



Optimal decisions on group buying option with a posted retail price and heterogeneous demand



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ABSTRACT

Group buying is now a popular business mechanism whereby customers are encouraged to bargain together. Today's group buying usually adopts a fixed group price rather than using a dynamic pricing mechanism and many retailers sell products using both a group buying and a posted price. Therefore, there are usually different shopping channels as the market can be divided into two segments, a group buying segment and an individual segment, according to consumers' preference. However, sometimes the group buying option can decrease total revenue by influencing the individual market segment. Consequently, the seller has to decide: (1) whether to offer a group buying option and (2) if offering such an option, which combination is the best? In this paper, we classify customers into collectivist customers and individualistic customers depending on their different valuations of the time and energy spent in group buying communication and study the optimal pricing strategy according to actual market information. Although collectivist customers prefer to participate in group buying, our results show that this is true only in certain conditions in an individualistic dominant market where the potential demand of the individualistic customers is greater than that of the collectivist customers or the price coefficient of the individualistic customers is less than that of the collectivist customers. In these circumstances, the seller should provide a posted retail price together with a group buying option which can assist in customer discrimination, but in other conditions, the seller should only provide a posted retail price. Additionally, we have extended the two customer classifications to multiple classifications in this paper.

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1. Introduction

Since the end of the 1990s, many e-commerce companies have been selling their products to consumers using group buying mechanisms. Under group buying, customers are encouraged to bargain together and quantity discounts are offered based on the customers' aggregated purchasing quantity. On earlier group buying websites, the seller announced prices for different levels of demand (i.e. price-quantity schedules) and the buyers serially placed bids until the market cleared at a particular price. Generally, as the number of buyers increased, the price usually decreased. There have been many dynamic price histograms which indicate how prices change depending on the quantity of units sold and which tier the current price is at. Buyers as well as potential customers are also informed about the number of bids needed for a price to drop further. At the beginning, some of these websites enjoyed considerable success. However, most of the earlier group

buying websites have ceased operations. Kauffman and Wang (2002) mentioned the following reasons for the failure of the earlier group buying websites: (1) the business model was too complex for the general consumer; (2) the auction cycle for group buying was lengthy and hindered impulse buying; (3) the transaction volume was too low leading to small discounts for consumers and thus it was difficult for earlier group buying websites to compete with large retailers from a price perspective.

In November 2008, the limitations inherent in the earlier group buying websites were addressed in Groupon.com's "Today's Deal" group buying business model which first originated in Chicago. Under this new model, the seller fixes the group buying price and sets a required group size instead of using "dynamic price histograms". Compared to the dynamic pricing system of the earlier group buying websites, customers facing the new model can see more clearly how much discount they can obtain if there are sufficient buyers. Additionally, the time for the new group buying mechanism is limited to a single day with another product offered the following day. Thus, the pressure of such a limited time motivates potential customers to monitor the websites on a daily basis.

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Because of the win-win situation to the shareholders of the system, just 18 months after its launch, the approximate company value of Groupon.com had reached 1.35 billion dollars and this uptrend and success made this market very attractive (Erdoğmuş and Çiçek 2011). In a short time, many clone sites adopted Groupon.com's business model and started their activities worldwide. By the end of June 2011, with almost 6000 "Today's Deal" group buying websites, China was the most competitive online marketplace for group buying in the world (Zhao 2013).

Almost all traditional group buying models, including Today's Deal group buying, are non-coupon based. Another practical group buying business model is the coupon based model. Coupon based group buying is very different from traditional online group buying and is, in fact, an advertising model and therefore the discount is usually much higher than for regular non-coupon based group buying. For sellers considering whether to offer coupon based group buying, the key question is whether such large discounts can attract new customers who might regularly return and pay the full price on future visits. As a result, coupon based group buying is more suitable for a seller who has sufficiently low recognition among potential consumers. In comparison, non-coupon based group buying mainly benefits from price discrimination. To yield profitable price discrimination, consumers who are offered non-coupon based group buying must be more price-sensitive (with regards to the participating sellers' goods or services) than the population as a whole. There has been a significant increase in non-coupon based group buying and we review those which are related to our study. However, coupon based group buying has received little attention in academic literature, even though there are increasingly more coupon based group buying businesses. To the best of our knowledge, the limited theoretical works, including Arabshahi (2011) and Edelman et al. (2011), which study coupon based group buying, have done so from the perspective of the coupon service and the perspective of the participating sellers.

Although Today's Deal group buying was initially a great success, since the latter half of 2011 a large number of group buying websites have had to lay off employees and have even collapsed in China. Further, insiders have predicted that 99% of group buying websites would be bankrupt in the future. By September 2012, the number of Chinese group buying websites had reduced to 2919, i.e. 42% from the same period in 2011, which means on average there were 5.9 websites disappearing every day (Zhao 2013). For Groupon.com, the situation was neither good or bad. Although about 60% of enterprise partners think that their group buying experience was successful, more than half don't wish to cooperate with Groupon.com again (Wang 2013). With a reduction in freshness, consumers have become more rational. Therefore, more normal and solid business models are needed for the group buying business. To win during the wave of reform, Chinese e-commerce companies have transformed the Groupon.com mechanism and created new group buying business models. One successful model is the "Package Deal" group buying model, which is widely used in catering industry in China. Different from Groupon.com, Package Deal group buying packs a certain number T of the items on sale to form one sale unit and sells the unit as a whole at a fixed unit group buying price p . Of course, the group buying price for one item is discounted, i.e., $p < p_0$ where p_0 is the common retail price for one item.

There are some main differences between the traditional group buying, Groupon.com's Today's Deal group buying, and the Chinese Package Deal group buying as follows:

(1) Market Mechanisms

The traditional group buying announces price-quantity schedules as $(p_1, q_1), (p_2, q_2), \dots, (p_n, q_n)$ where $p_1 > p_2 > \dots > p_n$ and $q_1 < q_2 < \dots < q_n$ at the beginning of a given

selling period of $[0, \Gamma]$. All transactions occur at time Γ . Suppose that the aggregated demand at Γ is equal to q_Γ , then the realistic price for all buyers is uniform and equal at p_i where $i = \arg\{q_i \leq q_\Gamma < q_{i+1}\}$ and $q_{n+1} = \infty$. Specifically, if $q_\Gamma < q_1$, then no transaction occurs.

Today's Deal group buying, similar to Groupon.com, announces only one price-quantity pair (p, q) for a given selling period $[0, \Gamma]$. Suppose that the aggregated demand at Γ is equal to q_Γ . If $q_\Gamma \geq q$, then all transactions occur at the same price p . Otherwise, if $q_\Gamma < q$, then there is no any transaction. Today's Deal group buying mechanism is a special model of traditional group buying mechanism in which two price-quantity pairs (p_1, q_1) and (p_2, q_2) are announced with $p_2 < p_1 = \infty$ and $q_1 < q_2$.

Package Deal group buying announces both a required group buying size T of a package of item and a unit group buying price p for this bundled volume. Transactions occur as long as the required size T is realized. Different to traditional and Today's Deal group buying, Package Deal group buying usually sets a longer selling period and transactions can be handled at any time during the selling period.

(2) Buyer Behavior and Demand realization

Under traditional group buying, buyers as well as potential customers are informed about the number of bids needed for a price to drop further. Potential buyers anticipate that prices for a given item are going to drop in the near future and it is this anticipation of a price drop that motivates them to make their purchase so as to facilitate the process in which prices drop from a discount level to another one.

Under Today's Deal group buying, customers can perceive more clearly how much discount they can obtain than through traditional group buying. Additionally, the time for Today's Deal group buying mechanism is usually limited to a single day and another product for the group buying option is offered the following day. Therefore, the limited time pressure motivates potential customers to monitor the websites daily.

Under Package Deal group buying, customers are encouraged to work as "sales agents" to gather companion consumers. Because the product offered in Package Deal group buying, like a family meal package, is more suitable for friends to share, the product offered in Package Deal group buying is not suitable for consumers unfamiliar with sharing. That is, online buyers do not take into account other online shoppers and have to spend time and money to discuss whether or not to adopt the group buying option and pay not only the group buying price but also the communication costs.

In this paper, we studied a Package Deal group buying model frequently used in the Chinese catering industry. This new group buying offers a homogeneous food service to different customers. For one class of customers, a posted price is offered and these customers pay for the food individually. For another class of customers, Package Deal group buying is offered and these customers have to gather enough companies (friends) to take advantage of the discount group price. Different to traditional group buying, this new group buying does not just sell the item at the end of the whole period. Instead, the special group buying sets a necessary group size T . As long as there are T customers, one transaction is done, so there is usually more than one group doing transactions during the selling period. This certain Package Deal group buying is widely used by the Chinese catering industry, such as the "Sichuan hotpot" nearby colleges or universities. "Sichuan hotpot" is a popular Chinese food, which is especially suited to schoolmates who wish to dine together. In China, almost all hotpot restaurants near

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