprises have introduced order-based agricultural systems through which supermarkets' real-time sales data can be fed back to production areas to guide harvesting and delivery planning. Jiajiayue enhances information transparency through traceability platforms such as "Shandong Food Chain." At the relationship level, supermarkets provide technical training and planting planning guidance to cooperative farmers. Long-term cooperative relationships have fostered a degree of social capital and mutual trust. However, farmer bargaining power remains insufficient—survey data show that 58.47% of farmers believe product prices are determined solely by supermarkets, with little room for negotiation [12]. At the external environment level, the government provides strong support through cold chain logistics infrastructure construction subsidies, green channel transportation policies for agricultural products, and service platform development. The model still faces challenges such as smallholder default, production reduction due to extreme weather, and imperfect last-mile cold chain delivery, but overall, its coordination effectiveness is significantly better than traditional wholesale models [12].

4.3. Comparative analysis: the critical dividing line

At the contract level, the Arctic case features ambiguous contracts with unclear responsibility allocation and no breach constraints, while Chinese farmer-supermarket direct procurement features standardized contracts with quality standards and breach clauses. At the information level, the Arctic case exhibits highly asymmetric, fragmented information with no sharing mechanisms, while China demonstrates order-driven information flow with partial traceability. At the relationship level, the Arctic case is characterized by frequent opportunistic behavior, no accountability, and low trust, while China shows long-term cooperation orientation with reciprocal relational capital accumulation, though farmer bargaining power remains insufficient. At the external environment level, both cases receive government subsidies, but Arctic subsidies fail to address institutional gaps while Chinese subsidies are integrated with cold chain infrastructure and policy support. The central comparative finding is that both cases face substantial external challenges—the Arctic's harsh natural conditions on the one hand, and China's long-distance transportation and decentralized smallholder production on the other—yet the cases exhibit different levels of coordination effectiveness. The Arctic case suggests that government subsidies alone may be insufficient to sustain coordination when contracts are ambiguous, information is opaque, and relational governance is weak [9].

5. Discussion

Based on the above comparative analysis, this paper draws three core arguments. First, perishable supply chain coordination is a systematic project of four dimensions—contract, information, relationship, and environment—and improvement in a single dimension is insufficient. The Arctic case shows that even with government subsidies, coordination may still fail when contracts are

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ambiguous, information is opaque, and relationships are poorly managed, because price subsidies alone cannot address structural deficiencies in governance [9]. Second, the three internal governance dimensions exhibit mutually reinforcing or mutually undermining feedback effects. In Chinese farmer-supermarket direct procurement, clear contracts reduce transaction uncertainty [12], providing an institutional foundation for information sharing; good cooperation history and information transparency in turn enhance both parties' willingness to perform contracts, forming a virtuous cycle. In contrast, in the Arctic community, ambiguous contracts encourage information hoarding and opportunistic behavior, and deteriorating relationships make both parties less willing to invest in improving contracts, forming a vicious cycle [9]. Third, governance mechanisms should be placed on equal footing with economic incentives. Existing literature extensively focuses on optimal subsidy ratios or optimal price parameters [1, 7, 5], but practice shows that without governance mechanisms—contract completeness, information sharing platforms, and relational governance rules—even precisely calibrated economic parameters may not be effectively implemented. Three managerial implications emerge from this study. First, before investing in cold chains or distributing subsidies, priority should be given to improving standardized contracts and breach constraint mechanisms between upstream and downstream partners. Second, information sharing platforms for farmers and cooperatives should be established to reduce demand forecast errors and supply-demand mismatches. Third, long-term cooperation and technical support should be used to cultivate trust relationships among members and reduce opportunistic behavior.

6. Conclusion

Through the dual-case comparative analysis of the Arctic community and Chinese farmer-supermarket direct procurement, this paper finds that coordination success in perishable food supply chains depends on the synergistic level of four dimensions: contractual clarity, information transparency, relational trust, and external environmental support. The three internal governance dimensions—contract, information, and relationship—are the critical dividing line. External environmental support, if not embedded in an effective governance framework, cannot independently improve coordination outcomes. The Arctic case demonstrates that subsidies without governance reform are insufficient; the Chinese case demonstrates that when governance mechanisms are in place, external support can be more effective. This study has several limitations. Case A relies on a single secondary source, while Case B draws on academic papers and reports and lacks primary interview data for cross-validation. Findings should be applied cautiously to other contexts. Future research may conduct field investigations based on the four-dimensional framework and apply it to more diverse contexts to test its applicability and explanatory power.

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