



Optimal Manufacturer Strategy for Live Streaming Introduction with Streamer Effort and Influence under Spillover Effect

Yang Wang

School of Foreign Languages and Business, Guangzhou Railway Polytechnic, Guangzhou, China
Email: wangyang@gtxy.edu.cn

How to cite this paper: Wang, Y. (2025) Optimal Manufacturer Strategy for Live Streaming Introduction with Streamer Effort and Influence under Spillover Effect. *Open Access Library Journal*, 12: e13360. <https://doi.org/10.4236/oalib.1113360>

Received: March 30, 2025

Accepted: May 27, 2025

Published: May 30, 2025

Copyright © 2025 by author(s) and Open Access Library Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Live streaming marketing has become a new driving force for economic development. Manufacturers should choose to introduce live streaming channels through reselling mode or agency mode. This paper uses the game method to study the optimal live streaming introduction strategy of the manufacturer under the joint action of spillover effect, streamer effort and streamer influence. The results show that the decrease of negative spillover effect or the increase of positive spillover effect can stimulate the streamer's effort and increase the manufacturer's profit. The increase in the influence of the streamer can increase the manufacturer's profit, but whether the retail price of the live streaming channel can be increased is related to the spillover effect. The cooperation space between the manufacturer and the live-streamer is related to the commission rate and the spillover effect. When the commission rate is moderate and the spillover effect is low, the two sides prefer the commission mode. When the commission rate is high and the spillover effect is high, the two sides prefer the reselling mode. Otherwise, the two sides cannot agree on the live streaming mode. The research results can help manufacturers and streamers to decide how to adopt specific sales models to obtain more profits and provide strategic guidance for live-streaming marketing.

Subject Areas

Supply Chain Management

Keywords

Live Streaming, Streamers Effort, Streamer Influence, Spillover Effect

1. Introduction

In recent years, live streaming as a new online shopping method has been highly

avored by manufacturers for its low cost and high conversion rate. More and more online shops have adopted live streaming services with significant market benefits. In 2022, the global market value of the live streaming industry reached \$55.4 billion, growing 5.3% year-on-year. The streamer introduces the product features to increase the “accessibility” to consumers, allowing manufacturers to interact with consumers in real time. Furthermore, the streamer can also rely on their influence to expand the reach of live streaming, which in turn can result in consumers making purchases. On October 20, 2021, two Chinese streamers, Viya and Li Jiaqi, sold more than \$3 billion in goods in a single day.

There are two strategies for the manufacturer to introduce a live streaming channel. On the one hand, the manufacturer can adopt the reselling mode, that is, the manufacturer wholesales the product to the streamer, who sells the products in its own stores. For example, Luo Yonghao’s product purchase link in the “Make a Friend” TikTok live streaming room directly guides consumers to his own store. On the other hand, the manufacturer can also adopt the agency mode, that is, the manufacturer gives the streamer a commission according to the proportion of sales. At this point, consumers will jump to the manufacturer’s store after clicking the purchase link of the streamer. Live streaming e-tailers such as Tmall and JD mostly use this model to direct consumers to manufacturers’ stores.

However, the introduction of live streaming is a double-edged sword for the manufacturer. On the one hand, the live streaming channel has a positive spillover effect on the manufacturer’s store. Consumers may be affected by the streamer’s efforts to increase the search for products, thus expanding the demand of the manufacturer’s store. On the other hand, the live streaming channel has negative spillover effects on manufacturer’s stores. Consumers attracted by live streaming may flood into the streamer store or lose their interest in products and reduce their purchases, which will reduce the demand of the manufacturer’s store. The impact of live streaming is also closely related to the characteristics of the streamer, and the head streamer with high reputations and efforts to sell goods has greater appeal to consumers and has more far impacts on the market.

Therefore, how the manufacturer introduces the live streaming channel not only needs to weigh the two-way spillover effect of the live streaming channel on the existing channel but also considers the efforts and influence of the streamers. This increases the difficulty of cooperation between the manufacturer and the streamer. Based on this, this paper focuses on the introduction strategy of the live streaming channel by the manufacturer under the two-way spillover effect and discusses the influence mechanism of streamers’ efforts and influence in selling goods.

The contributions of this paper are as follows: First, considering the spillover effect of live streaming channels on online store channels, and exploring the changes brought by both positive and negative spillover effects. Secondly, the competition effect between channels affected by price and service is considered. Thirdly, based on the above two effects, this paper discusses the relationship be-

tween the manufacturer and the streamer. The sales model between the manufacturer and the streamer is further derived.

2. Literature

This study is closely related to three streams of literature: 1) live-streaming e-commerce, 2) platform model, and 3) channel competition.

2.1. Live Streaming E-Commerce

Live streaming e-commerce is a new type of sales method in which brands use live streaming technology through streamers on the Internet platform to display the use of commodities, reply to inquiries, and guide shopping. It is characterized by realtime interactivity, fan economy, social shopping, content promotion, and other characteristics that are significantly different from those of traditional e-commerce [1]-[5]. Many scholars have studied the mechanism of the impact of live streaming on consumers' willingness to buy [6]-[9]. Recently, more related studies have focused on using theoretical modeling to analyze the operational decisions of live-streaming supply chains [10]-[12], including adding a live-streaming channel to firms [13] [14], different live-streaming showcasing modes [15], and the impact of online influencers on sales promotion in live-streaming selling [16] [17]. Based on the spillover effect, this paper studies the manufacturer's live streaming contract selection. Compared with the existing literature, this paper considers both positive and negative spillover effects.

2.2. Platform Model

E-commerce platforms are typically characterized by the possible existence of both direct and reselling sales models. Many scholars have investigated how factors, such as commission fees, information levels, fulfillment costs, competitive intensity, and risk preferences, affect manufacturers' and retailers' sales model choices [18]. On the other hand, differences due to the choice of sales model also affect the revenue of manufacturers and retailers as well as the competition and partnership between manufacturers and e-commerce platforms [19]. Only a few studies have discussed the interaction between live marketing strategies and manufacturers' sales model choices. Hao and Yang established two sales forms, reselling and agency sales, as well as three pricing strategies with the same high and low differences and explored the impact of consumer returns [20]. Ji *et al.* studied how to attract consumers by leveraging the influence of Internet celebrities and discount strategies in live streaming channels, comparing committed price schemes with dynamic price schemes [21]. Zhang *et al.* used linear demand functions to study two modes of live streaming sales: merchant live streaming and Internet celebrity live streaming and found that the commission rate of the streamer and the fixed signing bonus paid to the Internet celebrity [22]. Few literatures consider two sales models in the live streaming spillover scenario and consider the influence of the streamer's efforts at the same time.

2.3. Channel Competition

Many studies on the competition between channels explore performance improvement through the coordination of the channel conflict [23] [24], and the vertical integration of the distribution channel [25]. Other literature investigates the market strategies in dual-channel supply chain, such as the advent of the direct channel [26] [27], the product quality design [28] [29], and the product assortment selling online or offline [30] [31]. The omnichannel supply chain has also attracted the attention of many scholars, and research has been conducted around decisions such as pricing, site selection, logistics, quality, inventory, and coordination. Difrancesco *et al.* studied the optimal performance settings for online and offline fulfillment of omnichannel scenarios [32]. Li *et al.* explored the interactive impact of online consumer reviews, online third-party reviews, and online sales models on the omnichannel supply chain constructed for word-of-mouth recommendations, providing theoretical support for offline retailers to integrate online reviews [33]. Chenavaz *et al.* studied the optimal control decision for retailers to implement dynamic pricing in the context of online and offline omnichannel operations, considering consumer reference prices and the delivery cost of the last mile [34]. The above literature explores the price strategy of channel competition and service effort respectively. This paper considers the impact of these two factors on the channel, and on this basis, explores the problem of manufacturer's live streaming contract selection.

3. The Model

3.1. Description of Problems

Consider a supply chain consisting of a manufacturer and a streamer, where the manufacturer sells directly through its own channel, and consider how to introduce the live streaming channel through the streamer. The manufacturer has two strategies for introducing a live streaming channel: a reselling model and an agency model. Assuming that the manufacturer is the dominant player in the Stackelberg game, and the streamer is the follower, the manufacturer and the streamer are perfectly rational and information-symmetric, and both aim at profit maximization. When the manufacturer chooses the reselling model, it sells the product to the streamer at wholesale price w . When the manufacturer chooses the agency model, it gains revenue from the live streaming channel at a commission rate θ . Besides, the manufacturer decides the retail price p_m of the direct channel, and the streamer decides the retail price p_r of the live streaming channel. The streamer puts services s in live streaming. The supply chain structure is illustrated in **Figure 1**.

3.2. Description of Assumptions

Consumers' purchasing behavior in live streaming scenarios is deeply influenced by the streamer, whose personal influence and efforts to sell goods have a positive

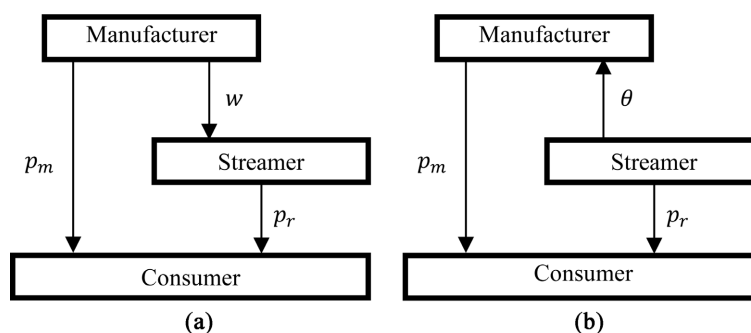


Figure 1. Supply chain structure. (a) Reselling model; (b) Agency model.

impact on consumers' purchasing behavior. The streamer, through prelive publicity and promotion, product information and in-depth understanding of consumer preferences, live program planning, good interaction in the live streaming to provide consumers with goods services, and by virtue of personal influence to increase the consumer's willingness to buy, contribute to the consumer's purchasing behavior. Therefore, the impact of live streaming on market demand is the product of the streamer's effort level and the streamer's influence. It means that the greater the streamer's influence, the greater the incentive of the streamer effort to the market demand. For example, under almost the same live streaming duration and live streaming explanation, the star streamer have stronger market driving force than the general streamer, which can affect the consumers' purchase intention and increase sales.

Live streaming has a spillover effect on the manufacturer's direct sales channel. Assuming that the live streaming spillover flow is $e(>0)$, the spillover effect is r , and the live streaming channel on the direct sales channel demand impact is re . When $r > 0$, that is, the spillover effect is positive, and the streamer's efforts to bring the goods will increase the manufacturer's exposure to increase the sales volume of the direct sales channel. In contrast, when $r < 0$, that is, the spillover effect is negative, and the streamer's efforts to bring the goods will divide the manufacturer's traffic, reducing the direct sales channel.

This study incorporates three key assumptions about consumer responses to live streaming marketing: 1) purchasing behavior is multiplicatively influenced by streamer influence and effort, where high-influence streamers generate disproportionately higher sales per unit effort; 2) live streaming channels generate spillover effects on direct sales channels, which can be either positive or negative; 3) consumers exhibit channel preference and price sensitivity. Changes to these assumptions significantly impact results: reduced streamer influence diminishes premium pricing power; negative spillovers may lead manufacturers to reduce live streaming investment; and shifted preference toward direct channels weakens live streaming pricing advantages. These dynamics crucially affect optimal manufacturer-streamer collaboration strategies.

Therefore, when the manufacturer introduces the live streaming channel, the demand functions of the manufacturer's direct sales channel and live retailer's live

streaming channel are $q_m = 1 - a - p_m + b(p_r - p_m) + re$, and $q_r = a - p_r + b(p_m - p_r) + ks$, respectively. Where, assuming that the potential market capacity is 1 and that a and $1 - a$ are the consumer shares of the live streaming and direct sales channels, respectively. Satisfying $0 < a < 1$, the larger a is, the more consumers favor the live channel. b is the cross-price elasticity coefficient, indicating the degree of competition between channels, satisfying $0 < b < 1$, and the larger b is, the higher the degree of channel competition.

In addition, drawing on previous studies depicting the cost of marketing service effort model, it is assumed that the cost of streamer's effort is $s^2/2$, indicating that the cost of banding effort increases dramatically with an increase in banding effort; that is, an increase in the level of marginal banding effort requires more human and material resources. In addition, this study only considers the pricing of a single product and the strategy choice of live streaming without loss of generality and assumes that the production and operating costs of the manufacturer and the live streaming retailer are zero without affecting the conclusions of the model.

To ensure the non-negativity of the demand for the direct and live streaming channels, we assume that $r > \max\{\bar{r}^T, \bar{r}^T\}^1$. In other words, the negative spillover effect of the live streaming channel cannot be too large; otherwise, the manufacturer has no incentive to retain the direct sales channel, and the direct sales channel will be squeezed out of the market by the live streaming channel.

3.3. Description of Symbols

a : Percentage of consumers on live channels.

b : Degree of competition between channels.

k : Influence of streamer.

r : Spillover effect of live streaming channels on direct marketing channels.

e : Traffic spillover from live channels to direct sales channels.

w : Manufacturer's wholesale price for live retailers in the reselling model.

θ : Manufacturer's commission rate for live-streaming retailers under the commission model.

T : Manufacturer's choice of reselling model to introduce live-streaming channels.

A : Manufacturer's choice of commission model for introducing a live-streaming channel scenario.

s^i : Streamer banding effort level of live channel in scenario i , $i = T, A$.

$${}^1 \bar{r}^T = -\frac{2(1+2b)(-2(1+b)+a(2+b))+(2+b(4+b)-a(2+3b))k^2}{-4(1+b)(1+2b)e+(2+b(4+b))ek^2},$$

$$\bar{r}^T = \frac{4-4a+12b-10ab+10b^2-6ab^2+2b^3-ab^3-4k^2+4ak^2-8bk^2+7abk^2-3b^2k^2+2ab^2k^2+k^4-ak^4+bk^4-abk^4-2abo-2b^2o-2ab^2o-2b^3o+4k^2o-4ak^2o+8bk^2o-7abk^2o+3b^2k^2o-2ab^2k^2o-2k^4o+2ak^4o-2bk^4o+2abk^4o+k^4o^2-ak^4o^2+bk^4o^2-abk^4o^2}{-4e-12be-10b^2e-2b^3e+4ek^2+8bek^2+3b^2ek^2-ek^4-bek^4+2b^2eo+2b^3eo-4ek^2o-8bek^2o-3b^2ek^2o+2ek^4o+2bek^4o-ek^4o^2-bek^4o^2}.$$

p_m^i : Retail price of live channel in scenario i , $i = T, A$.

p_r^i : Retail price of the live channel in case i , $i = T, A$.

q_m^i : Sales volume of direct channel in case i , $i = T, A$.

q_r^i : Sales volume of the direct channel in case i , $i = T, A$.

π_m^i : Manufacturer's profit in case i , $i = T, A$.

π_r^i : Profit of live bandwagoner in case i , $i = T, A$.

4. Equilibrium Analysis of Manufacturers' Live Streaming Introduction Strategies

This section constructs models for the manufacturer to introduce a reselling live streaming channel and a commission live streaming channel, obtain the optimal decision of the manufacturer and the streamer according to the order of the game by using the inverse solution method, and explores the introduction strategies of manufacturers' live channels by comparing optimal profits.

4.1. Introduction of a Reselling Live Streaming Channel (T Scenario)

When the manufacturer chooses the reselling model to introduce the live streaming channel, the profit functions of the manufacturer and live streaming retailer (*i.e.* the streamer) are

$$\pi_m^T = p_m^T q_m^T + w q_r^T \quad (1)$$

$$\pi_r^T = p_r^T q_m^T + w q_r^T \quad (2)$$

Theorem 1. If the manufacturer introduces a reselling live streaming channel, the optimal decisions and profits of the manufacturer and the live retailer are, respectively:

$$w^* = \frac{a[4(1+b)^2 - (2-b^2)k^2 - bk^4] + b(2+2b-k^2)^2(1+er)}{8(1+b)^2(1+2b) - 4(1+b)(1+2b)k^2 - b^2k^4} \quad (3)$$

$$p_m^{T*} = \frac{(1+b)[a(2+b)k^2 - 4a(1+b) + 2(1+b)(2+2b-k^2)(1+er)]}{8(1+b)^2(1+2b) - 4(1+b)(1+2b)k^2 - b^2k^4} \quad (4)$$

$$p_r^{T*} = \frac{a[2(1+b)(3+4b) - (2-b)(1+b)k^2 - bk^4] + b[4(1+b)^2 - 3(1+b)k^2 + k^4](1+er)}{8(1+b)^2(1+2b) - 4(1+b)(1+2b)k^2 - b^2k^4} \quad (5)$$

$$s^{T*} = \frac{k[2a + ab(6+4b-k^2) + b(1+b)k^2(1+er)]}{8(1+b)^2(1+2b) - 4(1+b)(1+2b)k^2 - b^2k^4} \quad (6)$$

$$\pi_m^{T*} = \frac{(1+b)\{a^2(3+2b-k^2) + a[(2+b)k^2 - 4(1+b)](1+er) + (1+b)(2+2b-k^2)(1+er)^2\}}{8(1+b)^2(1+2b) - 4(1+b)(1+2b)k^2 - b^2k^4} \quad (7)$$

$$\pi_r^{T*} = \frac{(2+2b-k^2)[2a+ab(6+4b-k^2)+bk^2(1+b)(1+er)]^2}{2[8(1+b)^2(1+2b)-4(1+b)(1+2b)k^2-b^2k^4]^2} \quad (8)$$

Corollary 1. $p_m^{T*} > p_r^{T*}$ if and only if

$$r > \frac{2(1+b)[a(5+6b)-2(1+b)]+(1+b)(2-4a-b)k^2+(1-a)bk^4}{e[4(1+b)^2-(2-b)(1+b)k^2-bk^4]}; \quad \pi_m^{T*} > \pi_r^{T*}$$

$$\text{if and only if } r > \frac{2(1+2b)[a(2+b)-2(1+b)]+[2+b(4+b)-a(2+3b)]k^2}{e[4(1+b)(1+2b)-(2+4b+b^2)k^2]}.$$

Corollary 1 suggests that, if the negative spillover effect of the live channel on the direct channel is not too large, manufacturers can always set higher retail prices in the direct channel and capture higher revenues than live retailers. However, the higher the streamer influences, the less space there is for manufacturers to capture more profit than live retailers, and the higher the streamer influence, the more space there is for manufacturers to set higher prices only if the market is highly competitive and streamer influence is not high.

4.2. Introduction of a Commission Live Streaming Channel (Scenario A)

Theorem 2. When the manufacturer introduces a commission live streaming channel, the optimal decisions and profits of the manufacturer and the live retailer are, respectively:

$$p_m^{A*} = \frac{a[2-k^2(1-\theta)]^2 + ab[6-3k^2(1-\theta)-2\theta] + 2ab^2(1-\theta) - [2+2b-k^2(1-\theta)]^2(1+er)}{2\{b[k^2(1-\theta)-2][6-k^2(1-\theta)] - [2-k^2(1-\theta)]^2 - b^3(2-\theta) - b^2[10-3k^2(1-\theta)-\theta]\}} \quad (11)$$

$$p_r^{A*} = \frac{a\{2k^2(1-\theta)-4-b^2-b[6-k^2(1-\theta)]\} + b[k^2(1-\theta)-2-2b](1+er)}{2\{b[k^2(1-\theta)-2][6-k^2(1-\theta)] - [2-k^2(1-\theta)]^2 - b^3(2-\theta) - b^2[10-3k^2(1-\theta)-\theta]\}} \quad (12)$$

$$s^{A*} = k(1-\theta) \frac{a\{2k^2(1-\theta)-4-b^2-b[6-k^2(1-\theta)]\} + b[k^2(1-\theta)-2-2b](1+er)}{2\{b[k^2(1-\theta)-2][6-k^2(1-\theta)] - [2-k^2(1-\theta)]^2 - b^3(2-\theta) - b^2[10-3k^2(1-\theta)-\theta]\}} \quad (13)$$

$$\pi_m^{A*} = \frac{-a^2[(2+b-k^2)^2 + 4\theta(1+b) + 2\theta k^2(2+b) - 2\theta k^4 + k^4\theta^2] + 2a\{[2-k^2(1-\theta)]^2 + 2b(3-\theta) + 2b^2(1-\theta) - 3bk^2(1-\theta)\}(1+er) + [2+2b-k^2(1-\theta)]^2(1+er)^2}{4\{b[k^2(1-\theta)-2][6-k^2(1-\theta)] - [2-k^2(1-\theta)]^2 - b^3(2-\theta) - b^2[10-3k^2(1-\theta)-\theta]\}} \quad (14)$$

$$\pi_r^{A*} = \frac{(1-\theta)[2+2b-k^2(1-\theta)]\{a[4+b^2+6b-bk^2(1-\theta)-2k^2(1-\theta)] + b[2+2b-k^2(1-\theta)](1+er)\}^2}{8\{b[k^2(1-\theta)-2][6-k^2(1-\theta)] - [2-k^2(1-\theta)]^2 - b^3(2-\theta) - b^2[10-3k^2(1-\theta)-\theta]\}^2} \quad (15)$$

Corollary 2. There exists r_1 such that $p_m^{A*} > p_r^{A*}$ if and only if

$$r > \frac{-1 + \frac{a \{ [2 - k^2(1 - \theta)] [4 - k^2(1 - \theta)] + b^2(3 - 2\theta) + 2b[6 - 2k^2(1 - \theta) - \theta] \}}{[2 + b - k^2(1 - \theta)] [2 + 2b - k^2(1 - \theta)]}}{e};$$

$$\pi_m^{A*} > \pi_r^{A*} \text{ if and only if } \theta > \frac{2 + 2b - k^2 - \sqrt{2(2 + 4b + 2b^2 - k^2 - bk^2)}}{k^2} \text{ or}$$

$$\theta < \frac{2 + 2b - k^2 - \sqrt{2(2 + 4b + 2b^2 - k^2 - bk^2)}}{k^2}, \quad r > r_1.$$

Like the reselling live streaming model, in the commission live streaming model, manufacturers maintain higher retail prices for the live streaming channel only when negative spillovers are not excessive. However, unlike the reselling live streaming model, it is easier for manufacturers to set higher retail prices than the live streaming channel in the commission model. As the streamer's influence increases, the space for manufacturers to maintain higher retail prices shrinks, and manufacturers have to make price concessions for the live channel. In addition, if commission rates are relatively high, then the manufacturer will always capture more profit than the live streaming retailer; otherwise, the manufacturer will only be more profitable than the live streaming retailer if commission rates are relatively low and the negative spillover effect is not too large.

Corollary 3. For any i ($i = T, A$), there exists k_1^i such that $\frac{\partial s^{i*}}{\partial k} > 0$;
 $\frac{\partial p_m^{i*}}{\partial k} > 0$; $\frac{\partial q_m^{i*}}{\partial k} < 0$; $\frac{\partial q_r^{i*}}{\partial k} > 0$; $\frac{\partial \pi_m^{i*}}{\partial k} > 0$; $\frac{\partial \pi_r^{i*}}{\partial k} > 0$; $\frac{\partial p_r^{i*}}{\partial k} < 0$ if and only if
 $r > \frac{a - b + 3ab - b^2 + ab^2}{be + b^2e}$, $k < k_1^i$.

Corollary 3 reveals the streamer's influence on the optimal decisions of manufacturers and live streaming retailers. With increasing streamer influence, streamers have an incentive to attract consumers with stronger influence and, therefore, increase their efforts, regardless of the mode of the live streaming channel introduced by the manufacturer. Higher efforts and stronger streamer influence increase the sales of the live channel but do not necessarily increase the retail price of the live channel. This is because live streaming retailers and manufacturers compete in the market through price, and increasingly powerful streamers capture consumers in the direct channel, causing manufacturers to raise prices to maintain revenue in the direct channel. At this point, if the negative spillover impact of the live streaming channel is not too high and the streamer's influence is not too large, then the competition between the live-streaming retailer and the manufacturer will not be too intense. The live-streaming retailer can lower the retail price of the live-streaming channel to gain more consumers, thus increasing its profit. Otherwise, both excessively high negative channel influence and too strong streamer influence will increase the competition between live retailers and manufacturers, forcing live retailers to increase retail prices to ease their relationship with manufacturers. In addition, although increased streamer influence decreases

sales in the direct channel, the manufacturer can increase revenues in the direct channel by raising the direct price and increasing its own profits by capturing revenues in the live channel through wholesale and commission revenues, resulting in a positive correlation between the manufacturer's total profits and streamer influence.

Corollary 4. For any i ($i = T, A$), there are $\frac{\partial s^{i*}}{\partial r} > 0$, $\frac{\partial p_m^{i*}}{\partial r} > 0$, $\frac{\partial p_r^{i*}}{\partial r} > 0$, $\frac{\partial q_m^{i*}}{\partial r} > 0$, $\frac{\partial q_r^{i*}}{\partial r} > 0$, $\frac{\partial \pi_m^{i*}}{\partial r} > 0$, $\frac{\partial \pi_r^{i*}}{\partial r} > 0$.

Corollary 4 shows the impact of spillover effects on the optimal decisions of the manufacturer and the live streaming retailer when the manufacturer introduces the live streaming channel. As the spillover effect increases, that is, the negative impact of the live streaming channel on the direct channel decreases and the positive traffic to the direct channel increases, the manufacturer is able to enjoy the additional traffic exposure from the increased live streaming channel, which leads to an increase in retail price and sales volume in the direct channel, and thus an increase in the manufacturer's profit. For live streaming retailers, the increased spillover effect indicates that the live streaming channel is less of a threat to the direct channel, easing the competitive conflict between the two parties. Therefore, incentivizing the streamer to work harder, and the live streaming retailer can increase retail prices to compensate for the cost of carrying effort, thereby increasing sales and profits.

Corollary 5. For any i ($i = T, A$), there exists r_1^i such that $\frac{\partial s^{i*}}{\partial a} > 0$; $\frac{\partial p_m^{i*}}{\partial a} < 0$; $\frac{\partial p_r^{i*}}{\partial a} > 0$; $\frac{\partial q_m^{i*}}{\partial a} < 0$; $\frac{\partial q_r^{i*}}{\partial a} > 0$; $\frac{\partial \pi_r^{i*}}{\partial a} > 0$; $\frac{\partial \pi_m^{i*}}{\partial a} < 0$ if and only if $r > r_1^i$.

From Corollary 5, if a manufacturer introduces a live streaming channel, then as the share of consumers in the live streaming channel increases, the live streaming retailer will increase its live streaming efforts and raise the price of its products, and the increase in the number of consumers in the marketplace will lead to an increase in sales volume and profits for the manufacturer. The increase in the share of consumers in the live channel is moderated by spillovers to manufacturing profits. When spillovers are low, manufacturers do not directly benefit from traffic spillovers, and therefore rely more on commission contracts and wholesale contracts to capture a certain amount of the live retailer's sales revenue, and the competition between the two parties is not too intense: as the number of consumers in the live streaming channel increases, the manufacturer's profits increase. On the contrary, when the spillover effect is high, the manufacturer does not have to pay any cost to enjoy the benefits of the traffic spillover, which will intensify the competition with the live retailers. As the number of consumers in the live channel increases, the live retailers are more capable of resisting the effect of the spillover effect, and excessive market competition dominates so that the manufac-

turer's profit decreases.

5. Comparative Analysis of Manufacturers' Live Channel Introduction Strategies

This section compares the equilibrium results of two live streaming introduction strategies for manufacturers, analyzes the impact of reselling live streaming channels and commissioned live streaming channels on streamer effort, product price, and profit, compares the preferences of manufacturers and live-streaming retailers for the two strategies, and explores the scope for both parties to enter live-streaming partnerships.

5.1. Comparison of Decision Making in Different Live Streaming Models

Proposition 1. $p_m^{T*} > p_m^{A*}$, $p_r^{T*} > p_r^{A*}$.

Proposition 1 analyzes the impact of reselling and agency models on product prices in the live streaming channel and the direct channel. Proposition 1 states that product prices are higher in the live streaming and direct channels of the reselling model than in the commission model. The reason for this is that the reselling model leads to a double marginal effect in the live streaming channel owing to the presence of wholesale prices, and the live streaming retailer has to resort to price increases to compensate for the channel's efficiency loss. Independent of commission rates and spillover effects, manufacturers can avoid the double marginal effect in the commission model and share the live retailer's revenue directly, so they do not need to set higher retail prices. Instead, their efficient profits in the reselling model mainly come from the direct channel, and thus pricing in the direct channel is higher in the reselling model than in the commission model.

Proposition 2. There exist θ_1 , θ_2 and r_2 such that:

- (1) $q_r^{T*} < q_r^{A*}$.
- (2) $q_m^{T*} < q_m^{A*}$ when $0 < \theta < \theta_1$; $q_m^{T*} > q_m^{A*}$ when $\theta_1 < \theta < \theta_2$ and $r < r_2$; $q_m^{T*} < q_m^{A*}$ when $\theta_1 < \theta < \theta_2$ and $r > r_2$; $q_m^{T*} > q_m^{A*}$, when $\theta_2 < \theta < 1$.

Proposition 2 analyzes the effects of reselling and direct sales models on product sales in the live and direct sales channels. Proposition 2(1) shows that live retailers have higher channel sales in the commission model than in the reselling model, which is consistent with the market law that price and demand move in the opposite direction and that live retailers utilize lower prices to obtain higher sales in the commission model. Proposition 2(2) suggests that the sales volume in a manufacturer's direct channel is not only related to the channel model but is also moderated by commission rates and spillovers. When commission rates are low, the manufacturer receives less revenue sharing from live retailers and thus attempts to increase its own direct channel sales to compensate for the gains. Conversely, when commission rates are high, manufacturers are more dependent on live retailers in the commission model; thus, direct channel sales are lower in the commission model than in the reselling model. However, when commission rates

are moderate, the commission model results in limited revenue sharing for the manufacturer. If the live channel has a high negative spillover to the direct channel, then the direct channel is squeezed even more, resulting in lower sales for the manufacturer. If commission rates are moderate and spillovers are not too low, manufacturers can still enjoy the benefits of the live channel without a loss of system efficiency, resulting in higher sales under the commission model.

Proposition 3. There exist θ_3 , θ_4 , and r_3 such that $s^{T*} < s^{A*}$ when $0 < \theta < \theta_3$; $s^{T*} > s^{A*}$ when $\theta_3 < \theta < \theta_4$ and $r < r_3$; $s^{T*} < s^{A*}$ when $\theta_3 < \theta < \theta_4$ and $r > r_3$; $s^{T*} > s^{A*}$ when $\theta_4 < \theta < 1$.

Proposition 3 analyzes the effects of the reselling and direct selling modes on streamer bandwagon efforts. Proposition 3 states that the streamer bandwagon effort is jointly affected by the mode of live streaming channel introduction, commission rates, and spillover effects. When the commission rate is low or the commission rate is moderate and the spillover effect is not too low, the introduction of commission live channels by the manufacturer motivates streamers' efforts to bring goods more than reselling live channels. The reason for this is that if commission rates are low, live-streaming retailers keep a large portion of the live-streaming sales proceed and thus have an incentive to increase their bandwagon efforts. As commission rates increase, live retailers are required to pay a higher share of the proceeds to the manufacturer, which tends to dampen the streamer's banding effort. However, if the commission rate is not too high and the spillover effect is not too low, the spillover from the live channel can increase the manufacturer's exposure and bring more consumers to the direct channel. Then, the manufacturer will moderate the market competition with the live retailer; at this point, the live retailer will increase the bandwagon effort to compensate for the loss of commission. Conversely, if the spillover effect is too low or the commission rate is too high, the live streaming channel will divide the consumers of the direct sales channel and cause more intense market competition, then the live streaming retailer will reduce the banding effort to ease the relationship with the manufacturer, and the streamer will have no incentive to further increase the banding effort, and at this point the reselling contract is a better incentive to incentivize the streamer's banding effort than the commission contract.

5.2. Profit Comparison of Different Live Streaming Models

Proposition 4. There exist θ_5 and r_4 such that:

- (1) When $0 < \theta < \theta_5$, $\pi_m^{T*} > \pi_m^{A*}$.
- (2) When $\theta_5 < \theta < 1$, if $r < r_4$, then $\pi_m^{T*} < \pi_m^{A*}$; if $r > r_4$, then $\pi_m^{T*} > \pi_m^{A*}$.

Proposition 4 reflects manufacturers' live-streaming introduction strategies; that is, manufacturers choose the reselling model to introduce live-streaming channels when the commission rate is low or the spillover effect is not too low, and they choose the commission model to introduce live-streaming channels when the commission rate is high, and the spillover effect is too low. It can be observed that commission rates and spillover effects affect manufacturers live-

streaming introduction strategies. On the one hand, the lower the commission rate, the less manufacturers get from the live streaming channel, and the less incentive they have to introduce the commission mode. On the other hand, when commission rates are high, the more manufacturers get from the live streaming channel as the spillover effect increases, the impact of commission fees superimposed on the spillover effect increases competition in the end market and reduces the motivation of live streaming retailers. Therefore, manufacturers will choose the reselling model to introduce live streaming channels to avoid overly intense market reactions.

Proposition 5. There exist θ_6 , θ_7 and r_5 such that:

- (1) $\pi_r^{T*} < \pi_r^{A*}$ when $0 < \theta < \theta_6$.
- (2) When $\theta_6 < \theta < \theta_7$, $\pi_r^{T*} > \pi_r^{A*}$ if $r < r_5$, and $\pi_r^{T*} < \pi_r^{A*}$ if $r > r_5$.
- (3) When $\theta_7 < \theta < 1$, $\pi_r^{T*} > \pi_r^{A*}$.

Proposition 5 reflects the live retailers' attitudes towards manufacturers' live-introduction strategies. When commission rates are low, live-streaming retailers favor the commission model for introducing live-streaming channels; when commission rates are high, live-streaming retailers favor the reselling model for introducing live-streaming channels. This is consistent with the motivation of live retailers to not want to share too much revenue with manufacturers. However, when the commission rate is moderate, if the spillover effect is high, the double marginal effect of the reselling model dominates the loss to the live retailer, and the live retailer prefers the commission model; if the spillover effect is low, and the channel conflict between the manufacturer and the live retailer is not too severe, the live retailer prefers the reselling model.

Based on Propositions 4 and 5, an indepth analysis of manufacturers' and live retailers' preferences for the live channel introduction model yields Proposition 6.

Proposition 6. There exists θ_8 such that:

- (1) When $0 < \theta < \theta_5$ or $\theta_5 < \theta < \theta_8$, $r > r_4$ or $\theta_8 < \theta < \theta_7$, $r > r_5$, the manufacturer chooses the reselling live mode, and the live retailer prefers the commission live mode.
- (2) When $\theta_5 < \theta < \theta_6$, $r < r_4$ or $\theta_6 < \theta < \theta_8$, $r_5 < r < r_4$, the manufacturer selects the commission live mode, and the live retailer prefers the commission live mode.
- (3) When $\theta_8 < \theta < \theta_7$, $r_4 < r < r_5$ or $\theta_7 < \theta < 1$, $r > r_4$, the manufacturer selects the reselling live mode, and the live retailer prefers the reselling live mode.
- (4) When $\theta_6 < \theta < \theta_8$, $r < r_5$ or $\theta_8 < \theta < 1$, $r < r_4$, the manufacturer selects the commission live mode, and the live retailer selects the reselling live mode.

Proposition 6 shows that regardless of the positive or negative spillover effect, if the commission rate is not too low, there always exists a certain commission rate and spillover effect that enables the manufacturer and the live retailer to reach a cooperation agreement under certain conditions, at which time the live supply chain is in a stable state.

Proposition 7. When $\pi_r^{T*} > \pi_r^{A*}$, $s^{T*} < s^{A*}$.

Proposition 7 suggests that if the live retailer chooses the commission model, the streamer bandwagon effort level will be lower. There is a conflict between the live retailer's level of effort and profit gain in the commission model, and to compensate for the transition to profit sharing for the manufacturer, the live retailer must lower its level of effort.

6. Numerical Analysis

Given the complexity of the model, this section uses numerical simulation to further analyze the introduction strategy of manufacturer live streaming as well as the cooperation space between manufacturers and live streaming retailers, while following the model assumptions. T represents the reselling model, and A represents the commission model.

6.1. Analysis of Manufacturers' Live Streaming Introduction Strategies

The manufacturer's live streaming introduction strategy is first analyzed, without loss of generality, by taking $b = 0.4$, $k = 0.3$, $a = 0.6$, $e = 0.5$ to obtain **Figure 2**.

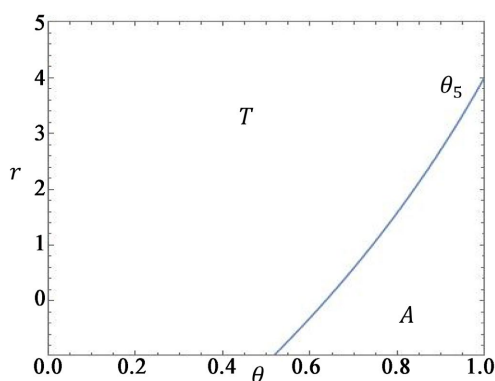


Figure 2. Manufacturer's live streaming strategy.

As seen in **Figure 2**, the higher the commission rate or the smaller the spillover effect, the higher the likelihood that the manufacturer will choose the commission mode to introduce the live streaming channel, with revenue sharing dominating the commission mode and traffic spillover dominating the reselling mode. In addition, there is a spillover effect threshold for the introduction strategy: when the spillover effect is higher than the threshold, the manufacturer chooses the reselling live streaming mode, and when the spillover effect is smaller than the threshold, the manufacturer chooses the commission live streaming mode.

In the following, we further analyze the spillover effect threshold (*i.e.*, θ_5) of manufacturers' live-streaming introduction strategy and the effects of consumer preference, channel competition, and streamer influence on live-streaming introduction strategy. Taking $a = 0.6$, $b = 0.4$, $\theta = 0.7$ and $k = 0.3$, $e = 0.5$, $\theta = 0.7$ yields **Figure 3**.

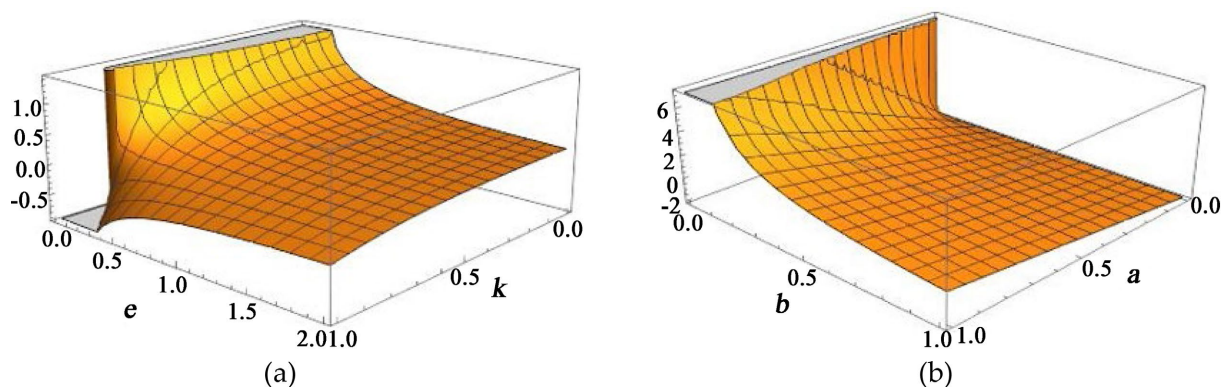


Figure 3. Effect of different parameters on the threshold of manufacturer's live introduction strategy. (a) Effect of e and k ; (b) Effect of a and b .

Figure 3 shows the effects of streamer influence, spillover traffic, channel competition, and live-streaming consumer share on manufacturers' live-streaming introduction strategies. When the spillover effect threshold (*i.e.*, θ_5) of a manufacturer's live streaming strategy is higher, the feasible space for the manufacturer to choose the commission model is larger, and the feasible space for the manufacturer to choose the reselling model is smaller. As shown in **Figure 3**, when the streamer influence is higher or the spillover traffic is smaller, the streamer effort is more effective in attracting consumers, the contribution of the live channel to the direct sales channel is smaller, and the manufacturer is more likely to choose the reselling mode. When the channel competition is smaller or the proportion of consumers in the live channel is higher, the manufacturer relies more on the spillover effect of the live channel; to avoid the loss of the double marginal effect, the manufacturer is more likely to choose the commission model.

6.2. Analysis of the Space for Manufacturers to Work with Live Retailers

From Propositions 4 and 5, manufacturers and live retailers have different preferences regarding live introduction strategies. In the following, different parameters are adjusted separately to explore the preferences of manufacturers and live-streaming retailers for the live-streaming mode and obtain the cooperation space where both parties agree.

First, let $a = 0.7$, $b = 0.6$, $e = 0.5$, $k = 0.4$, respectively, with "(T,T)," "(T,A)," "(A,T)," and "(A,A)" representing the different preferences of manufacturers and live retailers for the live reselling T model and the live commission A model, yielding **Figure 4**.

Figure 4 shows that when the commission rate is moderate and the spillover effect is low, manufacturers and retailers have the same preference for the commission live mode. When the commission rate is high and the spillover effect is large, manufacturers and retailers have the same preference for the reselling live mode. In general, as the commission rate increases, both parties tend to choose the reselling live mode of cooperation. As the spillover effect increases, both par-

ties tend to choose the commission live mode of cooperation.

In the following, we further analyze the effects of consumer preference, channel competition, spillover traffic, and streamer influence on the cooperation space between manufacturers and live-streaming retailers, such that $\Delta\pi_m = \pi_m^{T*} - \pi_m^{A*}$, $\Delta\pi_r = \pi_r^{T*} - \pi_r^{A*}$ and take $a = 0.3$, $b = 0.6$, $\theta = 0.8$, $k = 0.4$, $e = 0.5$, $r = 0.3$, and obtain **Figures 5-8**.

Figure 5 illustrates that as the share of consumers in the live channel grows, the manufacturer's preference for the commission model increases, while the live retailer's preference for the reselling model increases, and the two parties only

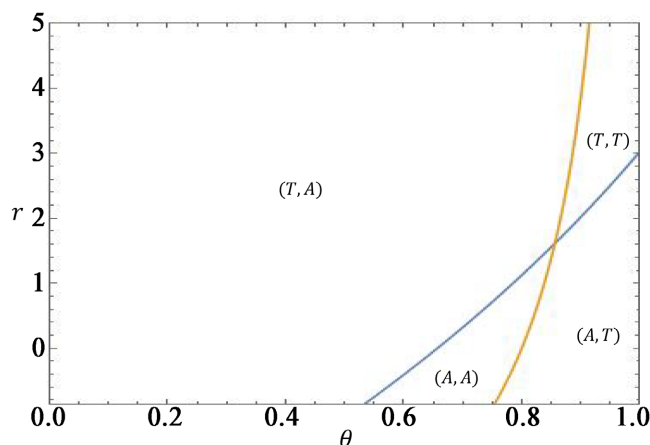


Figure 4. Collaborative space for manufacturers and live retailers.

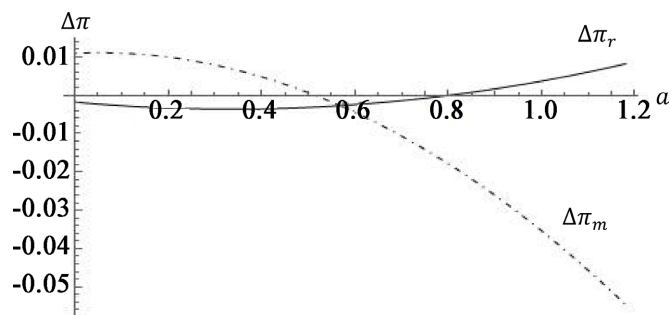


Figure 5. Impact of the share of consumers of live broadcasting on the collaboration space.

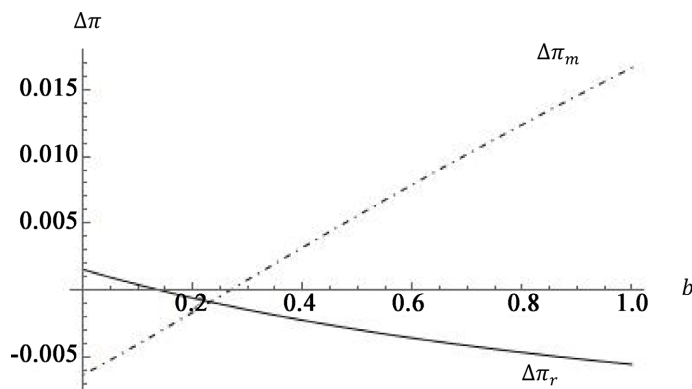


Figure 6. Impact of the degree of channel competition b on cooperative space.

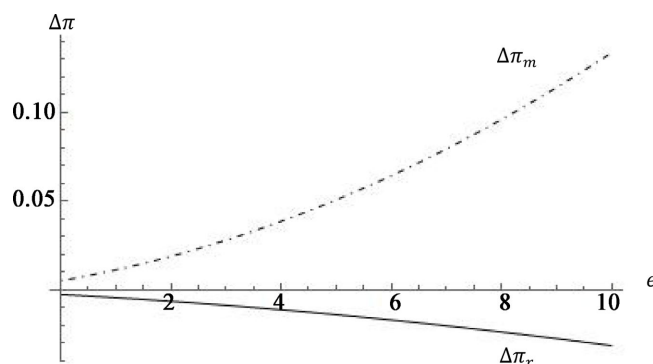


Figure 7. Impact of spillover flows on cooperative space.

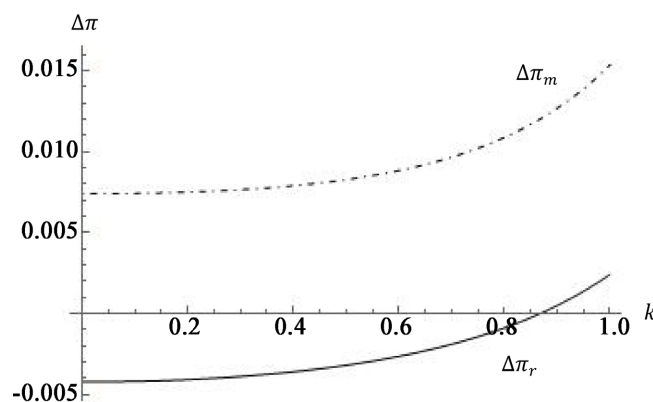


Figure 8. Impact of anchor influence k on collaboration space.

reach a consensus on commission cooperation when the share of consumers in the live channel is moderate. **Figure 6** illustrates that, as the level of channel competition increases, manufacturers' preference for the reselling model increases, while live retailers' preference for the commission model increases, and the commission model is only jointly chosen when the level of channel competition is relatively low. **Figure 7** illustrates that the more traffic the live channel spills over to the direct channel, the more manufacturers prefer the reselling model, whereas live retailers prefer the commission model. **Figure 8** illustrates that the increased influence of streamers makes both manufacturers, and live retailers prefer the reselling model, the space for cooperation between them can be further expanded, and the live-streaming supply chain is more stabilized.

7. Conclusions

This paper studies the introduction strategy of live streaming by manufacturers in commission mode and reselling mode. Influenced by the spillover effect between channels and the efforts of streamers, there is cooperation and conflict between manufacturers and live streaming retailers. The study found that if the influence of streamers is not high, the greater the influence of streamers, the greater the space for manufacturers to set high prices in the direct selling model, and the smaller the space for manufacturers to set high prices in the reselling model. No matter what kind of sales model, the enhancement of the influence of streamers

can improve manufacturers' profits, but it does not necessarily increase the retail price of live streaming channels, and the impact of channel spillover effect should be considered. In addition, the reduction of negative spillover effects or the increase of positive spillover effects can stimulate streamer efforts and increase manufacturer profits. The cooperation space between manufacturers and live streamers is related to the commission rate and spillover effect. When the commission rate is moderate and the spillover effect is low, both parties prefer the commission mode, and the increase of spillover effect will further improve the advantages of the commission mode. When the commission rate is high and the spillover effect is high, both parties prefer the reselling model, and the increase of the commission rate will improve the advantage of the reselling model.

According to the above conclusions, the following management implications can be drawn. First, manufacturers need to avoid the negative impact of live channels and streamers on direct channels. Therefore, the choice of streamer type and product type is particularly important. Second, the spillover effect affects the profits of manufacturers and live carriers, so the two sides need to balance the competition between channels in different environments and improve the interaction effect between channels. Third, in order to achieve the "win-win" goal, manufacturers and live carriers need to negotiate sales models and commission rates for different products to avoid losses caused by channel conflicts.

This paper does not account for external market factors such as economic recessions or technological advancements, nor does it consider differences in consumer live streaming behaviors across cultural contexts. Additionally, the parameter selection in the numerical examples section carries a degree of subjectivity, and the complexity of commission rates and spillover effects presents greater challenges for case analysis. Future research will aim to address these limitations and incorporate methods such as data analysis and surveys to provide more robust empirical support for the study.

Acknowledgements

This work was funded by the New Talent Research Initiation Project of Guangzhou Railway Polytechnic (GTXYR2310).

Conflicts of Interest

The author declares no conflicts of interest.

References

- [1] Sun, Y., Shao, X., Li, X., Guo, Y. and Nie, K. (2019) How Live Streaming Influences Purchase Intentions in Social Commerce: An IT Affordance Perspective. *Electronic Commerce Research and Applications*, **37**, Article 100886. <https://doi.org/10.1016/j.elerap.2019.100886>
- [2] Kang, K., Lu, J., Guo, L. and Li, W. (2021) The Dynamic Effect of Interactivity on Customer Engagement Behavior through Tie Strength: Evidence from Live Streaming Commerce Platforms. *International Journal of Information Management*, **56**, Ar-

- ticle 102251. <https://doi.org/10.1016/j.ijinfomgt.2020.102251>
- [3] Li, Y., Li, X. and Cai, J. (2021) How Attachment Affects User Stickiness on Live Streaming Platforms: A Socio-Technical Approach Perspective. *Journal of Retailing and Consumer Services*, **60**, Article 102478. <https://doi.org/10.1016/j.jretconser.2021.102478>
 - [4] Lu, B. and Chen, Z. (2021) Live Streaming Commerce and Consumers' Purchase Intention: An Uncertainty Reduction Perspective. *Information & Management*, **58**, Article 103509. <https://doi.org/10.1016/j.im.2021.103509>
 - [5] Bharadwaj, N., Ballings, M., Naik, P.A., Moore, M. and Arat, M.M. (2021) A New Livestream Retail Analytics Framework to Assess the Sales Impact of Emotional Displays. *Journal of Marketing*, **86**, 27-47. <https://doi.org/10.1177/00222429211013042>
 - [6] Chen, H., Dou, Y. and Xiao, Y. (2023) Understanding the Role of Live Streamers in Live-Streaming E-Commerce. *Electronic Commerce Research and Applications*, **59**, Article 101266. <https://doi.org/10.1016/j.elerap.2023.101266>
 - [7] Xu, W., Zhang, X., Chen, R. and Yang, Z. (2023) How Do You Say It Matters? A Multimodal Analytics Framework for Product Return Prediction in Live Streaming E-commerce. *Decision Support Systems*, **172**, Article 113984. <https://doi.org/10.1016/j.dss.2023.113984>
 - [8] Guo, L., Hu, X., Lu, J. and Ma, L. (2021) Effects of Customer Trust on Engagement in Live Streaming Commerce: Mediating Role of Swift Guanxi. *Internet Research*, **31**, 1718-1744. <https://doi.org/10.1108/intr-02-2020-0078>
 - [9] Yan, M., Kwok, A.P.K., Chan, A.H.S., Zhuang, Y.S., Wen, K. and Zhang, K.C. (2022) An Empirical Investigation of the Impact of Influencer Live-Streaming Ads in E-Commerce Platforms on Consumers' Buying Impulse. *Internet Research*, **33**, 1633-1663. <https://doi.org/10.1108/intr-11-2020-0625>
 - [10] Fan, T., Wang, L. and Song, Y. (2022) Impact of Live Commerce Spillover Effect on Supply Chain Decisions. *Industrial Management & Data Systems*, **122**, 1109-1127. <https://doi.org/10.1108/imds-08-2021-0482>
 - [11] Niu, B., Yu, X., Li, Q. and Wang, Y. (2023) Gains and Losses of Key Opinion Leaders' Product Promotion in Livestream E-Commerce. *Omega*, **117**, Article 102846. <https://doi.org/10.1016/j.omega.2023.102846>
 - [12] Zhang, T., Tang, Z. and Han, Z. (2022) Optimal Online Channel Structure for Multinational Firms Considering Live Streaming Shopping. *Electronic Commerce Research and Applications*, **56**, Article 101198. <https://doi.org/10.1016/j.elerap.2022.101198>
 - [13] Gong, H., Zhao, M., Ren, J. and Hao, Z. (2022) Live Streaming Strategy under Multi-Channel Sales of the Online Retailer. *Electronic Commerce Research and Applications*, **55**, Article 101184. <https://doi.org/10.1016/j.elerap.2022.101184>
 - [14] Huang, L., Liu, B. and Zhang, R. (2024) Channel Strategies for Competing Retailers: Whether and When to Introduce Live Stream? *European Journal of Operational Research*, **312**, 413-426. <https://doi.org/10.1016/j.ejor.2023.06.017>
 - [15] Xin, B., Hao, Y. and Xie, L. (2023) Strategic Product Showcasing Mode of E-Commerce Live Streaming. *Journal of Retailing and Consumer Services*, **73**, Article 103360. <https://doi.org/10.1016/j.jretconser.2023.103360>
 - [16] Liu, B. and Wang, W. (2023) Live Commerce Retailing with Online Influencers: Two Business Models. *International Journal of Production Economics*, **255**, Article 108715. <https://doi.org/10.1016/j.ijpe.2022.108715>
 - [17] Wang, J. and Zhang, X. (2022) The Value of Influencer Channel in an Emerging

- Livestreaming E-Commerce Model. *Journal of the Operational Research Society*, **74**, 112-124. <https://doi.org/10.1080/01605682.2022.2027825>
- [18] Tian, L., Vakharia, A.J., Tan, Y. and Xu, Y. (2018) Marketplace, Reseller, or Hybrid: Strategic Analysis of an Emerging E-Commerce Model. *Production and Operations Management*, **27**, 1595-1610. <https://doi.org/10.1111/poms.12885>
- [19] Abhishek, V., Jerath, K. and Zhang, Z.J. (2016) Agency Selling or Reselling? Channel Structures in Electronic Retailing. *Management Science*, **62**, 2259-2280. <https://doi.org/10.1287/mnsc.2015.2230>
- [20] Hao, C. and Yang, L. (2023) Resale or Agency Sale? Equilibrium Analysis on the Role of Live Streaming Selling. *European Journal of Operational Research*, **307**, 1117-1134. <https://doi.org/10.1016/j.ejor.2022.09.021>
- [21] Ji, G., Fu, T. and Li, S. (2023) Optimal Selling Format Considering Price Discount Strategy in Live-Streaming Commerce. *European Journal of Operational Research*, **309**, 529-544. <https://doi.org/10.1016/j.ejor.2023.01.034>
- [22] Zhang, W., Yu, L. and Wang, Z. (2023) Live-Streaming Selling Modes on a Retail Platform. *Transportation Research Part E: Logistics and Transportation Review*, **173**, Article 103096. <https://doi.org/10.1016/j.tre.2023.103096>
- [23] David, A. and Adida, E. (2015) Competition and Coordination in a Two-Channel Supply Chain. *Production and Operations Management*, **24**, 1358-1370. <https://doi.org/10.1111/poms.12327>
- [24] Li, Y., Xiong, Y., Mariuzzo, F. and Xia, S. (2021) The Underexplored Impacts of Online Consumer Reviews: Pricing and New Product Design Strategies in the O2O Supply Chain. *International Journal of Production Economics*, **237**, Article 108148. <https://doi.org/10.1016/j.ijpe.2021.108148>
- [25] Cao, L. and Li, L. (2015) The Impact of Cross-Channel Integration on Retailers' Sales Growth. *Journal of Retailing*, **91**, 198-216. <https://doi.org/10.1016/j.jretai.2014.12.005>
- [26] Chiang, W.K., Chhajed, D. and Hess, J.D. (2003) Direct Marketing, Indirect Profits: A Strategic Analysis of Dual-Channel Supply-Chain Design. *Management Science*, **49**, 1-20. <https://doi.org/10.1287/mnsc.49.1.1.12749>
- [27] Shi, D., Wang, M. and Li, X. (2021) Strategic Introduction of Marketplace Platform and Its Impacts on Supply Chain. *International Journal of Production Economics*, **242**, Article 108300. <https://doi.org/10.1016/j.ijpe.2021.108300>
- [28] Jin, M., Li, B., Xiong, Y., Chakraborty, R. and Zhou, Y. (2023) Implications of Coproduction Technology on Waste Management: Who Can Benefit from the Coproduct Made of Leftover Materials? *European Journal of Operational Research*, **307**, 1248-1259. <https://doi.org/10.1016/j.ejor.2022.10.020>
- [29] Zhang, J., Li, S., Zhang, S. and Dai, R. (2019) Manufacturer Encroachment with Quality Decision under Asymmetric Demand Information. *European Journal of Operational Research*, **273**, 217-236. <https://doi.org/10.1016/j.ejor.2018.08.002>
- [30] Dzyabura, D. and Jagabathula, S. (2018) Offline Assortment Optimization in the Presence of an Online Channel. *Management Science*, **64**, 2767-2786. <https://doi.org/10.1287/mnsc.2016.2708>
- [31] Luo, H., Zhong, L. and Nie, J. (2022) Quality and Distribution Channel Selection on a Hybrid Platform. *Transportation Research Part E: Logistics and Transportation Review*, **163**, Article 102750. <https://doi.org/10.1016/j.tre.2022.102750>
- [32] Difrancesco, R.M., van Schilt, I.M. and Winkenbach, M. (2021) Optimal In-Store Fulfillment Policies for Online Orders in an Omni-Channel Retail Environment. *European Journal of Operational Research*, **293**, 1058-1076.

<https://doi.org/10.1016/j.ejor.2021.01.007>

- [33] Li, Y., Li, G., Tayi, G.K. and Cheng, T.C.E. (2019) Omni-Channel Retailing: Do Offline Retailers Benefit from Online Reviews? *International Journal of Production Economics*, **218**, 43-61. <https://doi.org/10.1016/j.ijpe.2019.05.002>
- [34] Chenavaz, R., Klibi, W. and Schlosser, R. (2021) Dynamic Pricing with Reference Price Effects in Integrated Online and Offline Retailing. *International Journal of Production Research*, **60**, 5854-5875. <https://doi.org/10.1080/00207543.2021.1973136>