BOHR International Journal of Advances in Management Research
2023, Vol. 2, No. 1, pp. 48–54
DOI: 10.54646/bijamr.2023.16
www.bohrpub.com

METHODS

Live-streaming selling strategies of agricultural products: A game-theoretical analysis

Haonan Chen*, Kai Gao, Xiaogang Feng and Yanran Kuang

School of Management, Tianjin University of Technology, Tianjin, China

***Correspondence:**
Haonan Chen,
chn22338727@163.com

Received: 02 May 2023; **Accepted:** 09 May 2023; **Published:** 16 May 2023

With the rapid development of 5G network technology and the impact of the COVID-19, e-commerce technology continues to improve and develop, and the number of online shoppers increases rapidly. This series of development and changes also promote the formation of e-commerce form of live broadcast with goods and has become a new trend. In this article, under the background of not considering the off-line channel, but only considering the online single channel sales, aiming at the problem of direct seeding agricultural products with goods, we use game theory to model and study it and get the optimal pricing strategy. First, based on the pricing game of consumers' evaluation behavior, a two-stage evaluation model is made in order to analyze and calculate the optimal price function and profit function and to carry out the numerical simulation. Then, based on the different transportation costs, the Hotelling pricing game is made. Finally, the optimal pricing strategies under two assumptions are obtained. In addition, this article also puts forward four suggestions on live streaming of agricultural products against the current situation.

Keywords: game theory, live broadcast marketing, pricing strategy, agricultural products

1. Introduction

With the continuous acceleration of the construction and popularization of 5G network facilities in China, the 50th Statistical Report on Internet Development in China shows that as of June 2022, the number of live users in China has reached 716 million, accounting for 68.1% of the total number of Internet users. The penetration rate of the Internet has reached 74.4%. With the development of network and short video apps, consumers are not only satisfied with the traditional e-commerce platform but also turn to the live broadcast room of short video to buy goods. To improve its competitiveness, the traditional e-commerce platform has also derived other sales forms, taking live broadcast as an example. Online consumption is an important support to drive consumption during the epidemic situation. Compared with the traditional e-commerce sales model, the form of live streaming is more conducive for the seller to accurately convey the commodity information that consumers want to know. By driving consumers' desire to buy and the atmosphere in the live broadcast, it can promote more transaction orders.

From the embryonic stage in 2009 to the first year of live broadcast in 2016, and then to 2020, the phenomenon-level head anchor led the rapid growth of live broadcast e-commerce in the epidemic environment and entered the era of national live broadcast in 2021. With the rise and continuous improvement of the live-streaming sales model, the pricing of the live-streaming room has become a matter of concern. Take Taobao's Jiaqi Li live room as an example. In addition to the anchor's own professionalism and affinity, the most important thing is that the commodity price of the Jiaqi Li live room is always lower than the price of other live rooms, or the gift is more than other live rooms. Pricing strategy is a key factor affecting the marketing effect, so product pricing is particularly important in the sales model of the live-streaming room.

With the continuous development of "Internet plus," agricultural products also began to appear on the Internet and developed rapidly. At present, online shopping platforms such as Taobao, JD.com, and Buy Together have launched policies to help farmers, which aims to drive the development of agricultural products economy and rural economy while making profits. At the same time, the government has also issued a series of supporting policies, which have a very big role in promoting and influencing the development of live streaming of agricultural products.

2. Literature review

With the development of the Internet, a new sales situation "live delivery" came into being. Cai et al. (1) conceptualized it as an online shopping that includes real-time social interaction. Through research, it was found that hedonistic motivation is positively related to the intention based on celebrities, and utilitarian motives are positively correlated with product-based intentions. Wang et al. (2) believed that live-streaming commerce (LSC) is an e-commerce service. Sellers communicate with consumers through live streaming, and consumers can place orders in the same system. Live streaming has become a trend among young people. Sun et al. (3) constructed a theoretical model from the perspective of IT availability to test how live streaming affects the purchase intention of social business customers in China. The results found that visibility availability, meta-voice availability, and guidance shopping availability can affect the purchase intention of customers through real-time streaming media participation. Lin et al. (4) conducted an online questionnaire survey on users participating in live shopping. The research results show that demand, convenience, interactivity, and interest are actively stimulating consumers' perception and enjoyment.

In previous studies on live broadcasting, Wang et al. (2) found that differentiated pricing is beneficial to improving supply chain profits, but the price of consumer identification service provided by e-commerce platforms is the key factor to determine whether Internet celebrity anchors accept differentiated services from platform consumers. Consumers' evaluation of goods is of great significance to retailers. Chatterjee (5) found that the degree of word-of-mouth search depends on the reason why consumers choose online retailers and that the impact of negative word-of-mouth on perceived reliability and purchase intention depends largely on the familiarity with the retailer. For consumers who have not purchased the product, more reliable comments will lead to higher purchase intention, and they think online comments are more reliable (6). The balanced price of live broadcast with goods is not only related to the consumer's evaluation of the goods (i.e. the reputation of the goods) but also has an important relationship with the anchor flow effect and the anchor display effect of live broadcast and is positively related (7). Under the static or dynamic pricing strategy, the optimal pricing of the platform is positively related to the initial reference price. With the increase in the efforts of the anchor, there is a stronger impact of the anchor on consumer purchasing behavior, and the platform tends to set a high price (8). In addition to determining the price of the live broadcast room with consumers and anchors, the commission of the live broadcast platform should also be considered. Ma and Yuan (9) found that the pricing of online retailers is always the highest. In the mixed mode of retail agent live streaming, the size of supplier live-streaming pricing and platform agent pricing is determined by the commission ratio.

With the development of "Internet+" and the strong support of the government for e-commerce enterprises to promote the live streaming of agricultural products, the live streaming of agricultural products has received widespread attention. Xiong et al. (10) found that the live streaming of agricultural products can take the live-streaming intermediary as the information link, reduce the information asymmetry through the information interaction mechanism, provide the quality endorsement for agricultural products through the reputation effect mechanism, and show the supply chain management ability to consumers through the signal transmission mechanism, thus establishing a "trinity" trust system. As an agricultural product with obvious geographical characteristics, Lin (11) believed that consumer trust under the e-commerce live broadcast mode is established and has a certain positive impact in the field of geographical indication of agricultural product purchase intention. From the study of live marketing of agricultural products and its marketing methods, the aspects involved in the study are more extensive and specific. Zhan (12) proposed that, in combination with the natural attributes of agricultural products and the current predicament faced by live-streaming marketing, the optimization path should be taken by improving the industrial chain of live-streaming agricultural products, increasing the cultivation of e-commerce merchants, improving the professionalism of anchors, and establishing a long-term supervision mechanism for live streaming of agricultural products. In the context of "Internet+," it is necessary to master and understand the characteristics of commodities, clearly change the marketing mode and methods, and then increase the popularity and influence of agricultural products (13).

At present, although there are many research studies on live-streaming and agricultural products, there are not many research studies on live streaming of agricultural products. This article starts with live streaming of agricultural products and analyzes the pricing of agricultural products. This article proposed two game models, namely, Stackelberg model and Hotelling model, to analyze the pricing strategy of agricultural products of merchants. The first model is a two-stage pricing model. Merchant A observes the evaluation and reaction of consumers on the agricultural product through

the trial marketing stage of the new products, namely, the first stage. According to the consumer evaluation in the first stage, the agricultural product in the second stage is priced. At the same time, merchant B follows the pricing of "leader" merchant A to price the same product. The second model is a static game with complete information of different transportation routes under the condition that merchant A and merchant B have the same agricultural products.

3. Model I: Demand-oriented pricing method based on two-stage pricing model

3.1. Problem description

Compared with the traditional e-commerce sales model, live sales have obvious advantages. Consumers can ask the anchor about the commodity information they want to know through the pop-up screen, and the anchor will recover in time, which greatly increases the probability of order transaction. The pricing of products often depends on the consumer's acceptance of the product price and the cost of the product itself. The anchor can understand the consumer's acceptance through the consumer's evaluation of the product in the live broadcast room and then estimate the product value, so as to price the product. Considering that consumers' evaluation of products usually includes "favorable," "medium," and "bad," as potential consumers are often affected by the product evaluation and have expectations of the product, the higher the product's favorable rating, the higher the consumer's expectation and favorable rating, and vice versa, the higher the product's bad rating, the lower the consumer's expectation and favorable rating of the product, However, the evaluation will not directly affect the judgment of potential consumers on the expected value of goods. Therefore, this article chooses the dualistic evaluation model, divides the evaluation into "positive" and "negative," and then studies the relationship between consumer comments and anchor pricing.

3.2. Model construction and basic assumptions

The first stage is the trial sale stage. Generally speaking, merchants will conduct a trial sale of new agricultural products at a lower price, and consumers will buy them and then give feedback on their feelings about the products to the merchants. Merchant A sells a small amount of agricultural products at this stage and observes consumer satisfaction with agricultural products in the live broadcast room, so as to price agricultural products at the formal sales stage. In the second stage, the merchants price the goods according to the comments of the customers in the first stage during the live broadcast.

It is assumed that consumers' purchase in the first stage is affected by the reputation of agricultural products, expectations of agricultural products, and prices. Consumers in the second stage are completely influenced by the comments of consumers in the first stage, and the merchants then price the agricultural products in the second stage based on the comments of consumer in the first stage. And the agricultural products sold in live broadcast room A and live broadcast room B are of the same quality, that is, $m_A = mB = m(m > 0)$. The anchors of the two live broadcast rooms compete for price, that is, the decision variable of the two anchors is price, and live broadcast room A is the leader, and live broadcast room B is the follower. Consumer's willingness to spend, namely, the consumer's expectation, isβ $(0 < \beta < 1)$.

The consumers in the trial sale stage are all loyal fans of anchor A, while all consumers in the second stage are potential consumers, with a total of N potential consumers. Assume that the pricing of merchant A in the trial sale stage is P_{A1} , and the commodity prices of merchant A and merchant B in the formal sale stage are P_{A2} and P_{B2} , respectively.

3.3. Model analysis

From the above assumptions, it can be concluded that the consumer utility function in the first stage is: $U_{A1} = m + \beta - P_{A1}$.

When $U_{A1} \geq 0$, it means that the utility function in the first stage is positive, indicating that consumers are satisfied with the products of merchant A and will give favorable comments in the live broadcast in the second stage. When $U_{A1} < 0$, it means that the utility function in the first stage is negative, indicating that consumers are not satisfied with the goods of merchant A and will give travel comments in the live broadcast in the second stage. At $U_{A1} < 0$, merchant A will not continue to sell this agricultural product.

Potential consumers who have not yet purchased will make subjective judgment on the agricultural products of merchant A according to the bullet screen in the live-streaming room of agricultural products of merchant A that have already purchased in the first stage. Consumers who have purchased in the first stage will have preferences when tasting agricultural products. The consumer preferences in this article are recorded as follows: $\alpha(0 \leq \alpha \leq 1)$; when consumers prefer $\alpha = 1$, it said that the consumer's evaluation in the screen was "favorable"; when $\alpha = 0$, it means that the consumer's evaluation in the bullet screen is "negative"; when,$\alpha < \frac{1}{2}$ it means that the evaluation given by the consumer in the bullet screen is negative; when $\alpha > \frac{1}{2}$, it means that the evaluation given by the consumer in the bullet screen is positive; and when $\alpha = \frac{1}{2}$, it means that the attitude given by the consumer in the bullet screen is neutral

and does not affect the judgment of the potential consumer on the commodity of merchant A.

Therefore, the consumer utility function of buyer A in the second stage is $U_{A2} = \alpha(m + \beta - P_{A2})$. There are two cases as follows:

(1) When $0 \leq \alpha < \frac{1}{2}$, the utility function of the first stage is greater than zero $U_{A1} > 0$, and the utility of the first stage of business A is greater than the second utility, indicating that the consumer's willingness to pay for the agricultural products sold by business A is low, and the consumer utility function is lower than that of business B ($U_{B2} > U_{A2}$), and it can be concluded that $0 < \beta < (2\alpha - 1)m - \alpha P_{A2} + (1 - \alpha)P_{B2} + \alpha - 1$.

(2) When $\frac{1}{2} < \alpha \leq 1$, the utility function of the first stage is greater than zero $U_{A1} > 0$, and the utility of the first stage of business A is less than the second utility, which means that consumers have a higher willingness to pay for the agricultural products sold by business A, and the utility function of consumers is higher than that of business B ($U_{A2} > U_{B2}$), and it can be concluded that $1 > \beta > (2\alpha - 1)m - \alpha P_{A2} + (1 - \alpha)P_{B2} + \alpha - 1$.

Therefore, the demand functions of merchant A and merchant B in the second stage can be obtained as follows:

$$\begin{cases} q_{A2} = N\int_0^{(2\alpha-1)M-\alpha P_{A2}+(1-\alpha)P_{B2}+\alpha-1} d\beta \\ \quad = N[(2\alpha - 1)m - \alpha P_{A2} + (1 - \alpha)P_{B2} + \alpha - 1] \\ q_{B2} = N\int_{(2\alpha-1)M-\alpha P_{A2}+(1-\alpha)P_{B2}+\alpha-1}^{1} d\beta \\ \quad = N[(1 - 2\alpha)m + \alpha P_{A2} + (\alpha - 1)P_{B2} - \alpha + 2] \end{cases}$$

At the same time, it can be concluded that the profit functions of merchant A and merchant B are as follows:

$$\pi_{A2}(P_{A2}, P_{B2}) = (P_{A2} - c)q_{A2}$$
$$\pi_{B2}(P_{A2}, P_{B2}) = (P_{B2} - c)q_{B2}$$

Using the inverse induction method of Stackelberg model, the first derivative of π_{B2} is zero for P_{B2}, and it can be concluded that:

$$P_{B2}(P_{A2}) = \frac{1}{2(\alpha - 1)}[m(2\alpha - 1) - 2 - \alpha P_{A2} + \alpha + c(\alpha - 1)]$$

Substitute $P_{B2}(P_{A2})$ into the second stage profit function of merchant A to make $\pi_{A2}(P_{A2}, P_{B2}(P_{A2}))$ maximum and optimize the above problems to finally get:

$$P_{A2}^{*} = \frac{1}{5\alpha}[(2\alpha - 3)m + 7\alpha - 4 + c(3\alpha - 1)]$$
$$P_{B2}^{*} = \frac{1}{5(\alpha-1)}[m(4\alpha - 1) - 3 - \alpha + c(\alpha - 2)]$$

Therefore, the refined Nash equilibrium of the sub-game of the game is (P_{A2}, P_{B2}), which is brought into the demand function and profit function of merchants A and B, and the optimal sales volume and total profit can be obtained as follows:

$$q_{A2}^{*} = \frac{N}{5}[3m(4\alpha - 1) - 3\alpha - 4 - c(2\alpha + 1)]$$

$$q_{B2}^{*} = \frac{N}{5}[(1 - 4\alpha)m + \alpha + 3 + (4\alpha - 3)c]$$

$$\pi_{A2}^{*} = \frac{N}{25\alpha}[3m(4\alpha - 1) - 3\alpha - 4 - c(2\alpha + 1)]$$
$$[(2\alpha - 3)m + 7\alpha - 4 + c(3\alpha - 1)]$$

$$\pi_{A2}^{*} = \frac{N}{25(\alpha - 1)}[m(1 - 4\alpha) + \alpha + 3 + c(4\alpha - 3)]$$
$$[(4\alpha - 1)m - \alpha - 3 + c(\alpha - 2)]$$

It can be concluded from this analysis that the pricing of agricultural products of both merchant A and merchant B is affected by the utility of the agricultural products sold by merchant A in the first stage to consumers, that is, the consumer's use feelings commented in the live screen after tasting the agricultural products. In other words, the consumer's evaluation of agricultural products in the trial stage is very important to the pricing in the second stage. The more "favorable comments" from consumers, the lower the price merchant A will charge in the second phase. Similarly, merchant B will make corresponding pricing strategies according to the pricing of merchant A, so merchant B will also reduce the price with consumers' "favorable comments" on merchant A.

4. Model II: Cost pricing method based on hotelling model

4.1. Model framework and basic assumptions

Because the production and quality of agricultural products are greatly affected by regional factors such as light, temperature, humidity, and soil, most agricultural products have strong local characteristics. Generally speaking, people will think that Hami melon in Xinjiang is the sweetest and coconut in Hainan is the best. This article will consider the regional characteristics of agricultural product, and use the Hotelling model of game theory to analyze the live pricing of agricultural products of e-commerce duopoly merchants A and B. Suppose that the quality of agricultural products sold by two merchants is the same, but the delivery location is different, and the transportation cost is also different.

Suppose there are two live broadcast rooms selling the same type of agricultural products, which are of the same origin and of the same quality. The difference is that merchant A directly transports the agricultural products from the origin to customer's home, while merchant B first transports the agricultural products to the anchor's warehouse from the origin and then the anchor sends the

order of the purchased agricultural products by post to the location of the user who will buy the live broadcast room. Therefore, without considering the loss of agricultural products in the transportation process, the unit production cost c of agricultural products of merchant A and merchant B is the same. Since merchant A and merchant B live on the same platform, the commissions paid to the shopping platform between the two live broadcast rooms are also the same. However, the transportation cost of merchant B is higher than that of merchant A. This article assumes that the transportation locations of merchant A and merchant B are located at the start and end of [0, 1] segment, and consumers are evenly distributed within this [0, 1] segment. The distance between consumers and merchant A is x, and the distance between consumers and merchant B is $1 - x$.

Suppose that the consumers in the live broadcast rooms of the two merchants are rational consumers. They will also pay attention to the origin of the goods in addition to the quality of the goods. They will not only consider the price of the goods but also whether the transportation costs used by the merchants are accounted for in the pricing of the goods and are more sensitive to the price information. Suppose $t(0 < t < 1)$ is the price sensitivity of consumers.

4.2. Model analysis

Because the transportation cost of merchant B is higher than that of merchant A, the extra transportation cost of merchant B will be borne by consumers. Based on the above assumptions, it can be deduced that the utility that consumers get from purchasing the agricultural products of merchant A is $U_A = S - P_A - tx$, and the utility that consumers get from purchasing the agricultural products of merchant B is $U_B = S - (1 + \alpha)P_B - t(1 - x)$, where S represents the maximum utility that consumers get from the agricultural products. $P_i(i = A, B)$ represents the expected price of agricultural products in live broadcast room A and live broadcast room B, and $S > P_i$,$\alpha 0 < \alpha < 1$ is the proportion of transportation costs that merchant B needs to share with consumers. Therefore, the cost equation can be obtained as follows:

$$S - P_A - tx = S - P_B(1 + \alpha) - t(1 - x)$$

The expression of x can be obtained by solving the above equation:

$$x = \frac{P_B(1 + \alpha) - P_A + t}{2t}$$

The demand of merchant A is $D_A(P_A, P_B) = x$, the demand of merchant B is $D_B(P_A, P_B) = 1 - x$, namely:

$$D_A(P_A, P_B) = \frac{P_B(1 + \alpha) - P_A + t}{2t}$$

$$D_B(P_A, P_B) = \frac{P_A - P_B(1 + \alpha) + t}{2t}$$

Therefore, it can be concluded that the profit function of merchant A and merchant B is:

$$\pi_A = D_A(P_A, P_B)^*(P_A - c) = \frac{[P_B(1 + \alpha) - P_A + t]^*(P_A - c)}{2t}$$

$$\pi_B = D_B(P_A, P_B)^*[P_B(1 + \alpha) - c] = \frac{[P_A - P_B(1 + \alpha) + t]^*[P_B(1 + \alpha) - c]}{2t}$$

When calculating the price partial derivative of the profit function of merchant A and merchant B, the derivative is equal to zero. And then establish the equation, which is the Nash equilibrium price combination of this game:

$$\begin{cases} \frac{\partial \pi_B}{\partial P_B} = \frac{P_A - 2P_B(1 + \alpha) + c + t}{2t} = 0 \\ \frac{\partial \pi_A}{\partial P_A} = \frac{P_B(1 + \alpha) - 2P_A + c + t}{2t} = 0 \end{cases}$$

The optimal pricing of merchant A and merchant B can be obtained, respectively, as follows: $P_A^* = c + t$ and $P_B^* = \frac{c+t}{1+\alpha}$.

By substituting the optimal pricing into the profit function of merchant A and merchant B, it can be concluded that the equilibrium profit of both merchants is $\pi_A^* = \pi_B^* = \frac{t}{2}$.

We can find that even though the agricultural products are priced differently in the two live-streaming rooms and the transportation costs of the two businesses are different, the equilibrium profits of the two businesses are the same. It can be judged that the enterprise profit is only related to the price sensitivity of consumers and has nothing to do with the price sensitivity of businesses. The higher the price sensitivity of consumers, the higher the profits of businesses. On the contrary, the lower the price sensitivity of consumers, the lower the profits of businesses.

5. Numerical analysis

The above model I has analyzed the direct seeding pricing of agricultural products by using the reverse induction method of the Stackelberg model. This part will further analyze and verify model I through the method of numerical analysis. The assignment of related parameters is shown in **Table 1**:

As can be seen in **Figure 1**, with the increase in consumer preferences, that is, if consumer satisfaction with

TABLE 1 | Each parameter assignment table.

Parameter	N	c	m	α
Short-cut process	60,000	10,000	10	[0.4,0.6]

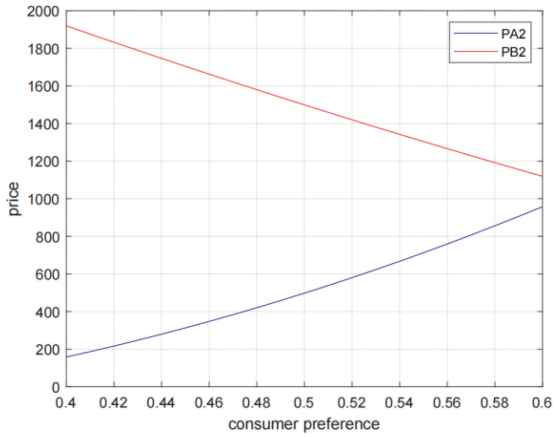

FIGURE 1 | Model I pricing diagram.

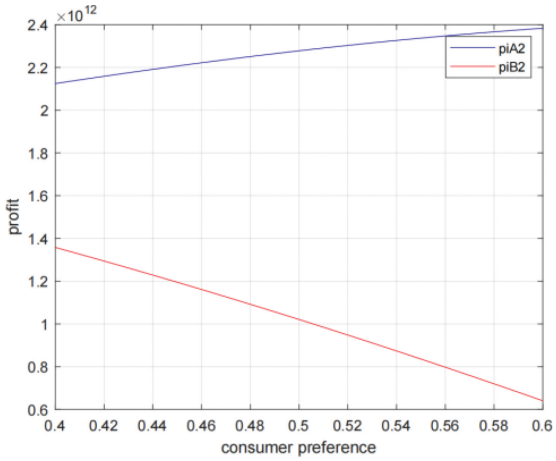

FIGURE 3 | Model I profit chart.

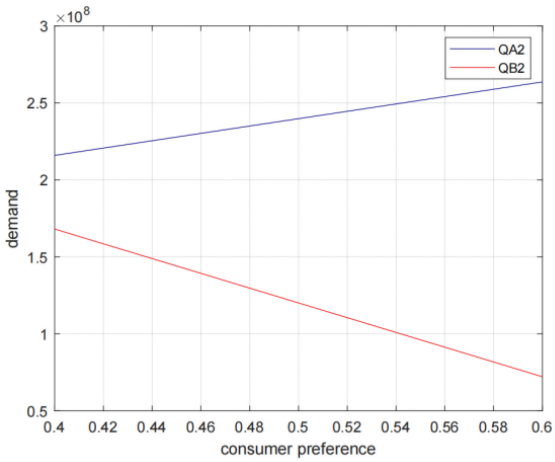

FIGURE 2 | Model I requirements map.

the agricultural products sold by merchant A in the first stage increases, the pricing of merchant A and merchant B in the second stage gradually increases and decreases and the price of agricultural products in live broadcast room B is higher than that in live broadcast room A in the consumer preference of about 0.4–0.6, and the two straight lines tend to intersect. **Figure 2** shows the trend of consumer demand. It can be seen in **Figure 2** that the demand of merchant A is increasing with the increase in consumer preferences, while that of competitor B is decreasing with the increase in consumer preferences.

The main purpose of merchant's pricing game is to obtain higher profits. Therefore, it can be judged from **Figure 3** that the profit obtained by merchant A is always higher than that obtained by merchant B and that the profit obtained by merchant A increases with the increase in consumer preference. On the contrary, the profit obtained by merchant B decreases with the increase in consumer preference for merchant A. In addition, the decrease rate of the profits of merchant B is higher than the increase rate of the profits of merchant A.

6. Conclusion

This article uses game theory to study two different pricing methods: demand-oriented pricing method and cost pricing method. Through the comparative analysis of the above two models, it can be concluded that for businesses, consumer preferences are more significant than the transportation costs of businesses.

This article first studies the two-stage pricing model of live-streaming products based on customer evaluation behavior. This article analyzes the two-stage agricultural product marketing market with only one homogeneous agricultural product and finds out the optimal pricing decision and the optimal sales in the second phase of the two live-streaming rooms. The study found that: (1) Under the influence of the sales evaluation of the first sales period, consumers will have different preferences for merchant A. (2) The more "favorable comments" consumers receive, the lower the price of merchant A in the second stage will be. (3) Merchant B will make the corresponding pricing strategy according to the pricing of merchant A, so merchant B will also increase the price with the increase in consumers' "favorable comments" on merchant A.

Finally, this article prices the agricultural products based on the transportation cost of merchants. The study found that although the pricing of agricultural products and transportation costs of the two live broadcast rooms are different, the equilibrium profits of the two businesses are the same.

Therefore, if businesses want to obtain higher profits, they should fully consider the preferences of consumers rather than the cost. In addition to the factors studied in this article, the anchor's product display ability, logistics and distribution problems, and the loss of agricultural products themselves will have an impact on the pricing of agricultural products. Therefore, this article puts forward the following conclusions and suggestions for the live broadcast of agricultural products:

(1) Train the anchor to make the anchor sales team more professional. Before selling agricultural products, the anchor needs to fully understand the nutritional value and other information of the agricultural products sold, so as to enhance consumers' purchasing desire. And do a good job of user portraits, focusing on the different values of agricultural products for different consumer groups.

(2) Use regional advantages to improve competitiveness. Agricultural products are highly regional, and some agricultural products have become the business card of a city. Therefore, the anchor can make full use of regional characteristics to improve the competitiveness of the same agricultural products on the same platform, so as to gain more consumers' favor and higher profits.

(3) Understand consumer preferences and provide targeted services. Consumer preference is a very important influencing factor for marketing. Because the sales channels of agricultural products are very wide, the form of live broadcast sales of agricultural products is a sales form that has just emerged in recent years. Therefore, before selling agricultural products live, we can use the method of trial sale to investigate and analyze the acceptance of consumers' online purchase of agricultural products. Through consumer analysis, consider the pricing strategy of agricultural products.

(4) Government policies and e-commerce platform support. In the Notice on the Establishment of Agricultural Modernization Demonstration Zone in 2022, it is proposed to promote the introduction of e-commerce into rural areas and promote the healthy development of new business forms such as live streaming of agricultural and sideline products. It can be seen that the state supports the live broadcast of agricultural products, and many e-commerce platforms have launched plans to help farmers. In such an environment, the anchor should seize the opportunity to price agricultural products reasonably so as to maximize the income.

References

1. Cai J, Wohn DY, Mittal A, Sureshbabu D. Utilitarian and hedonic motivations for live streaming shopping. *Proceedings of the 2018 ACM international conference on interactive experiences for TV and online video*. New York, NY: Association for Computing Machinery (2018). p. 81–8.
2. Wang Y, Lu Z, Cao P, Chu J, Wang H, Wattenhofer R. How live streaming changes shopping decisions in E-commerce: a study of live streaming commerce. *Comput Support Cooperat Work.* (2022) 31:701–29.
3. Sun Y, Shao X, Li X, Guo Y, Nie K. How live streaming influences purchase intentions in social commerce: an IT affordance perspective. *Electron Commerce Res Appl.* (2019) 37:100886.
4. Lin SC, Tseng HT, Shirazi F, Hajili N, Tsai P. Exploring factors influencing impulse buying in live streaming shopping: a stimulus-organism-response (SOR) perspective. *Asia Pac J Market Logist.* (2022) doi: 10.1108/APJML-12-2021-0903 [Epub ahead of print].
5. Chatterjee. (2001)
6. Jiménez FR, Mendoza NA. Too popular to ignore: the influence of online reviews on purchase intentions of search and experience products. *J Interact Market.* (2013) 27:226–35.
7. Xiong et al. (2022)
8. Hu et al. (2022)
9. Ma and Yuan. (2021)
10. Xiong et al. (2021)
11. Lin. (2022)
12. Zhan. (2021)
13. Huang. (2021)
14. Yu J, Song Z. Self-supporting or third-party? The optimal delivery strategy selection decision for e-tailers under competition. *Kybernetes.* (2022) doi: 10.1108/K-02-2022-0216 [Epub ahead of print].
15. Wang Q, Wu P, Su Y, Shi X. Analysis on pricing strategy of live streaming for heterogeneous consumers considering fairness concern. *Proc Comput Sci.* (2022) 214:1452–9.
16. Zhou C, Leng M, Liu Z, Cui X, Yu J. The impact of recommender systems and pricing strategies on brand competition and consumer search. *Electron Commerce Res Appl.* (2022) 53:1–15.
17. Zhou C, Ma N, Cui X, Liu Z. The impact of online referral on brand market strategies with consumer search and spillover effect. *Soft Comput.* (2020) 24:2551–65.
18. Hao X, Jinyi C, Huili Y, Haoying G. Pricing and coordination of live broadcast and goods dual-channel supply chain considering the characteristics of the anchor*. *J Manag Eng.* (2012) 1–8.
19. Jiao H, Li L, Hua Z, Xingzhen Z, Wensheng Y. Dynamic pricing decision of webcast platform considering reference effect and anchor influence. *Syst Eng Theory Pract.* (2022) 42:755–66.
20. Li C, Chu M. Is it always advantageous to add-on item recommendation service with a contingent free shipping policy in platform retailing? *Electron Commerce Res Appl.* (2019) 37:1–11.
21. Zhou C, Xu G, Liu Z. Incentive contract design for internet referral services: cost per click vs cost per sale. *Kybernetes.* (2020) 49:601–26.
22. Hanwu M, Yuan Y. Optimal pricing decisions of various entities in the mixed channels of e-commerce supply chain – taking live broadcast of suppliers as an example. *Logist Technol.* (2021) 44:144–50.
23. Zhou C, Tang W, Zhao R. Optimal consumer search with prospect utility in hybrid uncertain environment. *J Uncert Anal Appl.* (2015) 3:1–20.
24. Xue X, Chengxia Z, Haibo Z. The formation mechanism of consumer trust in live broadcast of agricultural products e-commerce: an intermediary capability perspective. *J Nanjing Agric Univ.* (2021) 21:142–54.
25. Liu Z, Zhou C, Chen H, Zhao R. Impact of cost uncertainty on supply chain competition under different confidence levels. *Int Trans Operat Res.* (2021) 28:1465–504.
26. Zhou C, Tang W, Zhao R. Optimal consumption with reference-dependent preferences in on-the-job search and savings. *J Industr Manag Optimizat.* (2017) 13:503–27.
27. Yu J, Zhao J, Zhou C, Ren Y. Strategic business mode choices for e-commerce platforms under brand competition. *J Theor Appl Electron Commerce Res.* (2022) 17:1769–90.
28. Chu M, Zhou C, Yu J. The impact of online referral services on cooperation modes between brander and platform. *J Industr Manag Optimizat.* (2022) 19:5306–30. doi: 10.3934/jimo.2022174
29. Xiaojing L. Research on the impact of consumer trust on the purchase intention of agricultural products with geographical indications under the e-commerce live broadcast mode. *Shanxi Agric Econ.* (2022) 06:89–91.
30. Dezhi Z. Analysis of the optimization path of agricultural products live broadcast marketing mode under the background of rural revitalization strategy. *Metall Manag.* (2021) 21:137–8.
31. Lan H. Analysis of live broadcast marketing mode of agricultural products in the context of "Internet plus". *Rural Econ Technol.* (2021) 32:77–9.