SPECIAL THEME

Buyers' purchasing time and herd behavior on deal-of-the-day group-buying websites

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Abstract Since its introduction 10 years ago, group-buying websites, where buyers with similar purchase interests congregate online to obtain group discounts, have metamorphosed into several variants. The most popular variant is the deal-of-the-day group-buying website, where there is only one product/service being offered each day. Starting in the United States in 2008, this new group-buying variant has rapidly achieved tremendous success and has been widely adopted in various countries. At the end of August 2010, there were more than 1000 deal-of-the-day group-buying websites in the most competitive online marketplace, i.e., China. How exactly do buyers behave on these websites? How can deal-of-the-day group-buying website providers take advantage of buyers' behavior? Based on herd behavior, we collected and analyzed over 500 hourly orders on the most popular deal-of-the-day group-buying website in Beijing. We found that auction times and new orders for each hour have an inverted-U relationship. Moreover, we discovered that the number of existing orders will only have a positive effect on the number of new orders during the first half of the day. Contributions to research and implications for group-buying website providers are presented in the paper.

Keywords Online group-buying · Deal-of-the-day · Purchasing time · Herd behavior · Buyer behavior

JEL classification D89

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Introduction

Group-buying is a shopping strategy in which buyers obtain volume discounts on the products they wish to purchase. Since the end of the 1990s a number of group-buying websites have been launched to congregate buyers with similar product interests to obtain significant quantity discounts from sellers. These group-buying websites have metamorphosed currently into several variants, the most popular variant being the deal-of-the-day group-buying website. Starting in the United States in 2008, deal-of-the-day group-buying websites besides enjoying tremendous growth have been adopted in various countries. These websites feature one deal per day, such as a special event ticket, a physical training lesson, or a restaurant menu at a discounted price. For interested buyers to enjoy the daily deal, the number of confirmed buyers on the particular day has to exceed the minimum required number as indicated on each website. On confirming the deal and having their credit cards charged, buyers will receive confirmations with which they can redeem the special discounts (provided that the minimum required number of confirmed buyers is reached). The websites will charge sellers service fees upon successful group buying events. Since the beginning of 2010, deal-of-the-day group-buying websites have mushroomed in China. More than 400 deal-of-the-day group-buying websites were established between March and June 2010 (Analysys 2010). By the end of August 2010, more than 1000 deal-of-the-day group-buying websites existed in China; of these it is estimated that about 80 % will still be in operation at the end of 2010 (Fang 2010). Consequently, China is considered as the most competitive deal-of-the-day group-buying marketplace. Compared to the other cities in China, Beijing sees the most intense competition as more than 800 deals are featured by group-buying websites daily. This makes Beijing the most interesting and dynamic marketplace for group-buying researchers.

In such an intense and highly competitive environment, it is crucial for deal-of-the-day group-buying websites in Beijing to better understand buyers' behavior and improve their websites and mechanisms to attract more buyers. According to herd behavior, people tend to follow others' actions (Banerjee 1992). That means an increasing number of existing orders may induce others to order online. Consequently, large numbers of buyers indicated on deal-of-the-day group-buying websites may effectively induce other hesitant customers to order. Moreover, the advantage of herd behavior can be maximized when this large number is indicated at the time before most of the potential customers browse the website. Thus, this study attempts to answer the following two research questions: whether herd behavior occurs under the deal-of-the-day group-buying context and when the critical purchasing time window is (i.e., the time when most potential customers browse deal-of-the-day group-buying websites). To answer these research questions, we collected data logs of the number of buyers on an hourly basis from one of the most popular group-buying websites in Beijing. The number of buyers per hour reveals buyers' purchasing time on the website. Herd behaviour can be investigated by comparing the number of buyers in each hour. In addition, we interviewed customers of group-buying websites in Beijing to further reveal their purchasing behaviour under a deal-of-the-day group-buying context. The interviews provide complimentary results and can verify the analysis of the objective data logs. Findings from this study provide guidelines for group-buying websites, especially those that compete in an intense and aggressive environment such as Beijing's, concerning when they should take action to induce greater commitment to their deal-of-the-day group purchases and what kind of action should be taken. If herd behaviour occurs, we can improve the mechanisms of deal-of-the-day group-buying websites to maximize the advantage of herd behaviour according to the critical purchasing time window. This study also provides guidelines for further research in this emerging e-marketplace.

In the following, we first review the evolution of group-buying business models and introduce deal-of-the-day group buying websites in greater detail. After reviewing the group-buying literature, we present the theoretical foundations and develop the hypotheses. Next, we introduce the research methodology employed in this study which is followed by the data analysis and discussion of the findings. Finally, we present the implications of the findings and the conclusions from our study.

Review of group-buying websites

In this section, we will elaborate on the group-buying phenomenon as well as identify the innovative and novel features of the deal-of-the-day group-buying websites. This is followed by an overview of the current practices of various deal-of-the-day group-buying websites in the most intense and highly competitive online marketplace, i.e., China.

Earlier group-buying websites

Earlier group-buying websites which were established at the end of the 1990s in American and European online marketplaces featured products for group-buying in an auction cycle with starting and ending times. They offered computers, consumer electronics, home appliances, and household goods (Kauffman and Wang 2002). Generally, as the number of buyers increased, the price might decrease. There were *dynamic price histograms* on some websites which indicated how prices changed according to the number of units sold and which tier the current price was at. Buyers as well as potential buyers were also informed about the number of bids needed for a price to drop further. In the beginning, some of these websites enjoyed considerable success. For example, the number of registered members at Mobshop increased from 37,000 to 132,000 between January and April 2000 (Kauffman and Wang 2002). However, by January 2001, Mobshop had terminated its group-buying operations. In fact, most of the earlier group-buying websites have ceased to operate. 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 (consumers had to wait for the end of an auction cycle); (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 the price perspective.

The first online group-buying websites in China employ a different business model. For example, Liba congregates potential buyers who plan to purchase decoration materials online. Buyers who have registered on the website will meet at a pre-arranged time and location and will then bargain with the sellers face-to-face. The website charges the seller a service fee upon the completion of the group purchase. Although this variant of group-buying business model appears to be more sustainable, the products and services offered are normally limited to the following categories: real estate, household goods (decoration materials, furniture, household appliances, and etc.), and automobiles. All of these are expensive and durable goods not meant for daily consumption. Accordingly, it is often difficult for such websites to attract a sufficient number of buyers.

Deal-of-the-day group-buying websites

The limitations inherent in the earlier group-buying websites are addressed through Groupon.com a deal-of-the-day

group-buying business model. Launched in November 2008 in Chicago, it is the first deal-of-the-day group-buying website. Being profitable since June 2009 (8 months after its launch) (Arrington 2009), it now operates in more than 100 cities in the United States and 28 other countries worldwide. Since the beginning of 2010, many Groupon clones have been mushrooming globally, including BigLion.ru in Moscow, DailyDeal.de in Berlin, PeixeUrbano.com.br in Rio de Janeiro and Meituan.com in Beijing (Arrington 2010; Kincaid 2010). These clones adopted Groupon's business model and even its website design. Figure 1 shows the webpage of Groupon in Los Angeles and the webpage of Meituan in Beijing.

With more than 400 deal-of-the-day group-buying websites by the end of June 2010, China is the most competitive online marketplace for group-buying in the world. Most of these websites start in Beijing's online marketplace and expand their services to the other major cities in China such as Shanghai, Shenzhen and Guangzhou. Groupon.cn (launched in Beijing in March 2010) expanded its services to 108 cities in China within 3 months. Lashou.com (launched in Beijing in March 2010) operated in 100 cities in China by the end of August 2010. Some of the websites begin by charging their sellers very low service fees (of about 10 % as compared to 50 % charged by Groupon.com in the United States) to attract the collaboration of more sellers (Fang 2010).

The improved mechanisms and novel features of the deal-of-the-day group-buying websites can be classified as follows:

- **One day, one deal.** The group-buying auction time is limited to a single day. The pressure of such a limited buying time may lead to impulse buying behavior. As the deals change daily, buyers are motivated to monitor the websites on a daily basis.
- **Simple and clear discount rates.** Compared to the dynamic pricing system on the earlier group-buying websites in the United States and Europe, buyers can perceive more clearly how much discount they can obtain if there are sufficient buyers at the end of the day. If there are insufficient bids at the end of the day, no one is required to pay a fee.
- **Purchase online, redeem offline.** Upon successful online purchasing by credit card, buyers receive coupons by email or SMS. They can then redeem the coupons from the participating merchants at personally preferred times; thus reducing the logistics costs for these websites. Earlier group-buying websites delivered the products to the buyers.
- **Local merchants.** Deal-of-the-day group-buying websites feature deals provided by local merchants such as restaurants and cinemas in the cities where the websites are operational. Local deals are more likely to attract the targeted local buyers and make the redemption of the coupons easier.
- **High discount rates and free advertising platforms.** Deal-of-the-day group-buying websites offer very high discount rates compared with earlier group-buying websites (approximately 50–95 % discounts). The high discount rates induce more buyers into making

Fig. 1 Groupon.com in the US and Meituan.com in China

commitments to purchase. Sellers who publish deals on such websites hardly make any profit from the group-buying activities. What attracts them to offer deals with very high discount rates is the possibility of advertising themselves. Most of the local merchants are not well-known to the local buyers. Furthermore, at the end of the day, if the number of buyers who confirm to purchase does not meet the required number, the sellers do not need to pay any fees to the website while having benefitted from a full day's free advertising.

With the increasing competition of deal-of-the-day group-buying websites in the major cities of China, it has become extremely difficult for buyers to check hundreds of deals from different websites daily. For this reason, some websites such as Goutuan.net, Nietuan.com, and 54tz.com are aggregating information on deals from various websites and categorizing them based on price, discounts, product type and geographical location. Figure 2 shows the webpage of Nietuan which aggregates deal information on that day.

As a new variant of the group-buying business model, buyers' behavior in deal-of-the-day group-buying websites remains poorly understood. In the next section, we will examine the online group-buying literature which has mainly focused on the earlier group-buying websites.

Literature review

Online group-buying literature can be divided into three streams, i.e., in terms of studies from the perspectives of the seller, the agent (i.e., group-buying websites and dedicated systems), and the buyer. Studies in the first stream focus on examining whether the dynamic group-buying pricing mechanism is more efficient than the traditional fixed pricing mechanism. It was found that the group-buying pricing mechanism outperforms the fixed-price mechanism when the demand regime is uncertain (Anand and Aron 2003; Chen et al. 2004), when the seller is a risk-

Fig. 2 Deals from various websites gathered in Nietuan.com

seeker wishing to expand into new products markets (Chen et al. 2007), and when there are more low-valuation than high-valuation demands (Chen et al. 2010). These studies provide sellers with better insights into when to offer group-buying products and how to design the price curves in group-buying auctions.

Studies in the second stream focus on addressing the problem of gathering sufficient numbers of buyers for group-buying activities on group-buying websites. Several group formation approaches have been proposed including: 1) forming a buyer group for a category of items instead of a particular item (Yamamoto and Sycara 2001), 2) a long-term group formation mechanism based on trust relationships (Breban and Vassileva 2001, 2002a, 2002b), 3) allocating buyers to several group-buying websites (Hyodo et al. 2003), 4) credit-based group negotiation (Yuan and Lin 2004), 5) Combinatorial Coalition Formation (CCF) which allows buyers to announce their reserve prices for a combination of items (Li et al. 2010), 6) volume discount allocation mechanism, which is based on seller's reservation prices and payment adjustment values (Mastuo 2009), and 7) a decision support system based on buyers' preferences (Mastuo and Ito 2002, 2004).

Studies in the third stream focus on exploring buyers' adoption of the online group-buying mechanisms and the factors shaping such adoption. Buyers' adoption and behavior can be affected by parameters of the group-buying mechanisms, such as length of auction cycle times (Sharif-Paghaleh 2009), aiding information for purchasing decision-making (conditional purchase and information cue) (Tan et al. 2007), incentive mechanisms (Lai and Zhuang 2004, 2006; Kauffman et al. 2010a), and textual comments about sellers' past auctions and the existing number of orders (Kauffman et al. 2010b).

The commonality of previous online group-buying studies is that the investigations were conducted in the context of earlier group-buying business models. Notwithstanding the importance of the findings of the previous studies, since most of the websites adopting such group-buying business models are no longer in operation, there is a need for a fresh investigation of the group-buying phenomenon. In particular, the growing emergence of deal-of-the-day group-buying websites demands new investigations. This study focuses on examining buyers' behavior in deal-of-the-day group buying websites. The parameters under study are time-of-the-day and existing number of orders. We aim to answer questions such as: How do the time-of-the-day and the existing number of orders affect the purchasing tendency of visitors to a deal-of-the-day group buying website? How can more visitors be induced to commit to group-buying by adjusting the starting time of the group-buying auctions? The latter can also potentially contribute to the second research stream which focuses on how to attain a greater number of buyers.

To investigate these questions, we use and extend the concept of herd behavior.

Theoretical foundation and hypothesis development

Time-to-purchase

Investigating the ordering time of buyers in the group-buying auction for a digital camera on Mobshop.com, Kauffman and Wang (2001) found that there was a significant ending effect for the whole auction cycle which means that there were many more new orders placed near the end of the auction time. Towards the end of the auction time, as the price decreases, there are more buyers placing their orders. On deal-of-the-day group-buying websites, without dynamic pricing but with extremely high discount rates (i.e., discounts of approximately 50–95%) and very short auction time (one day), buyers may behave differently. Krogmeier et al. (1997) found that buyers purchased very early when the supply is inelastic because of their sense of urgency. Deal-of-the-day group-buying websites always indicate that the quantity of the deals are limited which creates sense of urgency for buyers. For the short auction time, Swain et al. (2006) showed that promotions of shorter duration created a greater sense of urgency which leads to higher purchase intentions. In fact, a longer promotion time reduces the urgency of the offer, which leads buyers to delay their commitment to purchase. Accordingly, sellers can include a time limit in a promotion which encourages buyers to buy immediately rather than later (Hanna et al. 2005). On deal-of-the-day group-buying websites, the short duration of the deals (one day) increases the potential buyers' sense of urgency to commit to purchase earlier rather than later as the websites constantly indicate that the quantity of the deals is limited (Dholakia 2010). It also encourages buyers to monitor the deals on a daily basis. Buyers' curiosity and their attraction to the extremely high discount rates influence them to browse the websites and commit to the deals early in the day. However, as the deals only commence at the inconvenient hour of 0 am, most potential buyers prefer to search for interesting deals in the early hours of the morning. As more and more potential buyers rise in the morning and become available to search for deals, the deal-of-the-day group-buying website might experience an increasing surge of buyers making the commitment to purchase during the first half of the day. As most of the potential buyers would have already searched for deals and made their purchasing decisions during the first half of the day, the deal-of-the-day group-buying website might experience a decreasing number of buyers making the commitment to purchase during the second half of the day. Hence, we hypothesize:

Hypothesis 1 On deal-of-the-day group-buying websites, the number of new orders has an inverted U relationship with the auction time.

Herd behavior

People often infer information from the actions of others and imitate each other, resulting in herd behavior. People are influenced by others in their decision-making process such as choosing the restaurant and product on the basis of their popularity (Banerjee 1992). In an online shopping environment, herd behavior also occurs for the potential buyers when they are making their purchasing decisions. Especially, the uncertainty of the online environment increases their reliance on other people's opinions or behavior. Buyers could make purchase decisions based on the information posted on the website and are more likely to imitate others. Exploring herd behavior in the online shopping environment, Huang and Chen (2006) remarked that sales volume can positively affect a potential buyer's decision in making an online purchase. Kauffman et al. (2010b) found that the existing number of orders can positively affect buyers' intentions to purchase in the online group-buying context.

Herd behavior occurs when buyers make an identical decision, but not necessarily ignoring their private information (Çelen and Kariv 2004; Smith and Sørensen 2000). When buyers check the deals on deal-of-the-day group-buying websites, they may hesitate to purchase since the local merchants featured are normally new or not well-known to most customers. The existing number of orders displayed on the website can induce buyers to make purchasing decisions. According to our first hypothesis, deal-of-the-day group-buying websites may experience a decreasing number of buyers making the commitment to purchase as most potential buyers would have already made purchasing decisions during the first half of the day. As a consequence, such herd behavior would only be observed in the first half of the day. Accordingly, we hypothesize:

Hypothesis 2 On deal-of-the-day group-buying websites, the existing number of buyers positively affects the number of new orders only in the first half of the day.

Methodology

In order to test the hypotheses, we collected data logs from one of the most popular deal-of-the-day group-buying websites in Beijing for 5 weeks. The website, launched in March 2010 in Beijing, is one of China's earliest and most successful deal-of-the-day group-buying websites. The number of new orders was captured on an hourly basis. In addition, the product type, tipped point (minimum required number of buyers), price, discount percentage, and the amount saved on each deal were recorded. Moreover, we interviewed eight members of the deal-of-the-day group-buying website under study (2 male and 2 female students, 2 male and 2 female young professionals). The main question was: "When do you browse deal-of-the-day group-buying websites and commit to the daily deal?"

Data analysis

After excluding deals which were discontinued before the end of the day and those whose auction times were extended to more than 24 h, we examined 21 deals of the day. As the unit of analysis is the number of new orders in each hour, we had a total of 504 observations. The products of the deals included restaurant vouchers, foot massage coupons, cinema tickets, coupons for snacks, game vouchers, sports center tickets, discount coupons for haircuts and vouchers of online shopping websites. The auction time of all the deals was between 00:00:00 and 23:59:59 of the same day. We observed that for all deals, the number of new orders per hour regularly increased rapidly between 9 am and 12 noon, which was the peak purchasing time during the day. Thereafter, it began to decline. Figures 3 and 4 depict the number

Fig. 3 Number of new orders placed in each hour for a cinema ticket deal
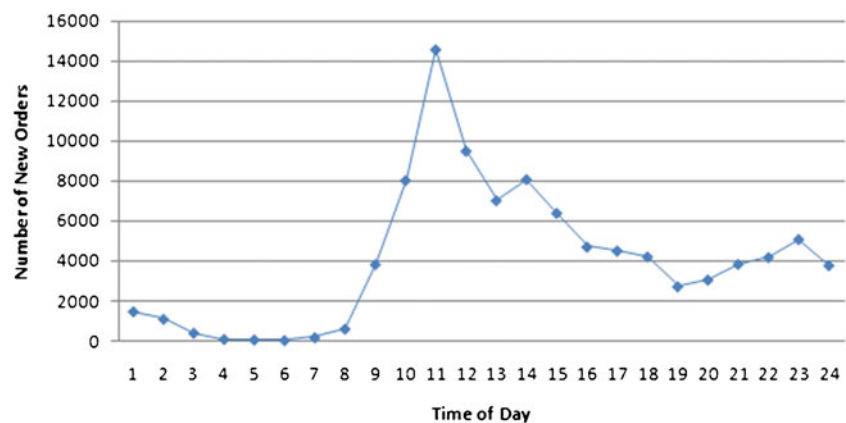
Fig. 4 Number of new orders placed in each hour for an online shopping website's voucher deal
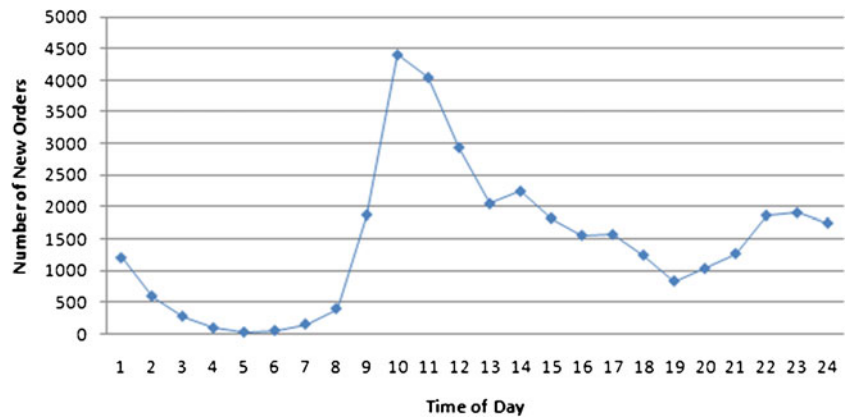
of new orders placed in each hour for the deals of a cinema ticket and an online shopping website's voucher.

According to the deal-of-the-day group-buying mechanism, the deal is confirmed when the number of buyers exceeds the required minimum number of buyers. Of the 21 deals that we captured, only 5 deals needed more than half an hour to attain the minimum number of orders. The fastest deal needed only 3 min and 20 s to attain the minimum number of orders after it was offered. Most of the deals were confirmed before 2 am. Accordingly, for the potential buyers, the deal-of-the-day group-buying websites are similar to the websites offering discount coupons. The only difference is that due to the extremely high discount rates, the deal-of-the-day websites constantly indicate that the "*Quantity is limited*".

Since the deals are changed daily, there could be some favorite deals, which were reflected by their total number of orders. In order to mitigate this favoritism effect, we divided the number of new orders made in each hour by the total number of orders made at the end of the day and converted this figure into the percentage of new orders made in each hour. The existing or current number of orders for each hour

was also divided by the total number of orders made at the end of the day and converted into a percentage. To control for the product types, the products offered were categorized into three groups, i.e., grocery/restaurant menu, leisure/entertainment, and others. Grocery/restaurant menu and leisure/entertainment products constitute the most popular deals in China, accounting for 24.50 % and 27 % of the total auction deals respectively (Fang 2010). We used two dummy variables, *Productcategory1* and *Productcategory2*, to indicate the different categories of products. Grocery/restaurant menu deals are selected as the base case and thus not coded. Our variables of interest are summarized in Table 1; whereas the descriptive statistics of deals are shown in Table 2.

Count data often follows a Poisson distribution. But Poisson regression is only appropriate when the mean and the variance are the same. When the distribution of the dependent variable is over-dispersed, Negative Binomial Regression is more appropriate. As the variance of *NewOrder* (10.888) is much larger than its mean (4.091), we utilized Negative Binomial Regression for analyzing the data to test for H1. To test H2, we split the data into two parts. One contained the data for the first half of the day

Table 1 Descriptions of the variables

Variable	Analytical meaning	Operational meaning
NewOrder	New orders placed in each hour	Percentage of new orders placed in each hour multiplied by 100
Time	Hour in each day	From 1 to 24
TimeSquared	Square of hours in each day	Square value of the hour
TippedPoint	Minimum required number of buyers	Positive integer number of minimum buyers
Productcategory1	Leisure/entertainment deals	1 for leisure/entertainment deals, and 0 otherwise
Productcategory2	Deals other than grocery/restaurant menu and leisure/entertainment	1 for deals other than grocery/restaurant menu and leisure/entertainment, and 0 otherwise
ExistingOrder	Number of existing orders	Existing orders divided by total number of orders and multiplied by 100
DayofWeek	The day of the week	Monday to Sunday are coded from 1 to 7
Price	The group-buying price for each deal	Price in RMB
Value	The market price for each deal	Price in RMB

Table 2 Descriptive statistics

Variables	Min	Max	Mean	Standard Deviation
NewOrder	0	14.908	4.091	3.300
ExistingOrder	0	97.302	37.393	32.676
Tippedpoint	10	100	22.619	25.735
Price	4	158	53.067	48.981
Value	8	1110	205.571	240.304

(0 am–12 noon) and the other part contained the data for the second half of the day (12 noon–12 midnight). For the first half of the day, the variance of *NewOrder* (16.452) was much larger than its mean (3.103) and we used Negative Binomial Regression for analyzing the data. For the second half of the day, the variance of *NewOrder* (3.409) was close to its mean (5.079) and we considered using Poisson Regression. Tables 3, 4 and 5 show the results of the tests. As Goodness-of-fit chi2 =150.344 and Prob>chi2(244)=1.000, Poisson Regression is appropriate for analyzing the data for the second half of the day.

Discussion of the findings

Based on the results of the analyses, we can conclude that there is indeed an inverted-U relationship between *NewOrder* and *Time* (see Table 3). Thus, Hypothesis 1 is supported. The control variables: *Productcategory1, Productcategory2, DayofWeek, Price, Value* and *Tippedpoint* have no significant effect on *NewOrder* for deals. Only a control variable *ExistingOrder* is significant on *NewOrder*, but in a negative direction. This finding is in-line with our second hypothesis which posits that only in the first half of the day, *ExistingOrder* has a significant positive effect on *NewOrder*. The results as shown in Tables 3, 4 and 5 support Hypothesis 2.

Based on the interviews, we noticed that all interviewees frequently searched for interesting deals-of-the-day on

websites such as Goutuan.net, Nietuan.com, and 54tz.com, which aggregate information on deals from various deals-of-the-day group-buying websites and categorize them on the basis of price, discounts, product type, and geographical location. We observed that young professionals search for the interesting deals upon arriving at their offices in the morning at around 9 am, as highlighted in the following interview log: "I browse websites after arriving [in] my office", "It is too late for me to wait for the beginning of the auction time at 0 am, so I search for deals in the morning in the office." Students also search for deals in the morning. They said: "I search for interesting deals after getting up in the morning for school if I have time"; "I search for deals in the morning while reading news online". These answers lend support to our study findings that: 1) there are more new orders in the first half of the day and the number will tend to decrease thereafter, 2) herd behavior is only observable in the first half of the day.

Theoretical and practical implications

This study explores buyers' purchasing behavior on the deal-of-the-day group-buying websites which provide a new online shopping context. It offers several theoretical and practical implications. From the theoretical perspective, this study makes contributions to the online buying behavior literature and more specifically, to the online group-buying literature. It examines the variable of purchasing time which is rarely explored by the existing literature under the online shopping context. Herd behavior explains that buyers may follow the actions of others. However, when to take advantage of herd behavior and how to maximize its effects in an online marketplace remains unstudied. It is important to understand buyers' preferred purchasing time in order to answer these two questions. This study highlights that with product offers of limited available time, buyers are motivated to purchase earlier due to their sense of urgency. Accordingly,

Table 3 Result of Hypothesis 1

NewOrder	Coef.	Std. Err.	z	P>|z|	[95 % Conf.	Interval]
Time	0.373	0.026	14.29	0.000	0.321	0.424
TimeSquare	−0.007	0.001	−8.40	0.000	−0.009	−0.005
DayofWeek	−0.015	0.016	−0.91	0.364	−0.047	0.017
Productcategory1	0.053	0.111	0.47	0.635	−0.165	0.271
Productcategory2	0.022	0.081	0.27	0.785	−0.136	0.181
Tippedpoint	0.001	0.001	0.69	0.493	−0.002	0.003
ExistingOrder	−0.024	0.004	−6.02	0.000	−0.031	−0.016
Price	0.000	0.001	0.15	0.884	−0.002	0.002
Value	0.000	0.000	−0.88	0.379	−0.001	0.000
_cons	−1.074	0.196	−5.50	0.000	−1.458	−0.691

Number of obs =504

LR chi^2 (9) =269.06

Prob>chi^2 =0.000

Log likelihood =−1119.943

Table 4 Result of Hypothesis 2 for the first half of the day

NewOrder	Coef.	Std. Err.	z	P>|z|	[95 % Conf.	Interval]
ExistingOrder	0.089	0.010	9.37	0.000	0.071	0.108
DayofWeek	−0.032	0.043	−0.76	0.449	−0.116	0.052
Productcategory1	0.182	0.294	0.62	0.537	−0.395	0.759
Productcategory2	0.073	0.214	0.34	0.733	−0.346	0.492
Tippedpoint	0.000	0.003	−0.02	0.986	−0.006	0.006
Price	0.002	0.003	0.64	0.522	−0.004	0.007
Value	0.000	0.001	−0.33	0.743	−0.001	0.001
_cons	0.171	0.316	0.54	0.589	−0.448	0.790

Number of obs =252

LR chi^2 (7) =90.85

Prob>chi^2 =0.000

Log likelihood =−518.339

the effect of herd behavior can only be maximized in the early hours of the deal of the day. These findings contribute to the second stream of existing online group-buying literature on how to gather more buyers for group-buying activities with limited duration. In addition, these findings are different from what Kauffman and Wang (2001) found from research on the previous generation of group-buying websites in which the existing number of buyers positively affects the number of new buyers for the entire duration of a group-buying activity.

Compared to the previous online group-buying business models, the deal-of-day group-buying model provides a shorter time span for buyers to purchase online. However, deals are featured regularly (daily) with high discounts, and buyers acquire the habit of searching for interesting deals early due to their sense of urgency. The variable of time becomes important under this new online group-buying context. Future research may be interested to explore the following research questions: (1) Is 1 day (24 h) the optimal duration to attract more buyers? (2) Is 0 am the optimal starting time to attract more buyers? (3) How can more buyers be induced to commit to a deal as soon as it is announced in order for the website to exhibit a high number of existing buyers? Field studies would be a suitable research method to test different manipulations (e.g. length of deal duration, starting time, notification of deals in advance, etc.) since we want to observe buyers' purchasing behavior over long periods.

Although the study has some important contributions for future research, the findings of the study are based on the hourly interaction data captured from one of the popular deal-of-the-day group buying websites in Beijing, China. Future research should test the generalizability of the findings with data from other websites. Future research may test the hypotheses in other cultural contexts, such as at the United States, where deal-of-the-day group-buying websites originated, and European countries where deal-of-the-day group-buying websites can potentially be popular in the near future.

Despite its limitations, this study offers several implications for group-buying website owners. This study shows that the time factor could be manipulated to induce more buyers to commit to the deals. The time duration of 9 am to 12 am is the peak time when most of the potential buyers are searching for deals. One of the characteristics of the deal-of-the-day group-buying websites is that they feature local merchants. Most of the local merchants are not well-known and use the avenue for promotion. Accordingly, some buyers may hesitate to commit to the deals unless they observe that many people are accepting the deals. The main issue here is that although the deals commenced as early as 0 am, only a few orders are placed between 0 am and 9 am. To take advantage of herd behavior during the peak period when most of the potential buyers are searching for deals, the deals could be offered in the early evening for 24 h. By shifting the starting time several hours earlier, a higher existing number of buyers could be displayed at 9 am the following day. Accordingly, some people who check for

Table 5 Result of Hypothesis 2 for the second half of the day

NewOrder	Coef.	Std. Err.	z	P>|z|	[95 % Conf.	Interval]
ExistingOrder	−0.003	0.002	−2.10	0.035	−0.006	0.000
DayofWeek	−0.001	0.016	−0.10	0.924	−0.032	0.029
Productcategory1	0.082	0.112	0.73	0.463	−0.137	0.301
Productcategory2	0.103	0.078	1.32	0.187	−0.050	0.257
Tippedpoint	−0.001	0.001	−0.78	0.438	−0.004	0.002
Price	0.002	0.001	1.62	0.105	0.000	0.003
Value	0.000	0.000	−0.32	0.745	−0.000	0.000
_cons	1.748	0.165	10.61	0.000	1.425	2.070

Number of obs =252

LR chi^2 (7) =12.91

Prob>chi^2 =0.074

Log likelihood =−507.767

deals from a navigation website in the morning will notice the higher number of orders on such a website as compared with the deals featured by other websites. This may in turn induce them to visit the deal-of-the-day group buying website with the highest number of existing orders.

Moreover, deal-of-the-day group-buying websites normally send emails to their members to inform them of *Today's Deal* slightly after midnight. These emails are probably ignored by the members as they may have dozens of such emails in their mailbox when they check it in the morning. Since most potential buyers will only start searching for interesting deals and make purchasing decisions in the morning, the deal-of-the-day group-buying websites should instead send emails to their members in the morning, e.g. around 9 am, to inform them of *Today's Deal* and indicate the existing number of buyers. At that hour, they may pay more attention to the information sent on the deal. Moreover, if there is a high number of existing buyers indicated along with the information on the deal, it will increase their tendency to commit to the deal as well.

Finally, if the group-buying websites prefer to feature deals from 0 am for 24 h, they need to motivate more buyers to purchase during the early hours of the deal in order to have a high existing number of buyers displayed on the website. Websites could send emails to their members in the evening to inform them about *Tomorrow's deal* such as the product category, discounted prices, limited quantity, etc. Highly motivated buyers may wait for this deal until it is offered and make their commitments to purchase. Giving more discounts or benefits for the first 20 buyers, for example, may attract more buyers to purchase during the early hours of the deal.

Conclusion

In this paper, we first discussed the emergence of deal-of-the-day group-buying websites. We highlighted the novel aspects of deal-of-the-day group-buying websites as compared to the previous group-buying websites as well as the advantages of this new group-buying business model in comparison with the previous ones. We then presented the previous group buying literature from the perspectives of the seller, the agent, and the buyer. We emphasized that our study mainly focuses on buyers' behavior in the new deal-of-the-day group-buying business model. Based on data from more than 500 hourly orders collected from a deal-of-the-day group-buying website, we found that the auction time and new orders for each hour have an inverted-U relationship. In fact, 9 am to 12 am is the peak purchasing period of the featured deals. Buyers are in the habit of searching for deals during the first half of the day and accordingly we found that the number of existing orders

positively affects the number of new orders only in the first half of the day. This is different from what Kauffman and Wang (2001) found from the previous generation of group-buying websites where the existing number of buyers positively affects the number of new buyers for the entire duration of a group-buying activity. Sellers and website owners engaged in deal-of-the-day activities are advised to focus on how to induce more potential buyers to purchase during the first half of the day. For online group-buying research, this study not only provides a comprehensive description of the newest deal-of-the-day group-buying business model, but also explores the purchasing behavior in this new group-buying context to add to the extant research on the early group-buying models.

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