Online Group Buying

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O2O (Online to Offline) is a business model that utilizes e-commerce platforms to combine online information with offline products. Consumers can browse product information online, complete payments, and obtain goods or services offline. In recent years, e-commerce platforms have developed rapidly, and increasingly more consumers have become accustomed to purchasing goods or booking services online. For restaurants, collaborating with third-party online platforms and providing group buying services are also common ways to increase sales channels and expand sales. Group buying, also, namely, group purchase or Tuangou in Chinese, refers to a shopping model which consumers with the same needs group together to purchase with discounted prices.

group buying | catering supply chain | O2O model

1. Online Group Buying Pricing Strategies

In terms of pricing strategies for online group buying, scholars have conducted much research from different perspectives in various situations. For example, Zhu et al. proposed a pricing method for online group buying based on continuous price functions, which dynamically set prices based on the buyer's demand and thereby encouraged the buyer to provide realistic quotations. Zhang et al. proposed a pricing method for online group buying based on buyer fixed bidding, aiming at the impact of buyer demand quantity on the participant population. Ming and Tunca established a continuous-time dynamic game theory model to study consumer behavior and solve its equilibrium, mathematically explaining the extent to which group buying can increase profit.

Some scholars have also studied group buying pricing strategies in specific situations. For example, Ni considered both positive and negative network effects and proposed three possible sales strategies for group buying, individual buying, and hybrid buying, as well as their optimal decision on price. Wu et al. studied the method for restaurants to set group buying prices and the optimal promotion strategy for the platform, given the promotion level of group buying websites. He et al. explored fairness-focused behavior in the group buying supply chain and found that the retailer's fairness-focused behavior does not always harm the supplier's profits. Guan et al. explored the optimal group buying price strategy in social e-commerce with information sharing. They found that when the cost of information sharing is small or the cost function is a quadratic function, sellers would choose to share information independently. To ensure the quality of fresh food and the profitability of merchants in community group buying, Shui and Li designed a community group buying pricing model and a cold chain vehicle route planning model. Wang and Song found that the emergence of community group buying caused concern about the fairness of businesses. They also found that online retailers would weaken the market position of offline sellers after entering the market. Ando analyzed the pricing strategy of merchants by predicting the market demand and

competitive environment. Although there have been many studies on group buying pricing strategies, few scholars have studied catering group buying (CGB). Therefore, it is worthwhile focusing on the issue of online CGB, considering the characteristics of the catering industry while developing pricing strategies and other strategies.

2. Factors Affecting Online Group Buying

The second stream of research is the factors affecting online group buying. Hsu et al. [1] conducted a survey on members of online group buying platforms in Taiwan and found that the expected value, hedonic value, and social value of online group buying could affect customer loyalty. Chou [2] studied the influence of different countdown time units on consumers' willingness to participate in group buying with limited time. He argued that using countdowns expressed with a contracted scale (vs. an expanded scale) can increase their willingness. Kozáková [3] studied the impact of reputation and perceived scale, system quality, information quality, and service quality of online group buying websites on customer confidence and satisfaction in Xi'an group buying, finding that reputation and perceived scale were the most important factors. Ou et al. [4] found that customer consistency behavior had a significant positive impact on online group buying willingness, and that perceived risk had a disruptive effect. Chow et al. [5] constructed an inverted U-shaped relationship between the popularity of group buying and consumers' purchase intention and found that popularity can promote group buying at low levels, while reaching a certain value would have an inhibitory effect on group buying. Hongsuchon and Li [6] explored the impact of consumer privacy concerns on the willingness to group purchase in communities. Hossain and Rahman [7] studied five personality traits that affect group buying in China, among which extroversion, affinity, and responsibility directly affect the group buying behavior of China customers. Klein and Sharma [8] studied the influence of consumers' decision-making style and consumers' intervention (the energy spent by consumers in searching and processing commodity-related information) on consumers' group purchase intention. Xiao [9] used qualitative methods to explore the factors that motivate consumers to participate in online group buying and explanatory structure modeling to develop a context-specific hierarchical motivation model. Many scholars have analyzed the factors that affect group buying intention by constructing utility functions, which also provides a certain theoretical basis for the following model constructed.

3. Online to Offline Supply Chain Pricing Strategies

The third stream of research related to this research is about O2O (Online to Offline) supply chain pricing strategies. In the related research of O2O supply chain pricing strategy, most scholars used game theory to build a model and solved the best decision. Lin and Hu [10] reviewed the commonly used game models for supply chain pricing and discussed the maximization of supply chain benefits and coordination mechanism. They believed that the profit maximization of agricultural companies and the consumer-centered research perspective would become the focus of future research. Song et al. [11] summarized the types of dual-channel supply chain considering consumers' green preference and thought that the influence of politics and media should be considered when studying this issue. Yu and Ren [12] used a Stackelberg game model and a Bertrand game model to formulate the best pricing strategy for each member of the food supply chain from online to offline. Some scholars have studied

the pricing strategy of O2O retail supply chain. Considering the dynamic reference quality effect of consumers, Qiu et al. [13] established an O2O retail supply chain model composed of suppliers and retailers, and designed a wholesale price, cost sharing, and two-part tariff contract to coordinate the supply chain. Amrouche et al. [14] studied the O2O competition game model in three scenarios: no service input, full compensation for offline service by retailers, and online service by manufacturers. It was found that the cooperation mechanism of full payment for offline service by retailers and revenue sharing could coordinate the O2O supply chain. Datta et al. [15] discussed the dynamic pricing problem of retailers under the condition of stochastic price and sensitive demand of sales efforts, arguing that O2O retail and sales work can help retailers improve profits and reduce waste.

Some scholars studied the pricing strategy of the catering supply chain, which is also the focus of this part. Zheng and Guo [16] believed that not all restaurants should be encouraged to participate or offer online price discounts. Especially for restaurants with fixed service capacity, it was recommended to participate in online price discounts when the number of loyal offline customers is relatively small. The following year [17], they studied a hybrid game model consisting of Nash games between multiple restaurants and Stackelberg games between these restaurants and third-party websites. Xu et al. [18] explored the different strategies that restaurants and third-party online platforms should adopt when collaborating on retail prices within different ranges. Tong et al. [19] compared the impact of dynamic pricing and static pricing strategies on platform profits, based on more than 2.4 million orders traded on the three platforms in China, and found that dynamic pricing performed better. Niu et al. [20] discussed the cooperation strategy between fast food restaurants and third-party online sales platforms when considering logistics strategies (platform logistics and self-logistics). Zhang et al. [21] studied the impact of price subsidies on product pricing and revenue in a single channel supply chain, as well as the impact of price subsidies and fairness concerns on supply chain revenue in a dual giant supply chain. Guo et al. [22] studied the impact of online ordering and in-store dining strategies on restaurant optimal decision-making and maximum profit; they found that when the unit carbon tax price is relatively high, using this strategy can reduce carbon tax costs. Du et al. [23] discussed four combinations of the pricing strategies (online and offline unified pricing and differential pricing) and delivery modes (self-distribution and platform distribution) of restaurants. By comparing the profits in four scenarios, the restaurant can choose the appropriate strategy. Zhang et al. [24] explored the take-away mode of restaurants and found that only when the income from take-away reaches a certain level can restaurants benefit from it. Webb et al. [25] put forward a priority mixed bundling strategy to solve the problems faced by traditional pricing methods and demonstrated its theoretical feasibility in the meantime. In these studies, few scholars have discussed the pricing and other strategies of group buying in catering.

Through a review of the relevant literature, it was found that although there are many studies on group buying and O2O pricing strategies, few scholars have studied the pricing strategies of CGB and how catering merchants using the O2O model set retail prices and group buying prices when collaborating with third-party online platforms. Therefore, the optimal decisions and maximum profits of restaurants and online platforms under each model are calculated, providing a reference for both parties' decision-making.

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