Research on the pricing strategy and sales model of agricultural products under consumers' poverty alleviation preference - Take Huangshaping Village as an example

Siyi Liu *

Nanjing International School, Nanjing, China

* Corresponding Author Email: siyiliu060224@outlook.com

Abstract. this study with consumer preference for poverty alleviation, under the background of sand ping village poverty alleviation, using the game theory and method, build the Stackelberg model, through mathematical deduction and Matlab simulation, analyze the consumer preference for poverty alleviation on the influence of agricultural products pricing strategy and sales model, in order to provide the important insights of agricultural products out of the dilemma. Considering the two sales models of online retail and live streaming with goods based on e-commerce platforms, the study finds that no matter what sales model you choose, the optimal pricing of the supply chain also increases with the increase of consumers' preference for poverty alleviation. At the same time, when consumers have a low preference for poverty alleviation, agricultural products suppliers should choose the live delivery mode, otherwise, they should choose the online retail mode. According to the impact of different sales models on the profits of offline retailers and e-commerce platforms, this study also finds that there is no strategy that benefits all supply chain players at the same time, that is, no Pareto dominant strategy.

Keywords: consumer poverty alleviation preference, supply chain management, pricing strategy, sales model.

1. Introduction

The mode of "helping agriculture + e-commerce" is an innovative business model that combines agricultural poverty alleviation with e-commerce. Through the construction and operation of the e-commerce platform, this model takes agricultural products as the core, and provides sales channels and business support for poor farmers, so as to promote the development of rural economy and the increase of farmers' income. How to help farmers to sell more agricultural products, and to obtain more profit distribution in the sales link of agricultural products, has become a key problem to be solved urgently.

In the past, most scholars who have studied the pricing of agricultural products assume that consumers are absolutely rational. However, their social attributes just show that consumers have responsibility preference. Consumers' preference for poverty alleviation is closely related to social responsibility, which can be regarded as that when purchasing agricultural products or other poverty alleviation products, consumers tend to choose products with the attribute of poverty alleviation, so as to support and promote the development of poor areas. This preference feature will undoubtedly have a huge impact on the decisions of agricultural products suppliers and e-commerce platforms. Therefore, this paper tries to solve the following questions: How does consumer preference for poverty alleviation affect the pricing of supply chain members? How can agricultural product suppliers (farmers) scientifically choose reasonable sales models, and promote their products to more consumers, so as to achieve higher profit margins? What will the impact of choosing different sales models on the pricing and profit of other members of the supply chain, including offline retailers and e-commerce platforms?

To sum up, this paper considers the preferences of consumers for poverty alleviation, builds a supply chain structure composed of agricultural products suppliers and e-commerce platforms, and puts forward scientific guidance and suggestions on how to price and choose agricultural products suppliers by constructing a game model and selecting online sales channels.

2. literature review

2.1. Consumers' preferences for poverty alleviation

At present, many scholars have studied supply chain decision-making from a behavioral perspective, focusing on consumer green preferences (2021, Dai Daoming and Liu Lei [1], Zhang Bo and Gao Li Hong [2]) and time preferences (Zhou Hongwei et al., 2021 [3], Xu Minghui et al., 2023 [4]). The impact of consumer poverty alleviation preferences on supply chain decisions and strategies is rarely studied. Zhou Yanju et al. (2020) [5] studied the impact of consumers 'poverty alleviation preferences on the total profits of enterprise supply chains. At the same time, Wan Xiaole et al. (2020) [6] constructed three poverty alleviation models and studied the impact of consumers' poverty alleviation preferences on poor farmers, wholesalers and cooperatives under these models. Zhu Zeyu and Sun Yuling (2021) [7] constructed the e-commerce platform pricing model of consumers 'poverty alleviation preference, and analyzed the impact of consumers' poverty alleviation preference on the pricing strategy of e-commerce platforms. Feng Chun et al. (2022) [8] included consumers 'poverty-alleviation preferences into the function of consumers' willingness to pay, and discussed the market competition and pricing strategies after the introduction of poverty-alleviation brand agricultural products. It is not difficult to find that the existing literature has not studied the influence of consumer poverty alleviation preference on the dual-channel supply chain pricing strategy.

2.2. Dual-channel supply chain and sales model of agricultural products

In the existing literature, the research on the dual-channel supply chain of agricultural products mainly focuses on the supply chain coordination. For example, Wang Zuotie and Li Ping (2023) [9] studied the dual-channel supply chain of agricultural products and retailers through the mixed channel coordination of suppliers and retailers, and discussed the supply chain coordination under the change of revenue sharing contract parameters. Ni lili et al. (2017) [10] built a dual-channel supply chain, and studied the strategic cooperation between manufacturers and retailers on the dual-channel supply chain. For the sales model of agricultural products, the relevant literature is very few. Puxujin et al. (2016) [11] built a game model to the supply chain of agricultural products to describe the transaction between cooperatives and supermarkets, compared the operation efficiency of single-channel sales model and dual-channel sales model, and gave the basis for the selection of cooperative sales model. Zhang Huanyong et al. (2016) [12] and Qu Huanxin (2017) [13] explored the model selection of family farm sales channels, but it is not difficult to find that they have not discussed the sales model selection of agricultural products in poor areas from the perspective of farmers and combined with the e-commerce platform.

In conclusion, this study largely compensates for the shortcomings of existing studies and has innovative significance.

3. Model construction and the Matlab simulation

3.1. Model description and hypothesis

This paper builds a secondary supply chain composed of agricultural products suppliers, offline retailers and e-commerce platforms. Among them, agricultural products suppliers are the leaders, offline retailers and e-commerce platforms are the followers, and the Starkerberg game model can be established. In addition to selling their products through traditional offline retail channels, agricultural products suppliers can also choose to sell through online channels in the form of poverty alleviation and agricultural assistance projects through the online retail mode or live delivery mode. When e-commerce platforms decide to alleviate poverty, they will provide new machinery and equipment, professional personnel and other technical support to agricultural products suppliers, and improve logistics matching, involving investment and resource allocation, to achieve the poverty alleviation goals. These poverty alleviation efforts will bring certain poverty alleviation costs to the e-commerce platform. It is assumed that the degree of poverty alleviation efforts of e-commerce platforms is μ, and the poverty alleviation cost is c, according to Zhu Zeyu and Sun Yuling (2021), $c(\mu) = \frac{k\mu^2}{2}$, where k is the cost-sensitive coefficient. Under the online retail model, according to the pricing strategy of agricultural products suppliers, it is divided into differentiated pricing and unified pricing. The decision order is as follows: first, the agricultural product supplier determines the wholesale price of the two channels, the differentiated pricing strategy determined w_r and w_e, the unified pricing strategy determined w, and then the offline retailer decides the offline retail price p_r. At the same time, the e-commerce platform determines the level of poverty alleviation efforts μ and the online retail price p_e. Live with goods mode, this paper assumes that the electric business platform is a collection of resources, decision order is: first agricultural products suppliers decided the offline channels of wholesale prices w_r, set electric business platform live party retail prices p_l, then offline retailers decided offline retail prices p_r, and the electric business platform decided poverty alleviation efforts μ, after complete sales of agricultural products suppliers to live party pay good commission, set the commission ratio λ.

Based on the above analysis, the paper makes the following model assumptions:

Hypothesis 1: Agricultural product suppliers, offline retailers and e-commerce platforms in the supply chain are all risk-neutral, with profit maximization as the basic decision-making goal.

Hypothesis 2: Offline and online channels sell homogeneous products, and there is no product circulation between the channels in the market. The potential total market demand is α, considering consumers 'channel preference, and using θ $(0 < \theta < 1)$ to express the consumers' preference coefficient for online channel purchase, $1 - \theta$ can be expressed as the preference coefficient of consumers for offline channel purchase.

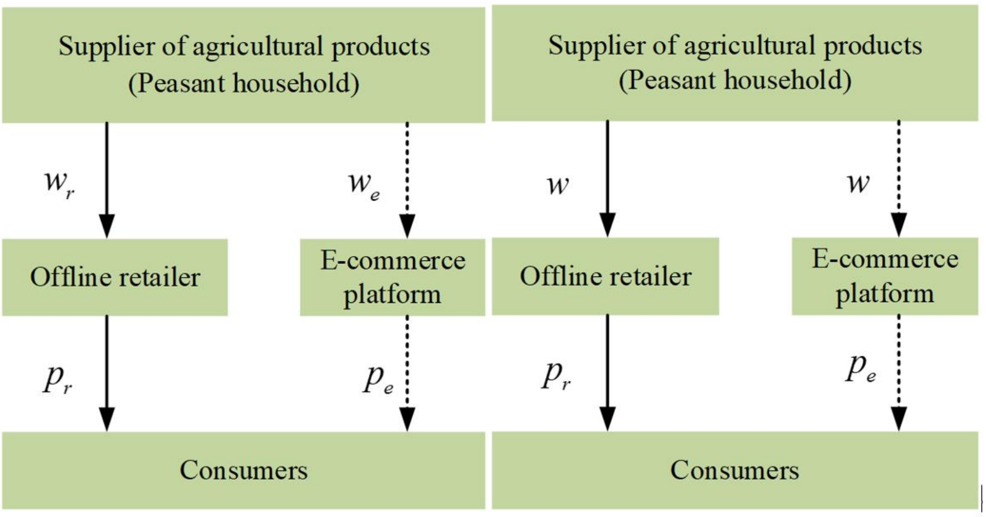
Hypothesis 3: Since production cost will not have a substantial impact on the main conclusions, to focus on the research issues in this paper, the production cost is 0.

Hypothesis 4: Products sold by agricultural products suppliers through the traditional channels of offline retailers do not have poverty alleviation labels and characteristics.

Hypothesis 5: In the whole supply chain process of agricultural products, it is assumed that the quality and freshness of agricultural products always remain in good condition without considering the corrosion and return of agricultural products.

3.2. Model construction and deduction

3.2.1. Online retail mode



(1) Differentiated pricing. (2) Unified pricing

Figure 1. Online retail model

In the online retail model, there is a competition between offline retailers and e-commerce platforms. The demand of offline channel is D_r, the demand of online channel is D_e, and $\tau(0 < \tau < 1)$ is the price competition coefficient. β indicates consumers' preference for poverty alleviation. This paper adopts the traditional additive demand function, so that the demand of offline channel is $D_r = (1-\theta)\alpha - p_r + \tau p_e$, and the demand of online channel is $D_e = \theta\alpha - p_e + \tau p_r + \beta\mu$.

When the agricultural product supplier chooses a differentiated pricing strategy, the upper standard d is used to indicate the situation. The profit function of offline retailers, e-commerce platforms and agricultural products suppliers are respectively

$$\pi_r^d = (p_r - w_r)D_r = (p_r - w_r)[(1-\theta)\alpha - p_r + \tau p_e] \tag{1}$$

$$\pi_e^d = (p_e - w_e)D_e - c(\mu) = (p_e - w_e)(\alpha\theta + \beta\mu + \tau p_r - p_e) - \frac{k\mu^2}{2} \tag{2}$$

$$\pi_f^d = w_r D_r + w_e D_e = w_e(\alpha\theta + \beta\mu + \tau p_r - p_e) + w_r[(1-\theta)\alpha - p_r + \tau p_e] \tag{3}$$

Through the reverse induction method, the best profits of retailers, e-commerce platforms and agricultural products suppliers are obtained as follows:

$$\pi_r^{d*} = \frac{\left[(\tau-1)(\tau+1)(\tau\theta-2\theta+2)k+\frac{\beta^2\left((\theta-1)\tau^2+\tau\theta-2\theta+2\right)}{2}\right]^2\alpha^2k^2}{4\left[(\tau^4-5\tau^2+4)k^2+2\beta^2(\tau^2-1)k-\frac{\beta^4\tau^2}{4}\right]^2} \tag{4}$$

$$\pi_e^{d*} = \frac{\left[(\tau+1)\left((\theta-1)\tau-2\theta\right)(\tau-1)k+\frac{\tau\beta^2(\tau\theta-\theta+1)}{2}\right]^2\alpha^2k\left(k-\frac{\beta^2}{2}\right)}{4\left[(\tau^4-5\tau^2+4)k^2+2\beta^2(\tau^2-1)k-\frac{\beta^4\tau^2}{4}\right]^2} \tag{5}$$

$$\pi_f^{d*} = \frac{2\alpha^2\left[\left(1+\left(\theta^2-\theta+\frac{1}{2}\right)\tau^2+3\left(\theta-\theta^2\right)\tau+2\theta^2-2\theta\right)k+\frac{\beta^2(\theta-1)(\tau\theta-\theta+1)}{2}\right]k}{4(\tau^4-5\tau^2+4)k^2+8\beta^2(\tau^2-1)k-\beta^4\tau^2} \tag{6}$$

Similarly, when the agricultural product supplier chooses the unified pricing strategy, the upper standard u is used to indicate the situation, and the optimal profit is

$$\pi_r^{u*} = \frac{4\alpha^2\left[\left(\left(\theta-\frac{1}{4}\right)\tau^2+\tau-4\theta+3\right)k^2+\frac{\beta^2\left((\theta-2)\tau+10\theta-8\right)k}{4}-\frac{\beta^4(\theta-1)}{4}\right]^2}{(k\tau^2+2\beta^2-4k)^2(-\beta^2+2\tau k+4k)^2} \tag{7}$$

$$\pi_e^{u*} = \frac{4\alpha^2k\left(k-\frac{\beta^2}{2}\right)\left[\left(\left(\theta-\frac{3}{4}\right)\tau^2-\tau-4\theta+1\right)k-\frac{\beta^2\left((-1+\theta)\tau-6\theta+2\right)}{4}\right]^2}{(k\tau^2+2\beta^2-4k)^2(-\beta^2+2\tau k+4k)^2} \tag{8}$$

$$\pi_f^{u*} = \frac{\left(\beta^2\theta-\beta^2+\tau k+2k\right)^2\alpha^2}{4(1-\tau)(\beta^2-2\tau k-4k)(k\tau^2+2\beta^2-4k)} \tag{9}$$

3.2.2. Live broadcast mode with goods

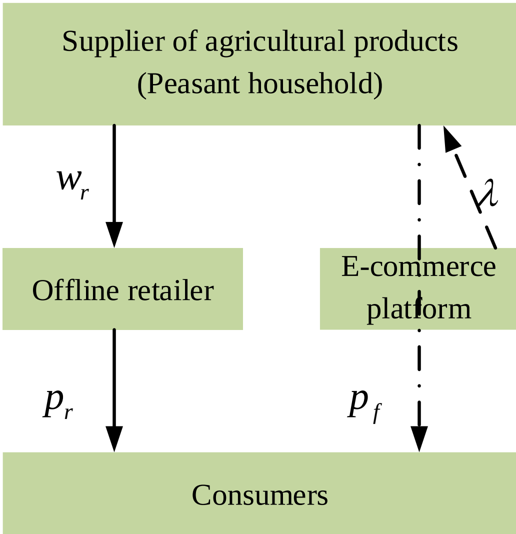


Figure 2. Live broadcast mode with goods

In the mode of live broadcasting with goods, the e-commerce platform acts as a medium to build a direct bridge between consumers and farmers. It is a typical two-sided market, and the upper standard l is used to indicate this situation. Compared with the online retail mode, the live delivery mode provides consumers with a brand new way of shopping through real-time interaction, entertainment experience, trust building, instant purchase and social sharing.

Referring to Hu Shasha (2022) [14], when the live broadcast delivery is opened, the opening of the network live broadcast channel will increase the demand for live broadcast traffic transformation. Therefore, the demand for live broadcast delivery channel is mainly composed of two parts. First of all, however, similar to the online retail model, the existing demand of the potential market and the price of fresh agricultural products are reversed, which is expressed as; second, the demand of the live broadcast channel is also related to the conversion of live traffic. This part of the demand is positively affected by the conversion rate of the traffic of the live broadcast and the level of live traffic, expressed as. The demand of offline channels is the same as the model of online retail, while the demand of online channels becomes. Given the commission ratio, the profit function of offline retailers, e-commerce platforms and agricultural products suppliers is respectively$\theta\alpha - p_f + \tau p_r +$ $\beta\mu\eta q$ ηq $D_f = \theta\alpha - p_f + \tau p_r + \beta\mu + \eta q\lambda$

$$\pi_r^l = (p_r - w_r)D_r = (p_r - w_r)\left[(1-\theta)\alpha - p_r + \tau p_f\right] \tag{10}$$

$$\pi_e^l = \lambda p_f D_f - c(\mu) = \lambda p_f\left(\theta\alpha + \beta\mu + \eta q + \tau p_r - p_f\right) - \frac{k\mu^2}{2} \tag{11}$$

$$\pi_f^l = w_r D_r + (1-\lambda)p_f D_f = w_r\left[(1-\theta)\alpha - p_r + \tau p_f\right] + (1-\lambda)p_f\left(\theta\alpha + \beta\mu + \eta q + \tau p_r - p_f\right) \tag{12}$$

Combine the optimal offline retail price decision and the poverty alleviation decision of the e-commerce platform to get the optimal profit

$$\pi_r^{l*} = \frac{\left[\left(\left(\left((1-\theta)\tau+\theta\right)\alpha+\eta q\right)\tau\lambda+2\alpha(\tau-1)(\tau+1)(\theta-1)\right)k+2\beta^2\alpha\lambda(\theta-1)\right]^2(1-\lambda)^2}{\left[(\lambda^2\tau^2-8\lambda\tau^2+8\tau^2+8\lambda-8)k+8\beta^2\lambda(1-\lambda)\right]^2} \tag{13}$$

$$\pi_e^{l*}=\frac{12k\lambda\left[\left(\left(\frac{3(1-\theta)\tau}{4}+\theta\right)\alpha+\eta q\right)\lambda+((\theta-1)\tau-\theta)\alpha-\eta q\right]\left[2\beta^2\left(\left(\frac{3(1-\theta)\tau}{4}+\theta\right)\alpha+\eta q\right)\lambda^2-\frac{4\left(\left(\frac{(1-\theta)\tau}{2}+\theta\right)\alpha+\eta q\right)k(\tau+1)(\tau-1)}{3+}\left(\left(\frac{2k(1-\theta)\tau^3}{3}+k\tau^2\theta+\left(\frac{4\beta^2}{3}+k\right)(\theta-1)\tau-\frac{4\theta\left(\frac{3\beta^2}{2}+k\right)}{3}\right)\alpha+q\eta\left(k\tau^2-2\beta^2-\frac{4k}{3}\right)\right)\lambda\right]}{-\left((k\tau^2-8\beta^2)\lambda^2+8(-k\tau^2+\beta^2+k)\lambda+8k\tau^2-8k\right)^2} \tag{14}$$

$$\pi_f^{l*}=\frac{2(1-\lambda)\left[\left(\left(\frac{((\tau-1)\theta-\tau)((\tau-2)\theta-\tau)\lambda}{2}+\left(2\tau-\frac{3}{2}-\frac{\tau^2}{2}\right)\theta^2+(\tau-1)^2\theta-\frac{\tau^2}{2}-\frac{1}{2}\right)\alpha^2k-\frac{3\left(\left(\left(\tau-\frac{4}{3}\right)\theta-\tau\right)\lambda+\frac{4(1-\tau)\theta}{4}+\frac{4\tau}{3}\right)\eta q\alpha}{2}-q^2\eta^2(1-\lambda)\right)+\frac{\beta^2\alpha^2\lambda(1-\theta)^2}{2}\right]}{(\lambda^2\tau^2-8\lambda\tau^2+8\tau^2+8\lambda-8)k-8\beta^2\lambda(-1+\lambda)} \tag{15}$$

In view of the complexity of the above equilibrium results, M atlab is used to assign values and numerical simulation for comparative analysis.

3.3. Matlab numerical simulation

According to the research assumption of relevant literature and the given parameters, combined with the actual investigation, the potential market demand is assumed $\alpha = 100$, and the commission proportion coefficient paid to the live broadcast party is based on the public data of the e-commerce platform. Through statistical analysis, the commission proportion coefficient λ fluctuates around 20%, and in this paper, $\lambda = 0.2$. This paper focuses on analyzing the impact of consumer poverty alleviation β preference on the optimal pricing, profit and sales strategy of each member of the supply chain. The other parameter Settings are shown in Table 1.

Table 1. Parameter setting

parameter	θ	τ	k	ηq
span	(0, 1)	(0, 1)	(0, ∞)	(0, ∞)
numeric value	0.5	0.5	10	20

3.3.1. The influence of consumer poverty alleviation preference on the optimal price decision

According to Figure 3, it can be found that the optimal price decision of agricultural products suppliers, offline retailers and e-commerce platforms will increase with the increase of consumers' preference for poverty alleviation. For different sales models, how consumer preference for poverty alleviation will influence the pricing strategy, we conclude: when consumers' preference for poverty alleviation is weak, compared with the online retail model, the wholesale price of the offline retailers and the retail price of the channel; otherwise, the price decision of the offline channels. As for how the purchase price of consumers through online channels depends to the changes in their poverty alleviation preferences, we find that when consumers have small or large preferences for poverty alleviation, the sales price of online channels compared with the online retail model; otherwise, when the preference of consumers will increase the sales price of online channels.

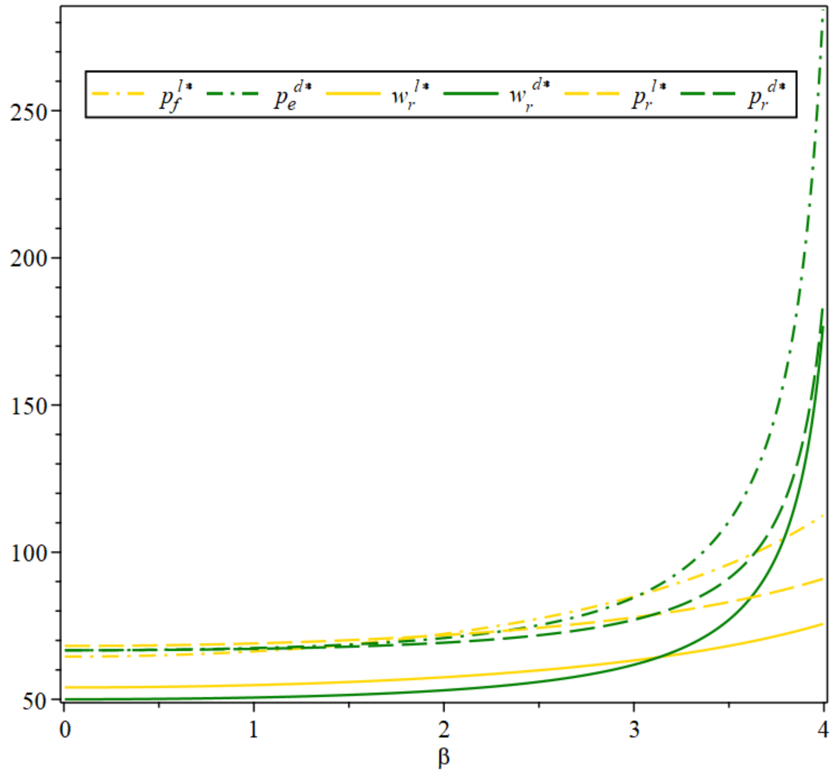


Figure 3. Impact of consumer poverty alleviation preference on pricing strategy under the two sales models

3.3.2. The impact of consumer poverty alleviation preference on the poverty alleviation efforts of e-commerce platforms

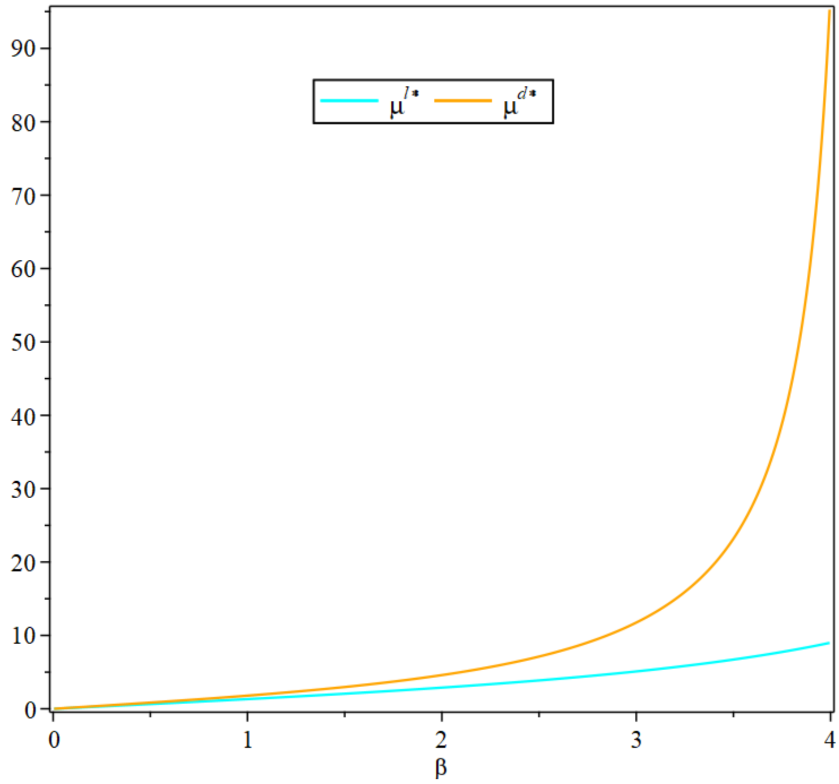


Figure 4. The impact of consumers' poverty alleviation preference on the poverty alleviation efforts of e-commerce platforms under the two sales models

According to Figure 4, it is intuitive that no matter what sales model, the stronger the consumer preference for poverty alleviation, the higher the level of poverty alleviation efforts of e-commerce platforms, and the poverty alleviation efforts of e-commerce platforms under the mode of live streaming with goods are always lower than the online retail model. This is because when e-commerce platforms directly sell products to consumers through the online retail model, their profit margins are more affected by the level of poverty alleviation efforts.

3.3.3. The impact of consumer poverty alleviation preference on the profits of all subjects in the supply chain.

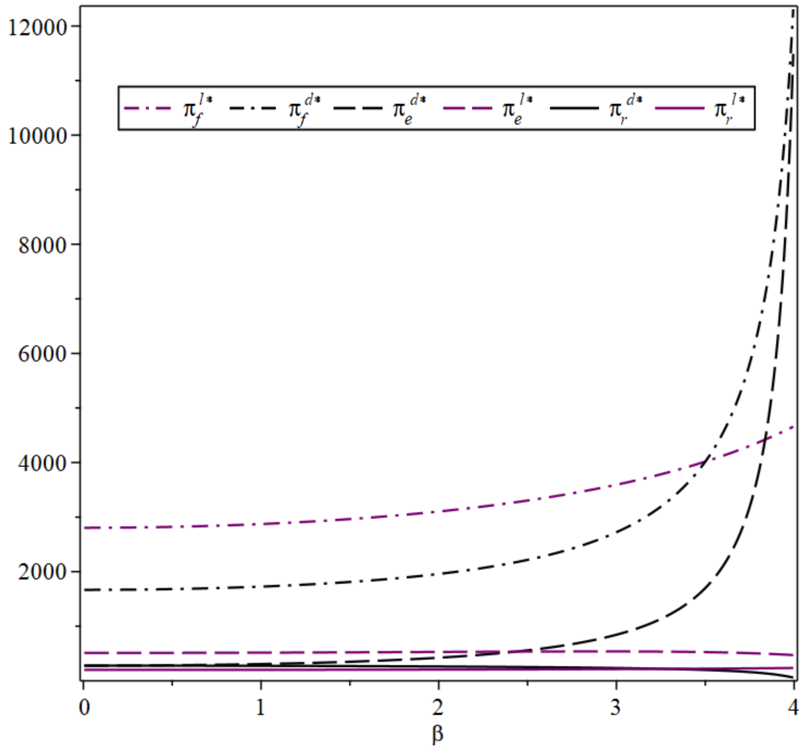


Figure 5. The impact of consumers' poverty alleviation preference on the profits of the supply chain subjects under the two sales models

According to Figure Figure 5, there are the following findings. First of all, for agricultural products suppliers, no matter what sales model they choose, their profits will increase with the increase of consumers' preference for poverty alleviation. When consumers' preference for poverty alleviation is low, agricultural products suppliers should choose the mode of live broadcasting with goods, otherwise, they should choose the online retail mode. For offline retailers, the impact of consumers 'poverty alleviation preference on their profits is very dependent on the choice of the sales model of agricultural products suppliers. Under the online retail model, the profit of offline retailers decreases with the increase of consumers' poverty alleviation preference. On the contrary, under the mode of live broadcast with goods, the profits of offline retailers increase with the increase of consumers' preference for poverty alleviation. When consumers' preference for poverty alleviation is low, the live broadcast with goods model is not conducive to offline retailers. For e-commerce platforms, in the online retail model, their profit is positively correlated with the consumers, with an inverted U-shaped relationship that increased and then decreased. When consumers' preference for poverty alleviation is low, the live broadcast with goods model is conducive to e-commerce platforms. In conclusion, there is no Pareto dominance strategy.

4. Conclusion and the implications of management science

This paper considers the preference of consumers for poverty alleviation, and studies the pricing strategy and sales model of the secondary and two-channel supply chain, with agricultural products suppliers as the leader and offline retailers and e-commerce platforms as the followers. Through the above analysis, there are the following conclusions and management enlightenment.

First, when the agricultural products suppliers choose the online retail model, their offline and online wholesale prices should adopt a differentiated pricing strategy, that is, the differentiated pricing strategy is in an absolute dominant position. Second, no matter what kind of sales model they choose, if consumers are found to have a strong awareness and preference for poverty alleviation, each subject in the dual-channel supply chain should appropriately improve the price decision and the level of poverty alleviation efforts. Third, for farmers, how to choose the sales model is closely related to consumers' preference for poverty alleviation. Specifically, when consumers have a low preference for poverty alleviation, it is suggested that farmers should choose the live broadcast with goods mode, otherwise, they should choose the online retail mode. At the same time, we found that the offline retailers' preference for sales mode is contrary to the farmers, and the e-commerce platform for sales mode is consistent with the farmers. Therefore, when the poverty alleviation preference is low, offline retailers should adopt some methods to restrain the live delivery mode, the e-commerce platform should encourage farmers to choose the live delivery mode; when the poverty alleviation preference is high, offline retailers should encourage farmers to choose the live delivery mode, and the e-commerce platform should encourage farmers to choose the online retail mode. Fourth, because there are no certain conditions that increase the profits of the three parties when the farmers choose a certain sales model, so there is no Pareto dominant strategy. In the future, how to balance the profit distribution of the three parties to realize the coordination of supply chain is also a problem worth studying. In view of the limitations of this paper, we will not repeat it here.

References

[1] Dai Daoming, Liu Lei. Supply chain strategy and coordination of government subsidies and consumer green preferences [J]. Journal of Chongqing Technology and Business University (Natural Science Edition), 2022, 39 (03): 81 - 88.

[2] Zhang Bo, Gao Lihong. Study on the supply chain coordination of agricultural products based on the dual preference of consumer brand and green products [J]. Logistics Research, 2022, No.10 (04): 57 - 62.

[3] Zhou Xiongwei, Li Juan, Zhou Yanju. Research on presale time strategies based on consumers' time preferences [J]. Journal of Systems Engineering, 2021, 36 (04): 539 - 551.

[4] Xu Minghui, Shen Hui, Zheng Yiwei. Dynamic pricing research based on consumer time preference and product quality information update [J / OL]. Theory and practice of system Engineering: 1 - 29 [2023-07-16].

[5] Zhou Yanju, Zheng Duo, Ye Xin. Three-level agricultural products supply chain decision-making and coordination considering poverty alleviation preferences [J]. Control and Decision-making, 2020, 35 (11): 2589 - 2598.

[6] Wan Xiao le, Wang Qian, Meng Qingchun, etc. Research on the poverty alleviation model of intelligent supply chain considering consumer preferences under the condition of uneconomical production scale [J]. Management Science of China, 2020, 28 (02): 153 - 165.

[7] Zhu Zeyu, Sun Yuling. Research on the pricing model of e-commerce platforms considering consumers' preferences for poverty alleviation [J]. Inner Mongolia Science and Technology and Economy, 2021, No.479 (13): 30 - 34.

[8] Feng Chun, Guo Qianyun, Chen Muquan. Study on the introduction strategies of poverty alleviation agricultural products considering consumers' preferences for poverty alleviation [J]. Integrated transportation, 2022, 44 (01): 113 - 121.

[9] Wang Zuotie, Li Ping. Dual-channel supply chain coordination of agricultural products based on revenue-sharing contract [J]. Anhui Agricultural Science, 2023, 51 (01): 169 - 174.

[10] Ni lili, Liu Hanchun, Wang Qiong, etc. Study on Dual-channel Supply Chain coordination of Fresh Agricultural Products from the perspective of game theory [J]. Journal of Heihe College, 2017, 8 (01): 50 - 51.

[11] Pu Xujin, Yang Hao, Liu Wei. Comparative study on cooperative sales model with different channel power structure [J]. Journal of Jiangnan University (Humanities and Social Sciences edition), 2016, 15 (06): 99 - 106.

[12] Zhang Huanyong, Zhou Zhipeng, Pu Xujin. Selection of family farm sales channel model from the perspective of agricultural products supply chain [J]. Business Research, 2016, No.474 (10): 130 - 137.

[13] Qu Wanxin. Model selection of family farm sales channel from the perspective of agricultural products supply chain [J]. Business Economics Research, 2017, No.736 (21): 121 - 123.

[14] Hu Shasha. Dual-channel supply chain pricing decision for online retail and online live streaming e-commerce of fresh agricultural products [D]. Beijing Jiaotong University, 2022.