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### CHANNEL SELECTION OF MERCHANTS IN COMMISSIONED LIVE-STREAMING COMMERCE: AGENT OR CELEBRITY ANCHORS?

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#### ABSTRACT

As an emerging e-commerce model, live-streaming commerce has attracted widespread attention from merchants. Since many merchants do not have their own anchors, they need to hire professional anchors, who are called commissioned live-streaming commerce. Merchants can choose either agent anchors or celebrity anchors, that is, a choice between two different live-streaming channels. Choosing celebrity anchors with large fan bases can crank up higher sales for merchants, but comes with higher commission expenses and potential competition from the anchors' own brand products. Conversely, choosing agent anchors whose popularity is far less than that of celebrity anchors may still bring high profits, as these agents charge lower commissions. Inspired by this interesting phenomenon, the present study examines the challenges faced by merchants in live-streaming channel selection using commissioned live-streaming commerce. The study employs a Cournot model to investigate the issues at hand and analyze the impact of different factors on merchants' channel selection based on simulation. The results show that when the effort cost of a merchant choosing anchors is high and the merchant's brand image advantage is significant, the merchant is more inclined to choose agent anchors; otherwise, the inclination is to choose celebrity anchors. The findings provide support for the decision-making process of different parties involved in live-streaming commerce and thus, promote the sustainable development of the live-streaming commerce industry.

**Keywords:** Live-streaming commerce, channel selection, agent anchor, celebrity anchor, Cournot model.

#### INTRODUCTION

In recent years, live-streaming has emerged as a prominent e-commerce model, garnering widespread attention and investment from merchants and establishing itself as an indispensable sales channel on mainstream e-commerce platforms (Abid et al., 2024). According to statistics from Coresight Research, the market size of the live-streaming e-commerce industry in the United States is expected to exceed 25 billion dollars by 2023 (Du et al., 2023). The report by iiMedia.cn shows that China's live-streaming e-commerce

market was valued at 1201.2 billion RMB in 2021 and is forecasted to reach 2132.3 billion RMB by 2025 (Du et al., 2023).

Live-streaming sales combine real-time product demonstration with interactive communication, enabling consumers to make instant purchase decisions (Zhang et al., 2022; Liu et al., 2022). Anchors address questions, showcase product effects, and create a participatory atmosphere that strengthens trust and boosts merchants' sales opportunities. Based on the affiliation between the anchor and the merchant, the live-streaming sales can be divided into self-live-streaming commerce and commissioned live-streaming commerce (Jin et al., 2024). In self-live-streaming commerce, merchants rely on internal staff to present products in their own live rooms. This approach strengthens brand control and consumer interaction, but it limits product variety and fan reach, and requires high investment, prompting many merchants to turn to commissioned live-streaming instead (Jin et al., 2024). In commissioned live-streaming commerce, anchors from brokerage companies promote products with their personal image and act as the key bridge between merchants and consumers.

Anchors are categorized into two types based on their fan base scale and sales capabilities, namely celebrity anchors and agent anchors. Celebrity anchors offer substantial private traffic and can boost exposure (Niu et al., 2023; Ye et al., 2024), and reinforce brand trust through consumers' trust in the anchor (Zhao et al., 2019). Moreover, they also have considerable bargaining power and usually charge high slot fees and commissions (Qi et al., 2022). Conversely, although agent anchors may have lower visibility, the commissions they charge from merchants are much lower than those of celebrity anchors (Qi et al., 2022).

Most self-live-streaming research focuses on Brand-Led Live-Streaming E-commerce (BLSE), examining how brand-related and customer-related factors shape sales and engagement (Wongkitrungrueng & Assarut, 2020; Kang et al., 2021; Wang et al., 2024; Aggarwal et al., 2025). BLSE has been shown to significantly improve firm profits (Wang et al., 2024), while customer-perceived value, trust, and motivation drive participation (Wongkitrungrueng & Assarut, 2020). Agricultural live-streaming similarly benefits from authenticity and intimacy conveyed by farmer-anchors (Li, 2023), and self-live-streaming can in some cases outperform collaborations with external anchors (Jin et al., 2024).

The current research on commissioned live-streaming commerce predominantly examines the factors through which anchors influence consumers' purchasing decisions, such as the anchor's personality (Chen et al., 2022; Xu et al., 2020; Xue et al., 2020), responsiveness (Xue et al., 2020), and professional knowledge (Chen et al., 2022). Xu et al. (2022) and Chen et al. (2016) emphasized that factors such as the anchor's professionalism can increase consumers' willingness to buy and build a celebrity halo effect. Furthermore, some scholars have studied the role of the anchor's identity and hierarchy in the commissioned live-streaming commerce model. Du et al. (2023) found that low signing fees encourage manufacturers to collaborate with celebrity anchors. Djafarova and Rushworth (2017) argued that agent anchors are more influential in influencing consumers' purchasing decisions, and merchants are more likely to look for anchors that are relevant to the product and closely related to consumers. Ye et al. (2024) found that sellers' preferences for anchors depend on the industry's average bargaining power and the fixed remuneration of celebrity anchors.

A notable industry shift is that an increasing number of celebrity anchors are launching their own product lines, selling both merchants' products and their own within the same live-streaming room. This practice has sparked direct competition that may potentially undermine the performance of merchant sales. Since agent anchors do not sell their own products, they pose no such internal competition risk (Qi et al., 2022). This structural transformation has redefined the partnership between merchants and anchors, shifting it from a simple cooperative relationship to a co-competition structure (Ahmad et al., 2023; Tsai, 2002). However, existing literature predominantly frames celebrity anchors as "traffic providers" rather than potential competitors.

From the perspective of social exchange theory, the relationship between merchants and anchors is fundamentally a reciprocal exchange (Chiou et al., 2019; Li & Xia, 2025); merchants provide commissions, traffic incentives, and content resources in return for the anchor's exposure and sales capabilities. However, when celebrity anchors launch their own brands, this exchange becomes co-competition, generating reciprocity risks and interest realignment (Ahmad et al., 2023; Chernyak-Hai & Rabenu, 2018; Tsai, 2002). Although a substantial body of research has explored reciprocal relationships, numerous aspects related to group benefits, status consistency, and competitive dynamics remain underexamined (Ahmad et al., 2023).

In e-commerce, buyers and sellers remain physically separated, making information asymmetry a persistent barrier to transaction efficiency (Li et al., 2019; Lu & Chen, 2021). To help consumers assess product quality, authenticity, and value, sellers often rely on various market signals to reduce this asymmetry, such as unconditional refund guarantees (Li et al., 2019), third-party certifications (Kimery & McCord, 2006), and brand endorsements (Kirmani, 1990). In live-streaming commerce, signals extend to anchors' endorsement experience, value alignment, live-room design, and online popularity (Chen et al., 2023). These signals influence purchase decisions through two main pathways (Lu & Chen, 2021): one is rooted in judgments rooted in product attributes themselves, and the other hinges on the anchor's influence and reputation (Park & Lin, 2020). Within this framework, celebrity anchors convey strong market signals through their visibility, fame, and credibility, thereby significantly reducing consumer information asymmetry. Li Jiaqi's sale of 15,000 lipsticks in five minutes illustrates this effect (CITICS, 2019). However, once celebrity anchors launch their own brands, their promotional preferences and resource allocation may become biased, strengthening signals for their own products while weakening merchants' signals. This reshapes downstream competition. Existing studies recognize anchors' influence, but have not addressed the structural tension created by personal brands nor integrated signal bias into competitive product modelling.

As a result, substantial gaps remain at both the theoretical and modelling levels. Existing studies have not considered that merchants' choices between celebrity and agent anchors depend not only on cooperative returns, but also on the competitive risks that emerge once celebrity anchors launch their own brands. Prior work has likewise overlooked how the anchor's dual identity as promoter and competitor distorts signal transmission. Furthermore, the emergence of anchors' personal brands introduces a classic quantity-competition feature into the downstream market relationship between merchants and celebrity anchors. When this happens, both parties compete for the same pool of consumer demand, and their respective output influences one another. This dynamic aligns with the Cournot competition model, but no studies have yet modelled it in this context. These omissions leave unanswered how cooperation, competition, and signal bias jointly shape merchants' strategic channel choices.

To address this gap, the present study aims to determine the optimal strategic choice between a celebrity anchor and an agent anchor in order to maximize merchant profit, particularly under conditions of potential brand competition from the anchor's own brand; to examine the quantitative effects of merchant effort cost in selecting an appropriate anchor and the anchor's brand image advantage on equilibrium sales and profit across different sales channels; and finally to analyze how the optimal channel strategy adapts to varying levels of merchant investment and brand strength.

In summary, this study addresses the identified research problem and makes three primary contributions to the literature, each corresponding directly to the research objectives posed. Corresponding to the first question, this study considers the competitiveness and substitutability between merchants' products and celebrity anchors' products in the downstream market, and analyze the problem of merchants' live-streaming channel selection based on the Cournot model. Selecting an agent anchor introduces supply chain competition, whereas choosing a celebrity anchor leads to self-competition among the celebrity anchors in the model. Addressing the second objective, this study analyzes the equilibrium results from the following three perspectives: the effort cost of merchants choosing a suitable anchor, product sales, and merchant profits. The study further explores the impact of merchants' investment and brand image on the choice of

live-streaming channels. Notably, merchant effort costs are consistently higher when opting for an agent anchor. Regarding product sales, when the merchant's investment is large and the merchant's brand image is weak, the popularity of the celebrity anchor can increase the merchant's sales. Otherwise, selecting an agent anchor yields higher sales. By comparing the merchant's profits under the two channels, this study finds that if and only if the merchant's investment is large and the merchant's brand image is strong, the merchant's profit from choosing an agent anchor is higher. Otherwise, selecting a celebrity anchor is recommended.

In response to the third objective, this study simulated the real scene through simulation and observing the rate of change in the merchant's effort cost, product sales, and merchant profit under different investment levels and brand images in a more intuitive way. The findings indicate that as merchants invest more, the impact of brand image on costs gradually weakens when selecting an agent anchor, but becomes more significant on profits. However, when selecting a celebrity anchor, the influence of brand image on costs and profits is less pronounced. Together, these contributions bridge theoretical modeling and managerial practice by offering strategic insights for merchants selecting between celebrity and agent anchors in commissioned live-streaming commerce.

### MERCHANT' LIVE-STREAMING CHANNEL SELECTION PROBLEM

In the commissioned live-streaming commerce model, merchants select agent or celebrity anchors, corresponding to two distinct live-streaming channels. This section will first elaborate on the live-streaming channel selection problem faced by merchants in the commissioned live-streaming commerce model. Subsequently, this study develops a Cournot model to address this selection challenge, accounting for the competitive relationship between merchants and celebrity anchors in the downstream market. The model aims to determine the equilibrium outcomes for merchants operating under these two channels.

The core issue explored in this paper is that, under the commissioned live-streaming commerce model, whether merchants should select agent anchors or celebrity anchors to maximize their interests while achieving a win-win situation for merchants and agent anchors.

**Figure 1**

*The Structure of Merchant Live Streaming Channel Selection*

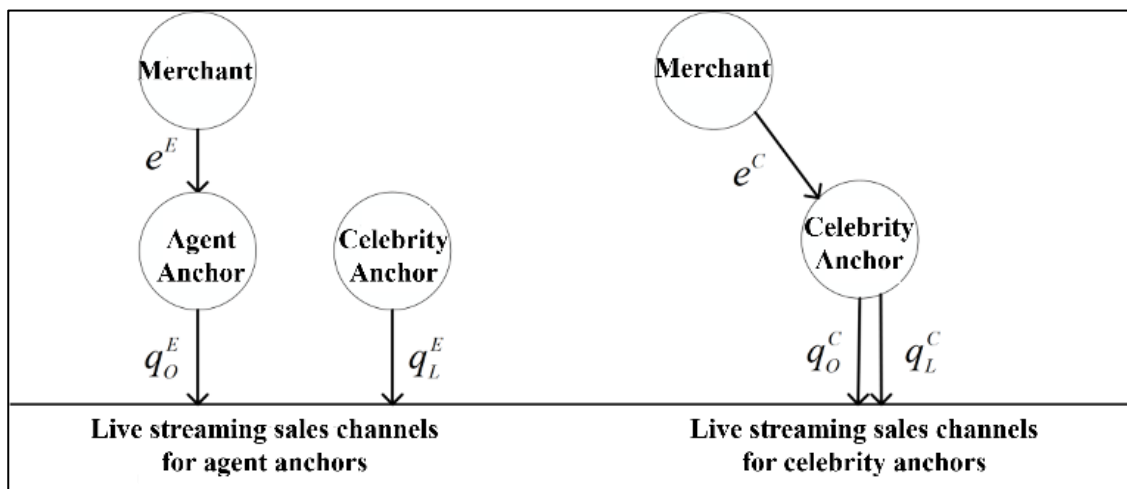


Figure 1 illustrates the structural framework for the two live-streaming channels. Celebrity anchors exhibit high professionalism, interactive ability, a substantial fan base, and robust sales ability. However, some celebrity anchors have their own brands, leading to competition between the celebrity anchors' products and the merchants' products when merchants select celebrity anchors. This study denotes this structure as  $C$ . The effort made by merchants to select suitable celebrity anchors is  $e^C$ , and the number of merchant products and self-branded products sold by celebrity anchors in their live-streaming rooms are  $q_O^C$  and  $q_L^C$ , respectively.

Agent anchors typically originate from proxy live-streaming service agencies. Although they may not possess the same level of popularity and expertise as celebrity anchors, agent anchors can help merchants accumulate private domain traffic and enhance brand loyalty among consumers by selling goods in the live-streaming room of the merchant's official account. When merchants choose agent anchors, merchants and celebrity anchors are located in different supply chains, and it is a competition between chains. This study denotes this structure as  $E$ . The effort made by merchants to choose a suitable agent anchor is  $e^E$ , the number of goods sold by the agent anchor in the live-streaming room of the merchant account is  $q_O^E$ , and the number of goods sold by the celebrity anchor in the live-streaming room of his personal account is  $q_L^E$ . The symbols used in this paper and their explanations are as shown in Table 1.

**Table 1**

*Symbols and Instructions for Selecting Live Streaming Channels of Agent Anchors and Celebrity Anchors*

Symbol	Description
$i$	Channel structure $i \in \{E, C\}$ , $E$ represents the selection of an agent anchor, and $C$ represents the selection of a celebrity anchor
$a$	The total market size of the product
$\theta$	The brand image of the merchant's products is better than that of the celebrity anchor's products.
$s$	Commission ratio in live streaming sales
$k$	The unit effort cost coefficient of merchants in selecting suitable anchors
$e^i$	The efforts made by merchants to choose the right anchor under the agent anchor/celebrity anchor sales channel
$p_O^i$	Under the agent anchor/celebrity anchor sales channel, the price of the merchant's goods
$p_L^i$	Under the agent anchor/celebrity anchor sales channel, the price of the expert host's products
$q_O^i$	Sales volume of merchant products under the sales channels of agent anchors/celebrity anchors
$q_L^i$	Under the sales channel of agent anchor/celebrity anchor, the sales volume of celebrity anchor products
$\pi_O^i$	Profits of merchants under the sales channels of agent anchors/celebrity anchors
$\pi_L^i$	Profits of celebrity anchors under the sales channels of agent anchors/celebrity anchors
$\pi_E$	Profits of agent anchors

The income of anchors during live-streaming mainly comes from the commission of product sales. The present study assumes that the cooperation between merchants and anchors follows a pure commission model, with the same commission ratio  $s$  for merchants selecting agent anchors and celebrity anchors is the same, and  $0 < s < 1$ . Since the research does not involve the production cost of merchants, this study standardizes the production cost of merchants to be 0 and simplify the total cost to the effort cost of merchants to select suitable anchors (Niu et al., 2016). This study further assumes that the effort cost of merchants to select suitable anchors in the early stage is in the form of a quadratic function (Cheng et al., 2023; Nie, 2012), expressed as  $\frac{1}{2}ke^2$ , where  $k$  represents the unit effort cost coefficient of merchants to select suitable anchors.

## LIVE-STREAMING CHANNEL SELECTION MODELING BASED ON THE COURNOT MODEL

This section develops the Cournot model to explore the selection of agent anchors and celebrity anchors by merchants. The Cournot model is widely used in the quantity decision-making of two merchants who sell homogeneous goods and compete in a monopolistic market under the premise of pursuing the maximization of their interests (Haiju et al., 2024). The assumptions of the present study are consistent with the basic assumptions of the Cournot model. The merchant and the celebrity anchor participate in Cournot competition in the downstream market to determine the quantity of goods (Niu et al., 2020; Niu & Mu, 2020; Niu et al., 2019).

The inverse demand functions of merchants and celebrity anchors are as shown in Equations (1) and (2), where  $i \in \{E, C\}$  represents the scenarios in which merchants choose agent anchors and celebrity anchors, respectively.

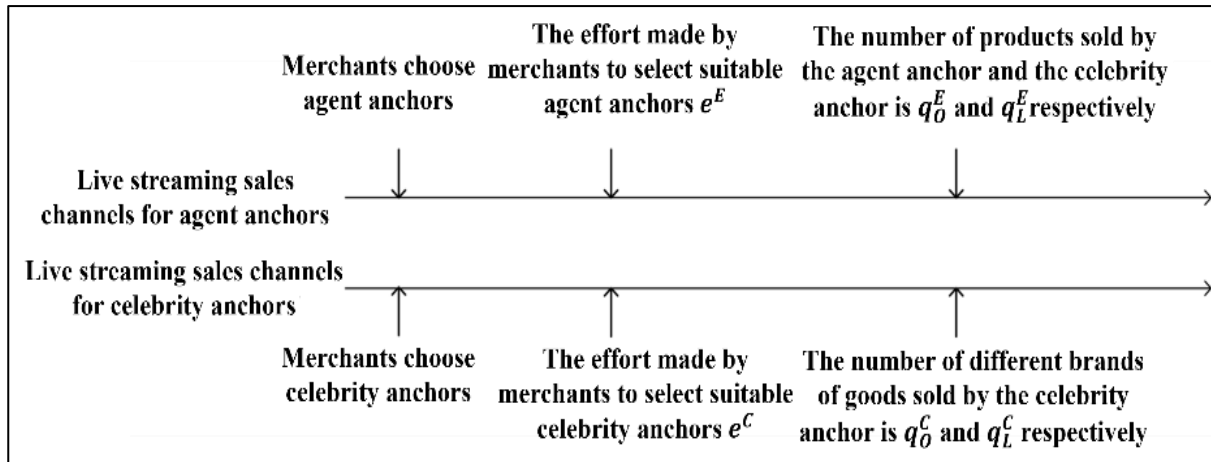
$$p_o^i = (1 + \theta)a + e^i - q_o^i - q_L^i \quad (1)$$

$$p_L^i = a - q_L^i - q_o^i \quad (2)$$

The total market size of the product is represented by  $a$ . Compared with the products of the celebrity anchor's own brand, the merchant's products have brand image advantages, such as advantages in brand design and marketing. Therefore, the merchant's market potential is  $(1 + \theta)a$ , where  $0 < \theta < 1$ . The effort made by the merchant to select a suitable anchor is represented by  $e^i$ . This effort encompasses factors such as anchor-brand compatibility, communication with the anchor, and anchor screening. When the anchor and the merchant brand have a high degree of compatibility, it is more conducive to expanding the merchant's market potential. The sales volume of different brands of the merchant and the celebrity anchor is denoted by  $q_o^i$  and  $q_L^i$ , respectively, and these are also the decision variables in the final stage. The sequence of events for merchants under the two channels is as shown in Figure 2.

**Figure 2**

*Event Sequence Diagram of Merchant Live Streaming Channel Selection*



The sequence of events for merchants to select an agent anchor is as follows: in the first stage, the merchant selects an agent anchor; subsequently, the merchant makes an effort to select a suitable agent anchor, which is  $e^E$ ; in the third stage, the number of goods sold by the agent anchor for the merchant is  $q_O^E$ , and the number of goods sold by the celebrity anchor for his own brand is  $q_L^E$ .

The sequence of events for merchants selecting a celebrity anchor proceeds similarly as follows: initially, merchants select celebrity anchors; in the second stage, the effort made by merchants to select suitable celebrity anchors is  $e^C$ ; and finally, the quantity of merchant and own-brand products sold by celebrity anchors is  $q_O^C$  and  $q_L^C$ , respectively.

Merchants, agent anchors, and celebrity anchors all pursue the maximization of their own interests in the decision-making process. Equations (3) to (7) present the profit functions for these parties under the agent anchor and celebrity anchor channels.

Agent anchor:

$$\pi_O^E = (1 - s)p_O^E q_O^E - \frac{1}{2} k e^{E^2} \quad (3)$$

$$\pi_L^E = p_L^E q_L^E \quad (4)$$

$$\pi_E = s p_O^E q_O^E \quad (5)$$

Celebrity anchor:

$$\pi_O^C = (1 - s)p_O^C q_O^C - \frac{1}{2} k e^{C^2} \quad (6)$$

$$\pi_L^C = p_L^C q_L^C + s p_O^C q_O^C \quad (7)$$

From the perspective of profit function, it can be observed that the profit of merchants in both channels is the sales revenue of merchants minus the effort cost of selecting suitable anchors in the initial stage. The profit of the agent anchor mainly comes from the commission income. The profit of the celebrity anchor in the agent anchor sales channel comes from the sales revenue of his own brand products, but in the celebrity anchor sales channel, a portion of the celebrity anchor's profit comes from the commission income of the merchant's products.

According to the event sequence in Figure 2, the optimal decision is derived through the reverse solution method. As shown in Table 2 and Table 3, the equilibrium results of merchants choosing celebrity anchors and agent anchors are different. In the case of ensuring that the equilibrium result is greater than 0, combined with the actual situation of the anchor's commission ratio, the range of parameters that need to be satisfied is as follows:  $a > 0$ ,  $0 < s < \frac{1}{5}$ ,  $k > \frac{-1-5s+4s^2-4s^3}{-6s+6s^2}$ ,  $\frac{1-k-3s+2ks-ks^2}{-k+ks^2} < \theta < \frac{-4+3k+4s}{3k}$ .

**Table 2**

*Equilibrium Results of Merchants Selecting Agent Anchors*

parameter	Equilibrium results	Numerical result ( $a = 1, s = 0.15, k = 4.75, \theta = 0.7$ )
$e^E$	$-\frac{4a(-1+s)(1+2\theta)}{-8+9k+8s}$	0.227
$q_0^E$	$\frac{3ak(1+2\theta)}{-8+9k+8s}$	0.951
$q_L^E$	$\frac{a(-4+3k+4s-3k\theta)}{-8+9k+8s}$	0.024
$\pi_0^E$	$-\frac{k(-1+s)(a+2a\theta)^2}{-8+9k+8s}$	0.647
$\pi_L^E$	$\frac{9a^2k^2s(1+2\theta)^2}{(-8+9k+8s)^2}$	0.136
$\pi_E$	$\frac{a^2(4-4s+3k(-1+\theta))^2}{(-8+9k+8s)^2}$	0.004

**Table 3**

*Equilibrium Results of Merchants Selecting Celebrity Anchors*

parameter	Equilibrium results	Numerical result ( $a = 1, s = 0.15, k = 4.75, \theta = 0.7$ )
$e^C$	$-\frac{a(-1+s+4s\theta)}{k(-1+s)^2+4s}$	0.107
$q_0^C$	$-\frac{a(2s+k(-1+s)(-1+s+2s\theta))}{(-1+s)(k(-1+s)^2+4s)}$	0.842
$q_L^C$	$\frac{as(-1+3s+k(-1+s)(-1+s+\theta+s\theta))}{(-1+s)(k(-1+s)^2+4s)}$	0.016
$\pi_L^C$	$\frac{a^2s(-3s+k^2(-1+s)^2\theta(-1+s+s\theta)+k(-1+s)(1+s(-1+2\theta)))}{-(k(-1+s)^2+4s)^2}$	0.122
$\pi_0^C$	$\frac{a^2(1-2k\theta(-1+s+2s\theta))}{2(k(-1+s)^2+4s)}$	0.652

Notes. Numerical results are calculated based on the basic parameters ( $a = 1, s = 0.15$ ) and medium effort cost ( $k = 4.75$ ) with moderate brand image advantage ( $\theta = 0.7$ ).

Although the Cournot competition model provides a rigorous and tractable analytical framework for examining merchants' channel selection, several simplifying assumptions should be acknowledged. First, the model assumes that the commission rates between agent anchors and celebrity anchors are fixed and identical, which helps to isolate the effect of merchants' effort and brand image. However, in real-world live-streaming commerce, commission rates may vary across anchor types and industries, potentially influencing merchants' optimal channel strategies. Second, the products are treated as homogeneous, which simplifies the competition setting but may overlook differentiation effects such as product quality, design, or emotional appeal. Third, the anchors are assumed to act rationally to maximize their profits, ignoring behavioural biases or contractual frictions that may occur in practice. Future studies may extend this model by relaxing these assumptions—for instance, by incorporating heterogeneous commission rates, product differentiation, or dynamic reputation effects among anchors.

## ANALYSIS OF THE GAME MODEL

This section conducts a comparative analysis of merchant effort costs, product sales, and merchant profits under different live-streaming channels to reveal the impact of the unit effort cost coefficient  $k$  paid by merchants in selecting suitable anchors and the merchant's brand image advantage  $\theta$ .

### Analysis of the Merchants' Effort Costs

The equilibrium results in Section 3 show that merchants incur different effort costs when choosing between agent and celebrity anchors. This difference depends primarily on the effort parameters  $e^E$  and  $e^C$  in the two channels. The conclusion is as shown in Proposition 1.

Proposition 1. (a) The effort cost of merchants choosing suitable agent anchors exceeds the effort cost of choosing celebrity anchors (i.e.  $\frac{1}{2}ke^{E^2} > \frac{1}{2}ke^{C^2}$ ).

(b) The effort cost of merchants selecting a suitable agent anchor increases with  $\theta$ , while the effort cost of merchants selecting a suitable celebrity anchor decreases with  $\theta$  (i.e.  $\frac{\partial e^E}{\partial \theta} > 0$ ,  $\frac{\partial e^C}{\partial \theta} < 0$ ).

Proof: (a) To prove that  $\frac{1}{2}ke^{E^2} > \frac{1}{2}ke^{C^2}$ , it suffices to show that  $e^E > e^C$ . By comparison, we find that  $e^E - e^C = \frac{8a-5ak-3aks-8as^2+12aks^2-4aks^3+(8ak+12aks+24aks^2-8aks^3)\theta}{(k(-1+s)^2+4s)(-8+9k+8s)}$ . When  $e^E - e^C = 0$ ,  $\theta = \frac{8-5k-3ks-8s^2+12ks^2-4ks^3}{4k(-2-3s-6s^2+2s^3)}$ . This is because when  $s \in (s_1, \frac{1}{5}) \subset (0, \frac{1}{5})$  and  $k > \frac{39}{20}$ ,  $1 + (5 - 6k)s_1 + (-4 + 6k)s_1^2 + 4s_1^3 = 0$ ,  $8a - 5ak - 3aks - 8as^2 + 12aks^2 - 4aks^3 < 0$ ,  $8ak(1 - s^3) + 12aks + 24aks^2 > 0$ , and  $\frac{1-k-3s+2ks-ks^2}{-k+ks^2} > \frac{8-5k-3ks-8s^2+12ks^2-4ks^3}{4k(-2-3s-6s^2+2s^3)}$ . So when  $\theta \in (\frac{1-k-3s+2ks-ks^2}{-k+ks^2}, \frac{-4+3k+4s}{3k})$ ,  $e^E - e^C > 0$ . Proposition 1(a) is proved.

$\frac{\partial e^E}{\partial \theta} = \frac{8a(1-s)}{-8+9k+8s} > 0$ ,  $\frac{\partial e^C}{\partial \theta} = -\frac{4as}{k(-1+s)^2+4s} < 0$ . Proposition 1(b) is proved.

Proposition 1 indicates that merchants usually need to spend more effort when cooperating with agent anchors because these anchors lack existing brand power and audience reach, while celebrity anchors' established popularity reduces the merchant's coordination and screening costs.

In Proposition 1(a), although competition exists between the merchants' products and celebrity anchors' products, merchants may still prefer to cooperate with celebrity anchors. Celebrity anchors can influence the sales of both competing products, and part of their profit derives from commission income. The higher commission ratio makes celebrity anchors more willing to cooperate with merchants.

Regarding Proposition 1(b), a stronger merchant brand image increases market demand and motivates merchants to invest more effort in selecting agent anchors with better brand fit. Meanwhile, the competition between the merchant's brand and the celebrity anchor's own brand will become more intense. The merchant's efforts to select the right celebrity anchor will decrease. Therefore, from the perspective of the effort cost for merchants to choose suitable anchors, it is recommended that merchants choose celebrity anchors.

### Analysis of Product Sales

The sales volume of merchants under the two channels is also different, and the main results are as summarized in Proposition 2.

Proposition 2. (a) When  $k \leq k_1$ , the merchant chooses the agent anchor, resulting in a higher sales volume for the product (i.e., when  $k \leq k_1$ ,  $q_0^E > q_0^C$ ).

(b) If and only if  $k > k_1$  and  $\theta < \theta_1$ , the merchant chooses a celebrity anchor, the sales volume of the product will be greater (i.e., if and only if  $k > k_1$  and  $\theta < \theta_1$ ,  $q_0^E < q_0^C$ ).

(c) When choosing an agent anchor, the merchant's sales volume increases with  $\theta$ . When choosing a celebrity anchor, the merchant's sales volume decreases with  $\theta$  (i.e.,  $\frac{\partial q_0^E}{\partial \theta} > 0$ ,  $\frac{\partial q_0^C}{\partial \theta} < 0$ ).

where  $k_1 = \frac{-2-2s-8s^2}{-3s+3s^2}$ ,  $\theta_1 = \frac{8k-6k^2+16s-30ks+9k^2s-16s^2+12ks^2-8ks^3-3k^2s^3}{-6k^2-8ks-8ks^2+16ks^3+6k^2s^3}$ .

Proof: First, we calculate the difference between  $q_0^E$  and  $q_0^C$ , and set it equal to 0.  $q_0^E - q_0^C = \frac{(-6ak^2-8aks-8aks^2+16aks^3+6ak^2s^3)\theta}{(-1+s)(k(-1+s)^2+4s)(-8+9k+8s)} + \frac{-8ak+6ak^2-16as}{(-1+s)(k(-1+s)^2+4s)(-8+9k+8s)}$   
 $+ \frac{30aks-9ak^2s+16as^2-12aks^2+8aks^3+3ak^2s^3}{(-1+s)(k(-1+s)^2+4s)(-8+9k+8s)}$ . Given  $s \in (0, \frac{1}{5})$ , and  $k > \frac{-1-5s+4s^2-4s^3}{-6s+6s^2}$ , we have  $-8ak + 6ak^2 - 16as + 30aks - 9ak^2s + 16as^2 - 12aks^2 + 8aks^3 + 3ak^2s^3 > 0$ ,  $-6ak^2 - 8aks - 8aks^2 + 16aks^3 + 6ak^2s^3 < 0$ , and  $\theta \in (\frac{1-k-3s+2ks-ks^2}{-k+ks^2}, \frac{-4+3k+4s}{3k})$ .

When  $\theta_1 = \frac{8k-6k^2+16s-30ks+9k^2s-16s^2+12ks^2-8ks^3-3k^2s^3}{-6k^2-8ks-8ks^2+16ks^3+6k^2s^3}$ ,  $q_0^E - q_0^C = 0$ . To ensure  $q_0^E - q_0^C < 0$ , we need  $\frac{1-k-3s+2ks-ks^2}{-k+ks^2} < \theta_1$ . By solving this inequality, we find that  $k > \frac{-2-2s-8s^2}{-3s+3s^2}$ . So when  $k > k_1$ , and  $\theta < \theta_1$ ,  $q_0^E < q_0^C$ . When  $\theta > \theta_1$ ,  $q_0^E > q_0^C$ . On the contrary, when  $\frac{1-k-3s+2ks-ks^2}{-k+ks^2} > \theta_1$ , we can get  $k < \frac{-2-2s-8s^2}{-3s+3s^2}$ , and  $q_0^E - q_0^C > 0$ . Hence, when  $k \leq k_1$ ,  $q_0^E > q_0^C$ , and Propositions 2(a) and (b) are proved.

$\frac{\partial q_0^E}{\partial \theta} = \frac{6ak}{-8+9k+8s} > 0$ ,  $\frac{\partial q_0^C}{\partial \theta} = -\frac{2aks}{k(-1+s)^2+4s} < 0$ , Proposition 2(c) is proved.

According to Proposition 2, when merchants have weaker brands or limited resources, celebrity anchors' strong influence boosts sales; but when the merchant's brand image and investment increase, agent anchors can achieve higher sales through better brand alignment.

Propositions 2(a) and (b) show that the sales volume of a merchant's goods is affected by two parameters: the unit effort cost coefficient  $k$  that the merchant pays for selecting a suitable anchor and the brand image advantage  $\theta$ . When  $k$  is small ( $k \leq k_1$ ), the difference in the effort cost paid by the merchant under the two channels is not large. Besides, the greater effort will also motivate agent anchors to work hard. Therefore, many merchants continue to choose agent anchors.

With the escalating unit effort cost coefficient of merchants choosing suitable anchors ( $k > k_1$ ), the size of the merchant's sales in the two channels depends on the merchant's brand image advantage  $\theta$ . When  $\theta$  is not significant ( $\theta < \theta_1$ ), merchants choose celebrity anchors to increase product sales. However, as  $\theta$  continues to rise, the celebrity anchor's goods are gradually at a disadvantage, and the attractiveness of selling merchant goods to the celebrity anchor declines. The sales of merchant goods in the celebrity anchors' sales channel will show a downward trend. When  $\theta > \theta_1$ , the sales of goods when merchants choose an agent anchor will exceed that when they choose a celebrity anchor. In addition, the sales of the celebrity anchor's own brand products in the two channels also exhibit disparities. These results are presented in Proposition 3.

Proposition 3. (a) If and only if  $\theta > \theta_2$ , the merchant chooses the agent anchor, which results in the sales volume of the celebrity anchor's own products surpassing that of the merchant's choice of the celebrity anchor (i.e., if and only if  $\theta > \theta_2$ ,  $q_L^E < q_L^C$ ).

(b) When merchants choose an agent anchor, the sales volume of the anchor's products decreases with  $\theta$ .

When merchants choose a celebrity anchor, the sales volume of the celebrity anchor's products increases with  $\theta$  (i.e.  $\frac{\partial q_L^E}{\partial \theta} < 0$ ,  $\frac{\partial q_L^C}{\partial \theta} > 0$ ).

$$\theta_2 = \frac{4k-3k^2+8s-11ks-15ks^2+9k^2s^2-8s^3+8ks^3-6k^2s^3-4ks^4}{-3k^2-4ks+4ks^2-9k^2s^2-8ks^3+12k^2s^3+8ks^4}.$$

Proof: 
$$q_L^E - q_L^C = \frac{-4ak+3ak^2-8as+11aks+15aks^2-9ak^2s^2+8as^3-8aks^3+6ak^2s^3+4aks^4}{(1-s)(k(-1+s)^2+4s)(-8+9k+8s)} + \frac{(-3ak^2-4aks+4aks^2-9ak^2s^2-8aks^3+12ak^2s^3+8aks^4)\theta}{(1-s)(k(-1+s)^2+4s)(-8+9k+8s)}.$$

For  $s \in \left(0, \frac{1}{5}\right)$  and  $k > \frac{-1-5s+4s^2-4s^3}{-6s+6s^2}$ , we have  $-4ak + 3ak^2 - 8as + 11aks + 15aks^2 - 9ak^2s^2 + 8as^3 - 8aks^3 + 6ak^2s^3 + 4aks^4 > 0$  and  $-3ak^2 - 4aks + 4aks^2 - 9ak^2s^2 - 8aks^3 + 12ak^2s^3 + 8aks^4 < 0$ .

When  $\theta_2 = \frac{4k-3k^2+8s-11ks-15ks^2+9k^2s^2-8s^3+8ks^3-6k^2s^3-4ks^4}{-3k^2-4ks+4ks^2-9k^2s^2-8ks^3+12k^2s^3+8ks^4}$ ,  $q_L^E - q_L^C = 0$ . We know that  $\theta_2 \in \left(\frac{1-k-3s+2ks-ks^2}{-k+ks^2}, \frac{-4+3k+4s}{3k}\right)$ , so to make  $q_L^E - q_L^C < 0$ , we can get  $\theta > \theta_2$ , Proposition 3(a) is proved.

$$\frac{\partial q_L^E}{\partial \theta} = -\frac{3ak}{-8+9k+8s} < 0, \quad \frac{\partial q_L^C}{\partial \theta} = \frac{aks(1+s)}{k(-1+s)^2+4s} > 0, \quad \text{Proposition 3(b) is proved.}$$

The equilibrium comparison demonstrates that as the merchant's brand image becomes stronger, the celebrity anchor's own products face more competition, leading to lower sales for the anchor's brand and higher sales for the merchant's products.

Proposition 3 shows that the merchant's brand image advantage  $\theta$  will affect the sales of the celebrity anchor's own products. Proposition 2(c) shows that the merchant's brand image advantage will pose a threat to the celebrity anchor's products and the celebrity anchor will invest more energy in their own products, so when the merchant chooses the celebrity anchor, the celebrity anchor's product sales will be higher. As shown in Proposition 2(c) and Proposition 3(b), the sales of the celebrity anchor's own products will decrease as  $\theta$  increases.

Combining the implications of Proposition 2 and Proposition 3, the following corollary is obtained. Corollary 1 shows that under the same live-streaming channel, the sales volume of merchants' products and the celebrity anchor's products fluctuate in response to variations in  $\theta$ .

Corollary 1. (a) When merchants choose agent anchors, the sales of merchants' products increase with  $\theta$ , while the sales of the celebrity anchor's own products decrease with  $\theta$  (i.e.  $\frac{\partial q_o^E}{\partial \theta} > 0, \frac{\partial q_L^E}{\partial \theta} < 0$ ).

(b) When merchants choose celebrity anchors, the sales of merchants' products decrease with  $\theta$ , while the sales of the celebrity anchor's own products increase with  $\theta$  (i.e.  $\frac{\partial q_o^C}{\partial \theta} < 0, \frac{\partial q_L^C}{\partial \theta} > 0$ ).

Corollary 1 illustrates that: (1) Irrespective of the magnitude of the k value, the "one rise and one fall" trend remains consistent. (2) When  $\theta$  increases, the merchant tends to choose the agent anchor because the merchant's product sales are superior when the agent anchor is chosen.

### Analysis of the Merchants' Profits

The unit effort cost coefficient of merchants in selecting suitable anchors and the merchant's brand image advantage will also affect the merchant's profits under the two live-streaming channels, as summarized in Proposition 4.

Proposition 4. (a) When  $k \leq k_2$ , merchants tend to choose celebrity anchors (i.e., when  $k \leq k_2$ ,  $\pi_0^E < \pi_0^C$ ). (b) If and only if  $k > k_2$  and  $\theta > \theta_3$ , merchants tend to choose agent anchors (i.e., if and only if  $k > k_2$  and  $\theta > \theta_3$ ,  $\pi_0^E > \pi_0^C$ ).

(c) Under both channel structures, the merchant's profit increases with  $\theta$  (i.e.  $\frac{\partial \pi_0^E}{\partial \theta} > 0, \frac{\partial \pi_0^C}{\partial \theta} > 0$ ).

$$k_2 = \frac{-1-8s-48s^2+64s^3-16s^4}{-54s^2+18s^3}, \quad \theta_3 = -\frac{8k(-1+s^2)+k^2(5+3s-12s^2+4s^3)}{4k^2(-2-3s-6s^2+2s^3)} - \frac{\sqrt{k^2(1+8s)(9k^2(-1+s)^2+32(-1+s)s+4k(-2+15s-6s^2+2s^3))}}{4k^2(-2-3s-6s^2+2s^3)}$$

Proof: First, we calculate the difference between  $\pi_0^E$  and  $\pi_0^C$ , and set it equal to 0.  $\pi_0^E - \pi_0^C = \frac{8-9k+2k^2-8s+8ks-6k^2s-8ks^2+6k^2s^2-2k^2s^3}{2(k(-1+s)^2+4s)(-8+9k+8s)} + \frac{(8k^2+12k^2s+24k^2s^2-8k^2s^3)\theta^2}{2(k(-1+s)^2+4s)(-8+9k+8s)} + \frac{(16k-10k^2-6k^2s-16ks^2+24k^2s^2-8k^2s^3)\theta}{2(k(-1+s)^2+4s)(-8+9k+8s)}$ . When  $\pi_0^E - \pi_0^C = 0$ , the equation simplifies to  $8-9k+2k^2-8s+8ks-6k^2s-8ks^2+6k^2s^2-2k^2s^3+(16k-10k^2-6k^2s-16ks^2+24k^2s^2-8k^2s^3)\theta+(8k^2+12k^2s+24k^2s^2-8k^2s^3)\theta^2=0$ . Therefore,  $\theta_3^* = \frac{-8k(-1+s^2)-k^2(5+3s-12s^2+4s^3)+\sqrt{k^2(1+8s)(9k^2(-1+s)^2+32(-1+s)s+4k(-2+15s-6s^2+2s^3))}}{4k^2(-2-3s-6s^2+2s^3)}$ , and  $\theta_3^* < \theta_3$ .

Because  $\theta \in \left(\frac{1-k-3s+2ks-ks^2}{-k+ks^2}, \frac{-4+3k+4s}{3k}\right)$ , if we ensure  $\pi_0^E - \pi_0^C < 0$ , then  $\theta_3 > \frac{-4+3k+4s}{3k}$ , leading to  $k < \frac{-1-8s-48s^2+64s^3-16s^4}{-54s^2+18s^3}$ . This implies that when  $k \leq k_2$ ,  $\pi_0^E < \pi_0^C$ . On the contrary, when  $k > \frac{-1-8s-48s^2+64s^3-16s^4}{-54s^2+18s^3}$ ,  $\theta_3 < \frac{-4+3k+4s}{3k}$ . So, when  $\theta > \theta_3$ ,  $\pi_0^E > \pi_0^C$ . Proposition 4(a) and (b) are proved.

Next, we analyse the derivatives:  $\frac{\partial \pi_0^E}{\partial \theta} = \frac{4ak(1-s)(a+2a\theta)}{-8+9k+8s} > 0$ ,  $\frac{\partial \pi_0^C}{\partial \theta} = \frac{2ka^2(1-s(1+4\theta))}{2(k(-1+s)^2+4s)} > 0$ , Proposition 4(c) is proved.

Proposition 4 shows that merchants with strong brands and higher investments gain more profit from agent anchors due to lower commission rates, while less established merchants benefit more from celebrity anchors' popularity and market influence.

When the unit effort cost coefficient of merchants choosing suitable anchors is small ( $k \leq k_2$ ), although the sales volume of merchants choosing agent anchors is higher, the effort cost of merchants choosing agent anchors is greater. Therefore, the profit obtained by merchants choosing agent anchors is less, making merchants more inclined to select celebrity anchors. As  $k$  continues to increase ( $k > k_2$ ), the channel chosen by the merchant is determined by  $\theta$ . When  $\theta$  is not significant ( $\theta \leq \theta_3$ ), the merchant is weak in product design, sales, and marketing, so the merchant prefers celebrity anchors. When  $\theta$  is significant ( $\theta > \theta_3$ ), the merchant will have higher profits when choosing an agent anchor. Therefore, the merchant is more inclined to choose an agent anchor.

From Proposition 4(c), as  $\theta$  increases, the total profit of the merchant in the entire supply chain will also increase (Niu et al., 2020). Although it takes a lot of effort to select the right agent anchors, this also attracts more traffic, and increases sales and profits. In addition, as  $\theta$  increases, the effort to select celebrity anchors and sales both decreases, but the effort decreases faster so even if competition intensifies, the merchant's profits will still increase.

## SIMULATION ANALYSIS

Simulation is employed to further intuitively observe how merchants' effort costs, product sales, and profits change with investment intensity and brand image under different channels. Based on the actual situation, the basic parameters of the model are adjusted accordingly. The basic parameters finally obtained are as follows: the total market size of the commodity  $a = 1$ , and the commission ratio in live-streaming  $s = 0.15$ . Specifically, the total market size is set with reference to the common practice of standardizing market scale in live-streaming commerce channel selection studies, which simplifies calculations while ensuring the relative relationships between variables can be effectively reflected. The commission ratio  $s = 0.15$ , it is calibrated based on observed averages from recent reports of major platforms such as TikTok Shop, Shopee Live, and Taobao Live, where commission rates typically range from 5% to 20%, and this value also meets the model constraint of positive equilibrium results to ensure the validity of subsequent profit and sales analysis.

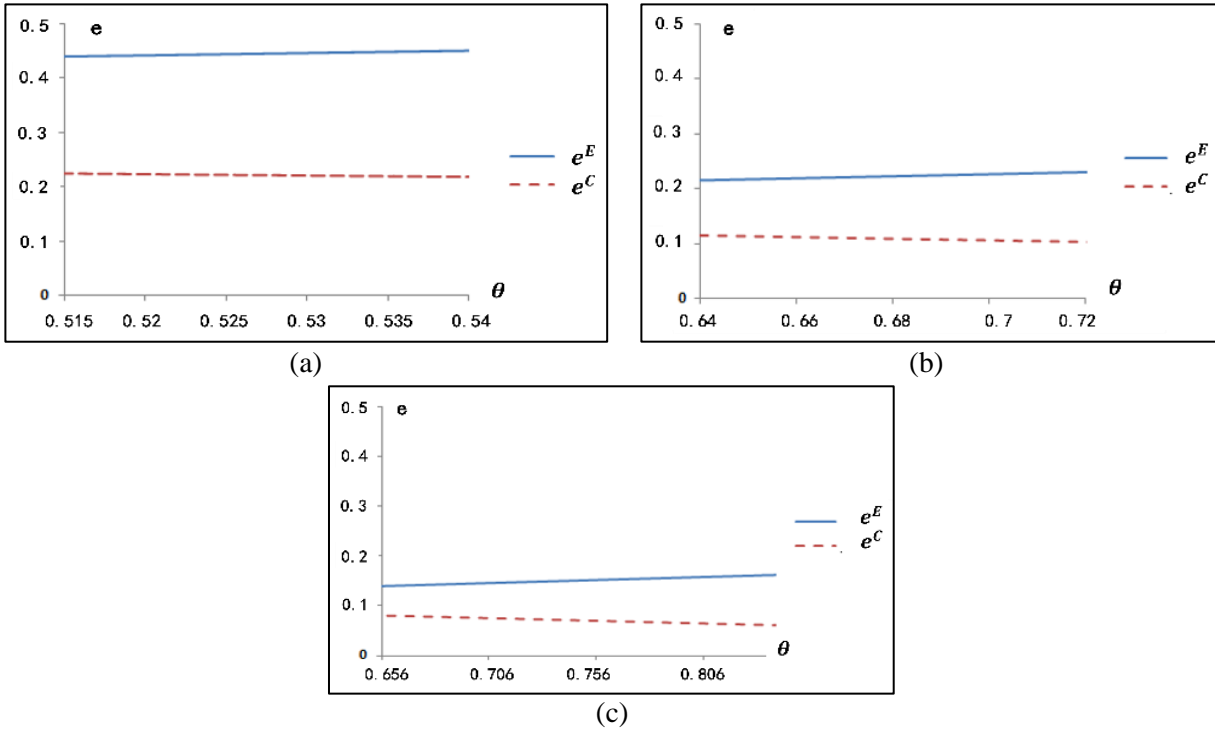
Notably,  $k_1 = \frac{-2-2s-8s^2}{-3s+3s^2} = 6.48$  and  $k_2 = \frac{-1-8s-48s^2+64s^3-16s^4}{-54s^2+18s^3} = 2.66$ . Following a comprehensive analysis of  $k_1$  and  $k_2$ , the unit effort cost coefficient  $k$  paid by merchants when selecting suitable anchors, is set to 2.5, 4.75 and 7. These values are chosen to represent low, medium, and high merchant investment intensities, respectively, reflecting different levels of resource allocation for anchor selection and marketing coordination. Meanwhile, these parameter values are tested to ensure that equilibrium outcomes remain positive and economically interpretable across all scenarios. This parameterization thus captures realistic cost and investment conditions in live-streaming commerce, while maintaining the internal consistency of the Cournot framework.

### Channel Selection Based on Merchants' Effort Costs

As shown in Figure 3, the effort  $e^E$  that merchants put in to select a suitable agent anchor is always greater than the effort  $e^C$  that merchants put in to select a suitable celebrity anchor. Therefore, the effort cost of merchants selecting an agent anchor  $\frac{1}{2}ke^{E^2}$  exceeds the effort cost of merchants selecting a celebrity anchor  $\frac{1}{2}ke^{C^2}$ .

**Figure 3**

*Comparison of the Efforts Made by Merchants to Select Suitable Anchors under the Live Streaming Sales Channels of Agent Anchors and Celebrity Anchors*



Notes. (a)  $k=2.5$ , (b)  $k=4.75$ , (c)  $k=7$ .

From  $\frac{1-k-3s+2ks-ks^2}{-k+ks^2} < \theta < \frac{-4+3k+4s}{3k}$ , merchant's brand image advantage  $\theta$  is affected by the  $k$  value and the  $s$  value. When the commission ratio is certain, the greater is the unit effort cost coefficient of the merchant to choose suitable anchors, and the brand image advantage of the merchant will be enhanced to a certain extent.

As the  $k$  value increases from 2.5 to 4.75, and then to 7, the effort made by merchants to choose a suitable agent anchor declines correspondingly due to the shift in brand image advantage. This is because the merchants have already incurred a substantial effort cost in the process of anchor selection in the early stage. As  $\theta$  increases in the later stage, merchants will maintain the efforts within a smaller range, so the changes in their efforts will not be too large.

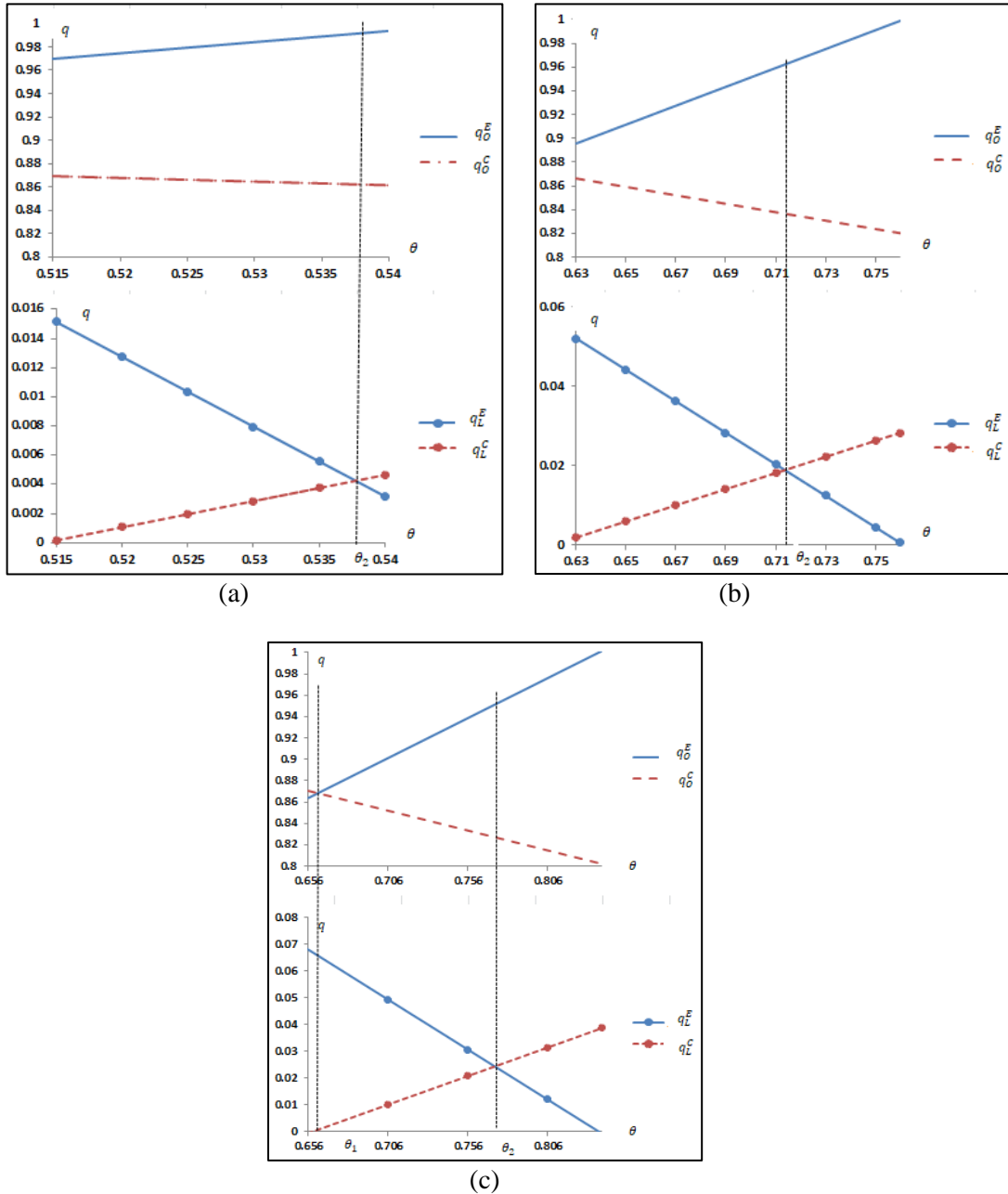
In addition, as the  $k$  value increases, although the difference in the effort made by merchants in selecting suitable anchors under the two channels  $|e^E - e^C|$  gradually diminishes, the difference in the merchants' effort costs  $|\frac{1}{2}ke^{E^2} - \frac{1}{2}ke^{C^2}|$  is quite different. As the  $k$  value amplifies, merchants are increasingly inclined to choose celebrity anchors with lower effort costs.

**Channel Selection Based on Product Sales**

The sales volume of the products of merchants and celebrity anchors under the channels of agent anchors and celebrity anchors depends on  $k$  and  $\theta$ . As shown in Figure 4, when  $k \leq k_1$  ( $k = 2.5, k = 4.75$ ), the sales volume when merchants choose agent anchors always exceeds the sales volume when they choose celebrity anchors. When  $k$  increases from 2.5 to 4.75, as  $\theta$  increases, the sales volume decline rate when choosing celebrity anchors is significantly accelerated.

**Figure 4**

*Comparison of Sales of Goods Sold by Merchants under the Live Streaming Sales Channels of Agent Anchors and Celebrity Anchors*



Notes. (a)  $k=2.5$ , (b)  $k=4.75$ , (c)  $k=7$ .

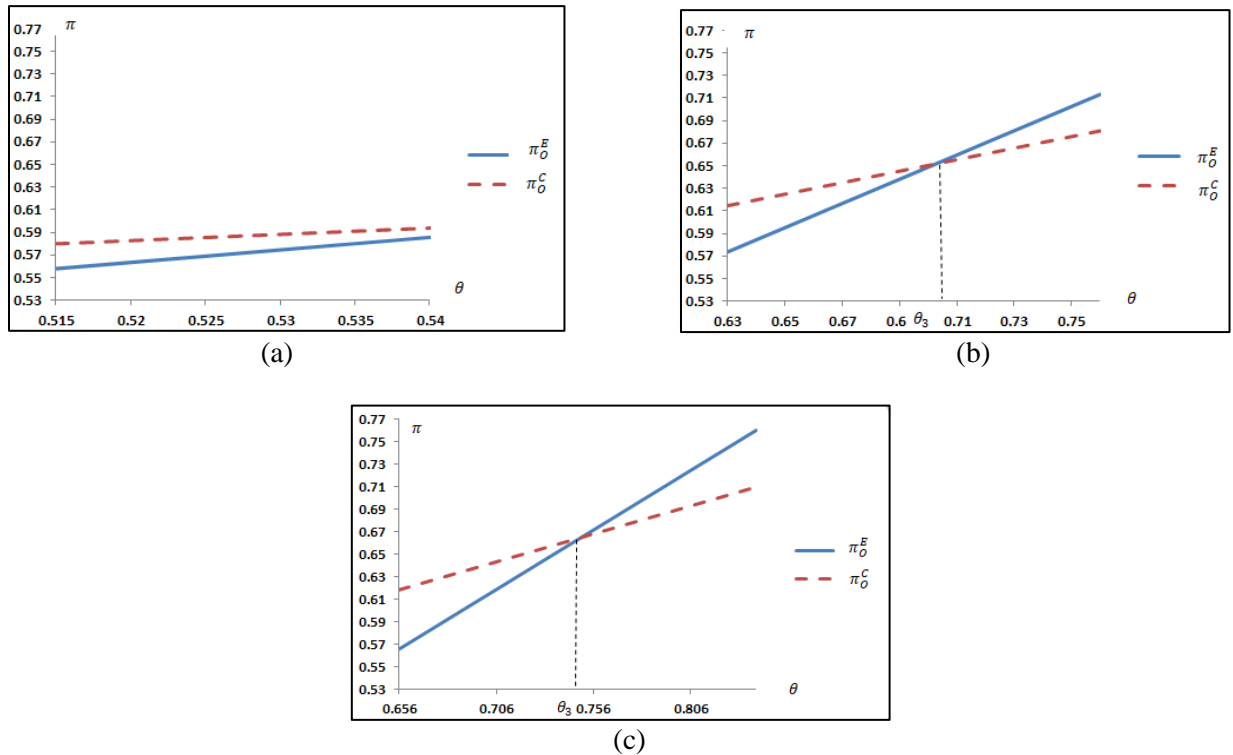
When  $k > k_1$  ( $k = 7$ ) and  $\theta < \theta_1$ , merchants who choose celebrity anchors will achieve higher product sales, as celebrity anchors typically possess a substantial fan base and influential power. Fans are more willing to try and buy products recommended by them. As  $\theta$  increases ( $\theta > \theta_1$ ), the merchant's product poses a greater threat to the celebrity anchor's own products, leading to a decrease in the merchant's sales volume when the celebrity-anchor channel is chosen. Moreover, when the merchant chooses a celebrity anchor, the sales of the celebrity anchor's products experience a more rapid upsurge with the enhancement of  $\theta$ . This is because when the cooperating brand has a good brand image, the celebrity anchor can also use the brand's reputation and consumers' positive evaluation to increase the sales of its own products.

### Channel Selection Based on Merchant Profits

The profit of merchants under the channels also depends on  $k$  and  $\theta$ . As shown in Figure 5, when  $k \leq k_2$  ( $k = 2.5$ ), the merchant profit from choosing an agent anchor is always less than the profit obtained from choosing a celebrity anchor. In addition, whether choosing agent anchors or celebrity anchors, the merchant profit when  $k = 2.5$  is less than that when  $k = 4.75$  or  $k = 7$  is because the corresponding  $\theta$  value remains relatively low at  $k = 2.5$ .

**Figure 5**

*Comparison of Merchant Profits under the Live Streaming Sales Channels of Agent Anchors and Celebrity Anchors*



Notes. (a)  $k=2.5$ , (b)  $k=4.75$ , (c)  $k=7$ .

When  $k > k_2$  ( $k = 4.75, 7$ ) and  $\theta \leq \theta_3$ , although the sales volume of the merchant's products choosing celebrity anchors is lower, the merchant still prefers celebrity anchors due to the weaker capabilities in product design, sales, and marketing. As  $\theta$  continues to increase, the merchant is more inclined to choose an agent anchor to deepen the value of consumers and create a stronger brand effect. For instance, Leier Media, an agent service agency, cooperates with merchants such as Procter & Gamble to improve product conversion rates and help accumulate private-domain traffic. Furthermore, agent anchors will also become a transitional state for merchants between choosing celebrity anchors and self-live-streaming commerce.

When  $k$  increases from 4.75 to 7, the profit derived by the merchant when opting for agent anchors experiences a notable escalation in tandem with the augmentation of  $\theta$ . This is because a higher unit effort cost coefficient leads the merchant to select agent anchors that more closely match the merchant's brand positioning, and the associated brand image advantage becomes increasingly significant. The synergy of these two factors contributes to a swifter increase in profit for the merchant.

## DISCUSSIONS

This section uses simulation analysis to more intuitively observe how merchants' effort costs, product sales, and profits change with investment intensity and brand image under different channels, thereby supporting the main conclusions of this study.

First, merchants encounter higher effort costs when selecting an agent anchor. With the escalation of the unit effort cost coefficient, the gap in effort costs between merchants operating under the two channels, widens progressively. This disparity prompts merchants to exhibit a stronger inclination toward celebrity anchors.

Second, the sales volume of the merchants' products under the two channels is jointly affected by the unit effort cost coefficient of the merchants' selection of suitable anchors and the merchant's brand image advantage. When the unit effort cost coefficient is small, the sales volume of the products selected by the agent anchor will be higher. However, as the unit effort cost coefficient increases, the merchants pay more attention to the brand image. When the merchant's brand image is not prominent enough, selecting a celebrity anchor can expand the popularity of the product and increase sales. However, as the merchant's brand image is enhanced, the merchant no longer relies on the fame of the celebrity anchor, and the sales volume of the products selected by the agent anchor will be higher.

Third, when the unit effort cost coefficient is small, merchants can obtain higher profits by choosing celebrity anchors. However, as the unit effort cost coefficient and the merchant's brand image advantage increase, the agent anchors chosen by merchants will become more professional, leading merchants to gradually shift their preference toward agent anchors. This finding implies that celebrity anchors are more effective for short-term exposure, while agent anchors become more profitable for sustained brand growth as investment and image increase.

Fourth, opting for celebrity anchors results in an upsurge in the sales of the celebrity anchor's own products, as the merchant's brand awareness also expands. In addition, as merchants increase their investment when choosing an agent anchor, the impact of brand image on cost gradually weakens, but the impact on profit becomes more significant. However, when choosing a celebrity anchor, the impact of brand image on cost and profit is not significant. Overall, the results illustrate a dynamic trade-off; celebrity anchors enhance visibility and early traffic, whereas agent anchors deliver more stable profitability and long-term brand loyalty as merchants invest more heavily and strengthen their brand image.

This study fills the gap in channel selection in the field of live-streaming sales and explores the issue of merchants' selection of anchors in a commodity competition environment. In real life, the "low-price rollover" incident of L'Oreal also shows that the game between merchants and anchors is becoming increasingly fierce. The present research is of great significance for promoting the sustainable development of live-streaming commerce and protecting the rights of anchors and merchants. To help merchants make better decisions on live-streaming channels and avoid channel conflicts to a certain extent, the management insights gained from the present study will be discussed below.

Firstly, when choosing a suitable anchor, merchants should comprehensively evaluate the size of the investment and brand image, and flexibly adjust the anchor selection strategy to maximize sales and profits. In the initial investment phases, merchants can offer the celebrity anchor the "lowest price on the entire network" to ignite initial sales and allure potential users. As the investment cost increases, when the merchant's brand image is not prominent, the merchant can continue to cooperate with the celebrity anchor to expand the exposure and influence of the product. Simultaneously, merchants can also enhance consumers' awareness of the brand through brand stories and high-quality products, and gradually reduce their dependence on the anchor's popularity. When the merchant has a good reputation, it can shift to an agent anchor to support advertising, promotional activities, and social media communication, thereby

conveying brand values and reinforcing consumer trust and recognition. Therefore, merchants should view anchor selection as a staged strategic decision—shifting from celebrity anchors to agent anchors as their brand image and investment capacity grow.

Additionally, merchants should clarify the role of anchors in live-streaming operations and strike a balance between traffic and brand loyalty. Although celebrity anchors can attract traffic, it mainly accumulates in the celebrity anchors' own live-streaming rooms. Moreover, over-reliance on the traffic of celebrity anchors brings short-term attention and makes it difficult to establish real brand loyalty. Agent anchors sell goods in the merchant's live-streaming room, which can more attentively convey the merchant's brand concept, characteristics, and values, and interact more deeply with the audience. This approach can cultivate consumers' sense of identity and loyalty to the brand and establish long-term brand relationships. In the L'Oreal "low-price rollover" incident, L'Oreal promised to give top celebrity anchors such as Li Jiaqi the "lowest price of the year" to attract traffic and sell lower-priced goods in the brand's live-streaming room to enhance brand loyalty. This behaviour not only deceived the anchors and consumers, but also damaged its own reputation. Merchants should seek a balance between traffic and brand loyalty through honesty and transparency, and establish a sustainable live-streaming operation strategy.

## **CONCLUSION, IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS**

In live-streaming commerce, merchants can choose either agent anchors or celebrity anchors. This corresponds to two different live-streaming channels. The present study investigates the issue of live-streaming channel selection faced by merchants. This study considers that some celebrity anchors have personal brands, and there is competition between the merchant's products and the products of the celebrity anchor's personal brand. Undoubtedly, merchants and anchors both pursue the maximization of their own interests. The analysis employs a Cournot-based model to examine merchants' channel selection and utilizes a reverse solution method to ascertain equilibrium outcomes for merchants operating under the two different channels. Finally, the study conducts game-theoretic and simulation analysis on the effort cost, product sales, and merchant profits of merchants in the two different channels, guiding the formulation and optimization of merchants' live-streaming sales strategies.

In terms of theoretical contributions, this study extends competition theory and channel-selection theory to commissioned live-streaming e-commerce by explicitly modelling the dual identity of celebrity live-streamers, who function simultaneously as sales partners and downstream competitors through their own brands. The analysis shows that the introduction of personal brands reshapes market signalling, reallocates consumer demand, and intensifies product-level competition, thereby explaining merchants' increasing preference for the following: agent–live-streamer ecosystems, growing emphasis on private-domain traffic accumulation, and the gradual erosion of top-tier streamer dominance. Methodologically, this study embeds the merchant–live-streamer relationship within a Cournot quantity-competition framework, offering a new analytical perspective for understanding how cooperative gains and competitive spillovers jointly influence channel selection. This modelling approach moves beyond the usual descriptive analyses in prior research and provides a structured quantitative basis for capturing the strategic interaction between merchants and celebrity live-streamers. It further demonstrates how brand image, effort cost, and commission structure jointly determine the equilibrium of different channels, thereby advancing theoretical modelling in this emerging field.

The results show that the cost of merchants choosing celebrity anchors is always less than that of choosing agent anchors. When a merchant's investment is large, but its brand image has not yet been established, the merchant's choice of celebrity anchors leads to higher product sales. By comparing the merchant's profits under the two different channels, the analysis finds that if and only if the merchant's investment is large and the merchant has a good reputation, selecting agent anchors yields higher profits. In other cases, it is recommended that merchants choose celebrity anchors. In addition, the study highlights that as merchants

escalate their investments, the impact of brand image on costs gradually weakens when selecting agent anchors, but the impact on profits becomes more significant. However, when selecting celebrity anchors, the impact of brand image on costs and profits is not significant. These findings jointly show that anchor selection is not a simple “traffic-maximization” choice, but a dynamic strategic decision that must incorporate competition, brand strength, and cost-effort trade-offs.

From a managerial perspective, the study provides clear strategic guidance. First, merchants should evaluate their brand image and investment capacity before selecting anchors; this is because weaker brands or firms in early development stages benefit more from celebrity anchors’ reach, while firms with stronger brands and greater investment capacity achieve higher long-term returns from agent anchors. Second, merchants should assess whether the risk of direct competition from a celebrity anchor’s personal brand outweighs the short-term sales benefits. If the anchor's brand directly competes with the merchant's products or if commission ratios are high, agent anchors provide a more controllable and loyalty-oriented channel. Third, the model suggests the need for strategic timing; merchants may initially rely on celebrity anchors to build visibility, but should progressively transition toward agent anchors to accumulate private-domain traffic and reduce dependence on external influencers. These guidelines help merchants convert model results into actionable channel strategies. Overall, the analysis offers practical guidance for merchants’ strategic channel selection and operational management in live-streaming sales, and will be able to contribute to the sustainable development of the e-commerce industry.

While this study provides valuable insights into the live-streaming channel selection of merchants, it has several limitations that point to the need for future research directions. Firstly, the model assumes a uniform commission ratio for celebrity and agent anchors, which simplifies analysis but does not reflect reality—commission rates often vary according to the following aspects: anchor influence, industry norms, and negotiation outcomes. Future research could explore how heterogeneous commission structures, for example, tiered commissions for celebrities and performance-based fees for agents shape the merchant’s trade-offs between traffic and costs.

Secondly, this study focuses on a single-channel choice, while many merchants may adopt a dual-channel strategy, which involves cooperating with both anchor types to combine celebrities’ exposure advantages and agents’ private-domain traffic value. Incorporating this dual-channel model would help to provide an analysis of cross-channel spillover effects and resource allocation optimization.

Thirdly, the current framework treats products as homogeneous, overlooking how product attributes, for example, complexity, brand positioning, and lifecycle stage affect channel fit. To illustrate, celebrity anchors may better promote trendy low-involvement products, while agents excel at conveying professional information for high-value items. In light of this, future studies could perhaps integrate product heterogeneity to refine selection criteria.

Finally, the model does not account for the intermediary role of live-streaming platforms, for example, their traffic allocation policies, subsidies or behavioral factors like anchor reputation risks. Extending the model to include platform dynamics or behavioral elements would enhance its realism and practical relevance.

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