"When you write review" matters: The interactive effect of prior online reviews and review temporal distance on consumers' restaurant evaluation

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Abstract

Purpose: This study aims to investigate how prior reviews posted by other consumers affect subsequent consumers' evaluations, and to what extent the review temporal distance can increase or reduce the social influence of prior reviews. In this study's restaurant context, review temporal distance refers to the duration between dining time and review time of a dining experience.

Design/methodology/approach: The data of paired online restaurant reservations and reviews is analyzed using Ordered Logit Model. Two robustness checks are conducted to test the stability of the main estimation results.

Findings: The empirical results demonstrate that (1) consumers' restaurant evaluation is socially influenced by both the prior average review rating and number of prior reviews; (2) review temporal distance has a direct negative effect on consumers' restaurant evaluation; (3) review temporal distance increases the social influence of prior reviews.

Practical implications: Our study suggests that *when* consumers write online review matters. Both restaurants and the online review platforms should encourage consumers to share their experiences and post online reviews immediately after their consumption.

Originality/value: The study contributes to the literature on electronic word-of-mouth, social influence and psychological distance. First, the bi-directional nature of social influence on electronic word-of-mouth for experience-oriented product is documented. Second, for the first time, this study examines how review temporal distance could affect the social influence on consumers' restaurant evaluation.

Keywords: Social influence, temporal distance, consumer evaluation, online reviews

1. Introduction

Online review becomes an increasingly popular and important source of word-of-mouth for today's consumers, particularly for travel information search and booking (Xiang and Gretzel, 2010). In addition, the positive valence of online review ratings and the number of online reviews are reported to have positive impact on the firms' product sales and financial performance (Zhu and Zhang, 2010). When online review rating increases by 1%, the hotel sales per room would increase for more than 2.5% correspondently (Öğüt and Onur Taş, 2012). In addition, positive consumer reviews, in general, bring a price premium for hotels listed on the online travel agents (Yacouel and Fleischer, 2012). Therefore, it is essential and meaningful to understand the factors influencing consumers' online review rating behavior in hospitality and tourism.

Most extant literature assumes that online consumer-generated review ratings are truthful feedback and unbiased reflection of consumers' product experience (Hu et al., 2011). However, Moe and Schweidel (2012) argue that an individual, when making the rating decision, tends to observe the prior reviews posted by past consumers and then adjusts his or her own evaluation accordingly, which indicates that consumers are likely to be socially influenced. However, to our best knowledge, there is limited understanding in previous literature on the social influence of prior online reviews as well as the associated factors affecting this social influence (Moe and Schweidel, 2012; Zhang et al., 2016). The discussion is even scarcer for the hospitality products, which is experience-oriented in nature.

If the social influence of online reviews does exist, a follow-up question may be raised as how to reduce the social influence of prior online reviews to generate more accurate evaluations. Today's rapid information technology advancement has enabled consumers to conveniently share

their consumption experiences on social media anytime they want (Law et al., 2014, 2004; Wu et al., 2017). According to the memory-strength theory (Hinrichs, 1970), all items in the memory have a strength, which declines over the passage of time. Therefore, it is meaningful to examine whether and how review temporal distance (i.e., the duration between consumption and review posting) could reduce (or increase) the social influence of prior reviews on focal consumers' product evaluation. To the authors' best knowledge, this particular research question is yet to attract academic attention from either marketing or hospitality field.

To fill the above research gaps, this study aims to investigate whether prior reviews posted by other consumers affect a subsequent consumer's evaluation on experience-oriented hospitality product. In particular, this study uses the restaurant business as the research context, and applies the data of online restaurant reservations and reviews in the analysis. This study also further examines the extent to which the review temporal distance can increase or reduce the social influence of past consumer reviews.

2. Literature review

2.1 Electronic WOM (eWOM)

EWOM refers to all informal communications directed at consumers through Internet-based technology related to the usage or characteristics of particular goods and services, or their sellers (Litvin et al., 2008, p.461). EWOM encompasses a variety of media forms and websites, with the dominant one being online reviews (Tsao et al., 2015).

Consumers are increasingly relying on online reviews to make purchase decisions, especially in the hospitality industry (Sparks and Browning, 2011; Zhang et al., 2018a; Zhang et al., 2018b), largely due to the intangibility and experience-oriented nature of the product/service and consequently higher perceived risks among consumers. The power of online reviews on

consumers' restaurant and hotel booking/purchase decision has been identified in the previous literature. For example, studies report that review rating valence significantly affects hotel booking intention (Mauri and Minazzi, 2013; Chan et al., 2017), and drive product sales and revenue (Blal and Sturman,2014). In addition, consumer overall rating is found to be positively associated with hotel performance (Xie et al., 2014).

EWOM also connects with online review volume (i.e., the total number of online reviews) to reflect the product popularity and awareness (Li et al., 2017). A large review volume generally implies that consumers are interested in talking about this product, which leads to high product awareness among people (Dellarocas et al., 2007). In addition, perceived purchasing risks decline significantly with the increase of consumer review volume, particularly for the experience-oriented hospitality products (Tsao et al., 2015). Consumer review volume also demonstrates a positive influence on product sales and enterprise performance (Dellarocas et al., 2007; Zhu and Zhang, 2010), and the influence is stronger on sales of experience products than that of tangible attribute-based commodities (Cui et al., 2012).

2.2 Influence of past online reviews

The social influence theory suggests that people tend to experience conformity pressures from others. Specifically, people conform to the social influence from the peers they are familiar with, from those they do not know (Darley and Latane, 1968; Cialdini and Goldstein, 2004), and even from abstract reference groups. The reasons of conformity behaviors could include the following: (1) following others can result in fewer mistakes; (2) following others is associated with lower mental effort; and (3) fear of losing reputation if deviating from the majority of others (Cialdini, 2009).

Moreover, based on the anchoring effects in judgment, people may apply an anchoring-

and-adjustment heuristic when making a decision (Kahneman, 1974). Specifically, a customer may start from an initial value, which may be based on other prior consumers' average rating as an anchor, and then makes adjustment according to the perceived disconfirmation obtained from his/her own consumption experience. There exists a systematic bias in that customers' final evaluations are likely to skew toward the anchor, as the anchor tends to cause biased retrieval of previous experience so consumers make it consistent with the initial anchor. The anchoring effects in judgment are more prominent when the experience needs to be recalled. The current online review and rating system is likely to bring the anchoring bias and significantly influences the subsequent consumers' evaluation of a product (Adomavicius et al., 2013).

Service marketing literature suggests that WOM influences customer expectations (Zeithaml et al., 1993). To reduce risks, consumers usually collect information from both online and offline to discover what can be expected from the product (Mauri and Minazzi, 2013). Moreover, in the process of restaurant and hotel reservations, consumers are also exposed to online reviews posted by other consumers. On this basis, as an important WOM, online reviews could set up consumers' pre-purchase expectations toward a product before making the purchase decision. According to the expectancy-disconfirmation theory, the expectation would influence consumers' satisfaction and the following review ratings (Ho et al., 2017). Even if consumers do not check online reviews before purchase, they are usually able to see prior reviews and ratings provided by other customers on the review page after purchase when they are about to post their own reviews (Moe and Schweidel, 2012). Therefore, consumers are very likely to exposed to online reviews before and/or after the purchase when they are about to post online reviews (Ho et al., 2017).

An online review rating is comprised of a customer's real consumption experience and

the social influence of prior reviews on this individual consumer (Moe and Trusov, 2011). However, extant empirical studies report inconsistent findings regarding the impact of prior reviews on subsequent review ratings, including the positive influence (Ma et al., 2013) and negative influence from prior reviews (Hu and Li, 2011). In addition, when consumers check product online reviews, they are exposed to not only the existing average review rating, but also the number of existing reviews, which is commonly used as a proxy for the business popularity **(**Lee et al., 2015**;** Li et al., 2017**)**. In fact, prior literature has indicated a strong positive association between product popularity and perceived product quality, that is, being popular itself signals high product quality (Zhu and Zhang, 2010). Consumers tend to interpret large market share or product popularity as high product quality (Hellofs and Jacobson, 1999). On this basis, the following two hypotheses are proposed:

Hypothesis one: *Restaurant prior average review rating has a positive influence on the subsequent review rating.*

Hypothesis two: *The number of prior reviews of a restaurant has a positive influence on the subsequent review rating.*

2.3 Moderating effect of review temporal distance

Human memory is often inaccurate, and the false recollection sources include interpersonal influence and social pressure (Meade and Roediger, 2002; Loftus, 2005; Schacter, 2002). This phenomenon is named as “memory conformity” (Wright et al., 2009) and occurs in different contexts, such as mass media exposure, social interactions, and eyewitness testimony (Edelson et al., 2011). As a result, individuals may match a false account provided by others and correspondingly revise their veridical recollections of the past events (Meade and Roediger, 2002; Loftus, 2005; Schacter, 2002). They present a strong conformity tendency to erroneous

recollections of the group even when their initial memories were accurate and strong (Edelson et al., 2011).

Ross and Wilson (2002) use the word "closeness" or "nearness" to describe people's perceived impression of temporal distance between past and present. They further state that the sense of memory closeness or nearness is often associated with the passage of time. According to the memory-strength theory (Friedman, 1993; Hinrichs, 1970), all items in memory have strength but they decline over time, either through decay or interference of following events. Moreover, the memory-strength theory is also verified by the forgetting curve, in which information in an individual's memory losses significantly with the passage of time when there is no attempt to retain it (Ebbinghaus, 1964; Murre and Dros, 2015).

The temporal distance between the present and the past is one type of psychological distance. According to the construal level theory (CLT), psychological distance can change the mental presentations of the past events in people's memory (Liberman and Trope, 1998). Specifically, events that happened a long time ago tend to be presented in high-level terms of abstract and central features; whereas recent events tend to be presented in low-level terms of concrete and detailed features (Trope and Liberman, 2000, 2003). This is consistent with the memory-strength theory, which highlights that detailed information losses over time in people's memory. Therefore, it is reasonable to propose that the longer temporal distance, i.e., the longer time between a restaurant dining experience and posting the review, the more likely consumers are to think in high-construal manner and focus only on abstract and central features, but would neglect the concrete, contextual, and detailed features. Therefore, consumers are more likely to find a reference or anchor, such as the prior average review rating and the number of prior reviews, and then make corresponding adjustment according to the central features of their

dining experience kept in mind.

On this basis, the following hypotheses are proposed:

Hypothesis three: *The influence of prior average review rating on subsequent restaurant rating is moderated by the review temporal distance. Specifically, the influence is stronger when a consumer has a longer review temporal distance; the influence is weaker when a consumer has a shorter review temporal distance.*

Hypothesis four: *The influence of the number of prior reviews on subsequent restaurant rating is moderated by the review temporal distance. Specifically, the influence is stronger when a consumer has a longer review temporal distance; the influence is weaker when a consumer has a shorter review temporal distance.*

The research framework is summarized in Figure 1, as follows:

*****Insert Figure 1 Here*****

3. Method

3.1 Data collection

For the first time, this current research seeks to test the role of review temporal distance on the social influence effect on consumers' online review behavior, which has been rarely discussed in previous literature due to the difficulty of measuring review temporal distance. This study used a unique dataset from a leading third-party restaurant reservation website in China, *Xiaomishu* (www.xiaomishu.com), which allows consumers to reserve restaurants and post relevant dining reviews. It offers restaurant reservations in more than 363 major cities in China in 2012, and had over 3,000,000 members in 2014 (Xiaomishu, 2018). The website records consumers' dining information (e.g., dining time and date) in the process of reservation, and appends the dining information to the corresponding posted review. On this basis, we

innovatively combined the reservation dataset and the review dataset, and calculated the time duration between the dining and its correspondent review posting.

We collected the restaurant reviews in Shanghai, China as this city is the birthplace of *Xiaomishu* site and owns the largest number of users. Moreover, Shanghai is one of the most well-developed cities in China's restaurant and catering industry, and the total restaurant and catering revenue ranks the first across the country (China Industry Research Website, 2018). A crawler and a parser were developed, respectively, to automatically download web pages of restaurants and to parse the HTML and XML web pages into a database. Two types of reviews were available, including regular reviews (those posted by any consumers who log in the website without reservations through *Xiaomishu*) and reservation reviews (those pertaining to corresponding restaurant reservations with dining time information). We extracted the overall review rating, review time, review text and the number of pictures contained, and the device through which the review was posted. The dining time for each corresponding reservation review was collected, as well as all reviews written by any individual reviewer, including his/her reviews for restaurants in Shanghai and other regions. In addition, we collected the restaurant level variables, including the lowest price of per capita consumption, the highest price of per capita consumption, and the cuisine style of the restaurants.

In March 2017, we gathered all consumer reviews for restaurants in Shanghai ranged from January 2011 to March 2017, and obtained 307,348 reviews from 25,627 restaurants, with 173,168 reservation reviews in particular. The reservation reviews with no review rating or being the first review of a restaurant were removed. As a result, 164,309 reservation reviews were included in the formal data analysis.

3.2 Variable operationalization

The dependent variable is the review rating (*Rating*), based on the five-point rating scale of the website. *Rating* is measured by an integer ranging from 1 to 5 (1 = "very dissatisfied" and 5 = "very satisfied") as an ordinal variable.

Independent variables include the average review rating (*AveRating*), and the number of reviews (*RatingNum*) before the focal individual customer's current review for a specific restaurant in the restaurant's review sequence.

The moderating variable is the review temporal distance (*TemporalD*). We calculated the review temporal distance as the duration between the actual dining time and the review time of that dining experience from the *Xiaomishu* website, in the unit of day (accuracy to minute).

To isolate the effects of the variables of interest, we controlled the factors deemed important in previous literature, including review specific variables, consumer specific variables, restaurant specific variables, and time specific variables (Huang et al., 2016). The review-related controlling variables include the number of characters in a review (*RevText*), number of pictures in a review (*RevPic*), and the device through which a review was posted (*Device*). In order to account for the consumer heterogeneity effect (i.e., consumers may be systematically positive or negative) and consumers' past reviewing experience, we controlled the reviewer's average review rating before the current review (*ConAveRating*) and the reviewer's volume of past reviews before the current review (*ConRatingNum*). Restaurant related variables were controlled as well, including the lowest price and highest price of per capita consumption for a specific restaurant (*LowPrice* and *HighPrice*), and the cuisine style of a restaurant (*CuisineStyle*). In addition, we controlled the time specific variables to account for the unobserved temporal heterogeneity. Specifically, we controlled the year fixed effects (*Year*) by adding a vector of year dummy variables to account for year-specific exogenous shocks. The month fixed effects

(*Month*) was also controlled by incorporating a series of month dummy variables to account for any possible seasonal effects on online restaurant rating. The measurements of all variables in this study are shown in Table 1.

*****Insert Table 1 Here*****

3.3 Econometric model

According to previous literature (Godes and Silva, 2012), we apply the following Ordered Logit Model (Cameron and Trivedi, 2005, p. 519-520) to test the hypotheses.

y_{ijt}^{*} is a latent variable ranging from $-\infty$ to $+\infty$, and it depends on a series of independent variables, as follows:

$$
\begin{aligned}
y_{ijt}^{*} = {} & \alpha_1 \mathrm{AveRating}_{jt} + \alpha_2 \mathrm{RatingNum}_{jt} \\
& + \alpha_3 \mathrm{TemporalD}_{ijt} \\
& + \alpha_4 \mathrm{TemporalD}_{ijt} \times \mathrm{AveRating}_{jt} + \alpha_5 \mathrm{TemporalD}_{ijt} \times \mathrm{RatingNum}_{jt} \\
& + \alpha_6 \mathrm{RevText}_{ijt} + \alpha_7 \mathrm{RevPic}_{ijt} + \alpha_8 \mathrm{Device}_{ijt} \\
& + \alpha_9 \mathrm{ConAveRating}_{it} + \alpha_{10} \mathrm{ConRatingNum}_{it} \\
& + \alpha_{11} \mathrm{LowPrice}_{j} + \alpha_{12} \mathrm{HighPrice}_{j} + \alpha_{13} \mathrm{CuisineStyle}_{j} \\
& + \sum_{T_1} \lambda_t * \mathrm{Year}_t + \sum_{T_2} \tau_t * \mathrm{Month}_t + u_{ijt} \qquad (1)
\end{aligned}
$$

where *i* refers to the consumer; *j* refers to the restaurant; *t* refers to the time; u_{ijt} is a is the logistic distributed with $\mathrm{F(z)} = \mathrm{e^z}/(1 + \mathrm{e^z})$.

As y_{ijt}^{*} crosses a series of increasing unknown thresholds we move up the ordering of alternatives (Cameron and Trivedi, 2005, p. 519-520). For instance, for very low y_{ijt}^{*} customer's evaluation is very poor, for $y_{ijt}^{*} > \alpha_1$ customer's evaluation increases to poor, for $y_{ijt}^{*} > \alpha_2$ it

increases to neutral, and so on. We define the ordered model in this study as follows (Cameron and Trivedi, 2005, p. 519-520):

$$\begin{aligned}\Pr\left[\text{Rating}_{ijt} = j\right] &= \Pr\left[\alpha_{m-1} < y_{ijt}^{*} < \alpha_{m}\right] \\ &= \Pr\left[\alpha_{m-1} < x_{ijt}'\beta + u_{ijt} < \alpha_{m}\right] \\ &= \Pr\left[\alpha_{m-1} - x_{ijt}'\beta < u_{ijt} < \alpha_{m} - x_{ijt}'\beta\right] \\ &= F\left(\alpha_{m} - x_{ijt}'\beta\right) - F\left(\alpha_{m-1} - x_{ijt}'\beta\right), \end{aligned} \quad (2)$$

where F is the cdf of u_{ijt}.

The threshold values (α_m) and the regression parameters β can be obtained by using the maximum log-likelihood estimation method with Equation (2).

4. Results

4.1 Estimation results

Table 2 shows the estimation results of the ordered logit model. The valence of a review rating is treated as the dependent variable. Models 1.1 does not control the variables related to consumers' past reviewing behavior, including the reviewer's prior average review rating and the reviewer's volume of prior reviews; whereas Model 1.2 includes these two particular consumer-related control variables. As including consumer past reviewing variables in the model will exclude the consumer sample who wrote online review only once, we estimate the two models separately to test the robustness of the empirical results. According to the results shown in Table 2, the estimation results are stable and consistent between Models 1.1 and Models 1.2. Therefore, we use Model 1.2 as our final estimation results.

*****Insert Table 2 Here*****

The estimation results demonstrate that the "prior average review rating" had a positive effect on subsequent consumer restaurant rating (coefficient =0.8839552, $p < 0.01$), which indicates that a consumer tends to rate a restaurant higher if past consumers' reviews present high ratings for the restaurant in general. Therefore, Hypothesis 1 was supported. In addition, the results demonstrate that the number of prior reviews positively influenced the subsequent restaurant rating for the same restaurant (coefficient =0.00017, $p < 0.01$). Therefore, Hypothesis 2 was supported (see Table 2).

Further data analysis was conducted to test the moderating effect of review temporal distance on the relationship between prior average review rating and the subsequent rating for the same restaurant. As shown above, a consumer's restaurant evaluation/rating tends to be positively influenced by prior average review rating. However, this positive social influence was strengthened, as indicated by statistically significant and positive interaction coefficients between review temporal distance and prior average review rating (coefficient =0.0001535, $p < 0.05$). Therefore, Hypothesis 3 was supported (see Table 2). Similarly, the results also demonstrate that the positive relationship between the number of prior reviews and the subsequent restaurant rating was strengthened, as indicated by a statistically significant and positive interaction coefficient (coefficient =0.000000121, $p < 0.05$). Therefore, Hypothesis 4 was supported (see Table 2). Interestingly, the empirical results also show that the review temporal distance had a direct negative effect on consumer restaurant evaluation (coefficient =-0.0006551, $p < 0.05$), which indicates that a consumer tends to rate a restaurant lower if he/she writes a review after a longer period of time, rather than immediately.

The small coefficients generated in the analyses are due to the unit and measurement of

the dependent, independent, and moderating variables in this study. According to Table 1, the dependent variable review rating is an ordinal variable, ranging from 1 to 5, which had relatively small value and standard deviation (Mean=4.10; Std. Dev. =0.82). At the same time, the independent and moderating variables, i.e., the number of prior reviews (mean=220.97; Std. Dev. =251.36) and review temporal distance (mean=132.77; Std. Dev. =328.23), had relatively large values and standard deviations. Therefore, it is unsurprising to generate small coefficients in the above estimation results.

4.2 Robustness check

Robustness test by including consumer fixed effects. In the main models shown in Table 2, we controlled the consumer-related factors, including the focal consumer's prior average review rating and his/her volume of prior posted reviews, which are the variables varying with time. However, other consumer heterogeneity which does not vary over time, such as the gender, education, and social status, may not be considered. On this basis, to avoid the estimation bias and increase the generalizability, we conducted another robustness check by including a series of consumer dummies (the number of dummies = the number of consumers - 1) into the main models. In order to increase the estimation efficiency and the model freedom, we only included the reviews posted by consumers who wrote at least 10 reviews in *Xiaomishu*. Finally, we incorporated 3,591 dummies (i.e., 3,592 consumers) in the main models and the estimation results are shown in Table 3. The newly estimated results in Table 3 demonstrate consistent and similar outcome compared to the estimation results of the main models shown in Table 2.

*****Insert Table 3 Here*****

Robustness test by using ordinary least squares (OLS). To test the robustness of the results estimated using ordered logit model, we re-estimated the empirical models by using another estimation method—OLS, and checked the sensitivity of results. The newly estimated results of OLS were quantitatively similar to the estimation results shown above (see Table 4).

*****Insert Table 4 Here*****

All the above hypotheses testing results are summarized in Table 5.

*****Insert Table 5 Here*****

5. Conclusion and Implications

5.1 Discussion

Given the significant influence of online reviews on consumers' purchase decision and business profitability, understanding the social influence on consumers' online product evaluation and process is considerably important. This study reviews the literature on social influence and temporal distance to formulate the hypotheses, and employs ordered logit regression models to examine the influence of prior reviews posted by other consumers, review temporal distance (i.e., the duration between restaurant dining and online review posting), and their interaction effect on consumers' restaurant evaluation. Further robustness checks were conducted and demonstrated quite stable and consistent results.

First, this study shows that consumers' restaurant evaluation is positively influenced by

prior average review rating and the number of prior reviews. In other words, a consumer tends to rate a restaurant higher if the existing aggregate rating is high or there are a large number of prior online reviews. Current consumers tend to use the prior average review rating as an anchor, and adjust their own rating based on their personal experience accordingly. Moreover, consumers also tend to rate a restaurant higher if it is a popular restaurant. This result is consistent with Zhang et al.'s study (2016), which shows that the number of expert reviews positively affect subsequent reviewers' ratings for hotels. In addition, Ma et al. (2013) demonstrate that prior review ratings have a positive influence on subsequent ratings on Yelp. By contrast, Hu and Li (2011) reveal that prior book review ratings show a negative influence on the following reviews, which indicates a differentiation behavior. The possible inconsistency may be explained the existence of potential moderating factors in the social influence process. For example, Berger and Heath (2008) suggest that consumers tend to show stronger differentiation behavior for niche products than mainstream products. In addition, in a recent study of Lee et al. (2015), a movie's popularity may determine whether the subsequent consumers imitate or differentiate themselves from prior review ratings.

Second, review temporal distance increases the social influence/bias of prior reviews. Specifically, the social influence from prior average review ratings and number of prior reviews is stronger when a consumer has a longer review temporal distance, and vice versa. Our results indicate that online reviews are not necessarily unbiased, true reflection of consumers' restaurant experience. In other words, consumer online reviews are a combination of consumers' restaurant experience and the social influence coming from prior reviews. Most previous research regarding social influence in online reviews have focused on aggregate behavior, thereby neglected the differences based on review temporal distance.

Third, review temporal distance has a negative direct effect on consumer evaluation. In this study, the average rating of all restaurant reviews was 4.10 (see Table 1), which means that consumers in general have good dining experiences in the restaurants. According to the memory-strength theory and the forgetting curve, the strength of good dining experience memory declines over time, either through decay or following events interference. Therefore, consumers who post online restaurant review/evaluation after a longer period of time tend to rate the restaurant more negative than their counterparts who post review/evaluation immediately after consumption. However, this finding is in contrast to Huang et al.'s (2016) study findings, in which review temporal distance shows a significantly positive effect on consumer product evaluation. A comparison between this study and Huang et al. (2016) reveals two differences: 1) The measurement unit of review temporal distance in Huang et al.'s (2016) study uses "month" as the unit, whereas in our study is "day" (accuracy to minute), which is more reasonable and more accurate; 2) The data source applied in our study is *Xiaomishu*, one of the most popular restaurant reservation and restaurant review platforms in China; whereas Huang et al.'s (2016) study uses the restaurant reviews from *TripAdvisor*, which is more well-known for hotel and trip reviews.

5.2 Theoretical implications

This study contributes to the literature by extending previous findings on eWOM literature, social influence and psychological distance literature regarding online reviews in several ways.

First, this study documents the bi-directional nature of social influence on electronic word-of-mouth for experience-oriented product. In contrast to most previous literature which rarely questioned the truthfulness and bias issues of online reviews, this study takes an initial

attempt to examine the influence of prior reviews provided by past consumers on subsequent review rating for experience-oriented product in hospitality management filed (in this case, restaurant dining experience). The empirical results from this study show that a consumer's restaurant evaluation is socially influenced by prior average review rating as well as the number of prior reviews. This indicates that online reviews are possibly biased, and online reviewers, who may influence others as opinion leaders, could also be somewhat socially influenced.

Second, although review temporal distance is highly relevant and important for hospitality firms in the digital marketing environment (Chen and Lurie, 2013), the influence of review temporal distance is underexplored in both business and hospitality management field (Huang et al., 2016). For the first time, this study tests the role of review temporal distance in increasing or reducing the social influence/bias of prior reviews on consumers' product evaluation on experience-oriented product. The research findings show that not only *what* consumers write in online reviews is important, but also *when* consumers post online reviews matters, as the time point of writing an online review determines the review rating accuracy and objectivity, as well as the rating positivity.

Third, this study contributes to the literature on temporal distance by extending this concept into the online review context. Moreover, most past research on temporal distance applied experimental design, in which temporal distance is measured by a researcher-created discretionary, i.e., different categorical levels of temporal distance (Huang et al., 2016). The only exception is Huang et al. (2016), who measured the temporal distance by using values ranging from 0 to 11 months (i.e., the number of months between the consumption date and the review date). Using the particular dataset in this study, we are able to measure review temporal distance continuously (as opposed to categorically) and more accurately (number of days instead of

number of months) with a wide range of naturalistic temporal distances. The measurement of review temporal distance in this study makes the estimation results and findings more reliable, robust and accurate.

Fourth, most previous studies automatically assume that consumers post online reviews immediately after dining and thus neglect the time delay. Yet according to the memory-strength theory (Hinrichs, 1970), the duration between the dining activity and the corresponding review posting could affect how the dining experience is recalled and, by extension, is evaluated. To address this research gap, the current study investigates the moderating role of temporal aspect of reviewing on the influence of prior average review rating on subsequent ratings.

5.3 Managerial implications

The empirical findings in our study unveiled important practical implications and suggestions on digital marketing strategies and online review management for both online review platforms and hospitality firms. Specifically, the following practical implications are proposed based on the conclusions from this study.

Motivating consumers to post online reviews immediately after consumption. The hospitality industry is becoming increasingly dependent on online distribution channels and online reviews, therefore, it is crucial for hospitality businesses to monitor and manage the online user-generated contents, especially the online reviews (Law et al., 2014; Li et al., 2016, 2017). For the online review communities/platforms, the accuracy of the online reviews, especially the review ratings, is crucial for their recognition, reputation, and long-term development. This research contributes to the practical knowledge on online review management. Particularly, this research proposed a neglected area of the time point of posting online reviews, i.e., the review temporal distance between consumption and review posting time. The results showed that

posting online review immediately after consumption helps reduce the social influence/bias from prior reviews posted by past consumers for the same restaurant. Therefore, the review temporal distance matters, and both hospitality firms and online review platforms should encourage consumers to share their experiences and post online reviews immediately after their purchase or consumption, so as to generate more fresh, direct and unbiased reviews and evaluations.

Encouraging consumers to include temporal contiguity cues in the review text. Previous studies revealed that reviews posted immediately after a consumption experience typically incorporates temporal contiguity cues which indicate the time closeness between consumption experience and review posting, such as "today" and "just got back" (Wu et al., 2017; Chen and Lurie, 2013). The presence of temporal contiguity cue in a review can help mitigate the negativity bias through reducing the extent to which positive reviews are attributed to reviewer related factors (Chen and Lurie, 2013). Moreover, temporal contiguity cue in a review positively affects consumers' perceived trustfulness toward the review and eventually increase their purchase intention to the reviewed products (Wu et al., 2017). Therefore, the online review platform can refine its design system by adding another required section in addition to review rating and review text when consumers submit their reviews, i.e., how many months, days, and minutes have passed since their consumption/purchase of the product.

Placing reviews with shorter temporal distance in more prominent positions in the review webpage. The findings of this study showed that review temporal distance can moderate the social influence of prior reviews on subsequent review ratings. Therefore, the reviews with shorter review temporal distance are found to be more accurate and unbiased. This finding provides valuable insights for online review platform managers/marketers, as placing these reviews in prominent locations will help consumers to easily find more trustable reviews and to

make better and wiser purchase decisions on restaurant choice and reservation.

5.4 Limitations and future research

In summary, this study provides valuable theoretical and managerial insights on the influences of prior reviews on subsequent consumer evaluation for the same restaurant, and the moderating effect of review temporal distance. However, the study has some limitations which can be addressed in future research. First, this study only examines the moderating effect of review temporal distance on the social influence on consumers' restaurant evaluation, future studies could further specify the effects of other dimensions of psychological distance, such as spatial distance, social distance, and certainty distance (Liberman et al., 2007). Moreover, given the parsimonious/simplicity consideration of the econometric model, some other potential moderators identified in previous research (Hu and Li, 2011; Lee et al., 2015; Ma et al., 2013; Wang et al., 2018), including both reviewer and review characteristics, are not included in this current study. Therefore, these neglected moderators may cause potential bias. Second, this study has an assumption that people are exposed to other people's ratings before providing their own review ratings. As the platform *Xiaomishu* in this study is a combination of reservation and review website, when any consumer reserves a table through *Xiaomishu*, it is very likely that s/he has access to the publicly available review ratings on the webpage. However, we cannot empirically verify this assumption or guarantee that the consumer checks the review before s/he post his/her own. This limitation also exists in other extant literature, such as Lee et al. (2015) and Ma et al. (2013). Future studies can address this limitation by using an experimental design approach. Third, this study only focuses on the restaurants in a specific regional market of Shanghai, thereby the findings may not be generalized to other cities in China. We suggest future studies be conducted to test the findings of this study in more cities in China. Moreover, this

study's sample was derived from the Chinese restaurant setting and may not be applicable to other countries or cultures. Consumers from other cultures may behave differently on their online review behavior. For instance, Ho et al. (2017) and Hong et al. (2016) report that compared with collectivistic culture, consumers from individualistic culture are more likely to deviate from reviews posted by other consumers and willingness to post online reviews. Therefore, future studies can extend to other cultures to improve the external validity and to conduct a cross-cultural comparison study. Fourth, this study does not consider the heterogeneity effects of different generations due to the data unavailability. Customers of different generations may present distinctive online review behavior. Future research could address this gap by investigating the generation differences between younger and older consumers in the restaurant market. Fifth, this current study also neglects the recency effects. This study assumes that people only look at the aggregate review information, including prior average review rating and the number of reviews, rather than the individual reviews. However, previous literature demonstrates that more recent reviews exert stronger influence than the average rating, as more recent reviews reflect updated information about the product and correspondingly consumers show higher credibility (Maxham and Netemeyer, 2002; Westerman et al., 2014). It would be interesting to test the recency effects in the social influence process of prior reviews in the future. Last, this study found that consumers who post online restaurant reviews after a longer period of time tend to rate the restaurant more negatively. Consumers in general had positive dining experiences in the restaurants (mean=4.10; negative reviews with ratings being equal to 1 or 2: 3.29%; neutral reviews with rating being equal to 3: 18.55%; positive reviews with rating being equal to 4 or 5: 78.16%), thereby a negative relationship was found in this study. However, the memory decay also applies to negative experiences. Subsequently, with a longer review temporal distance,

negative experiences may be evaluated more positively. Therefore, it would be interesting to test the moderating effect of review valence on the influence of review temporal distance on consumers' ratings.

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Figure 1 Conceptual Framework

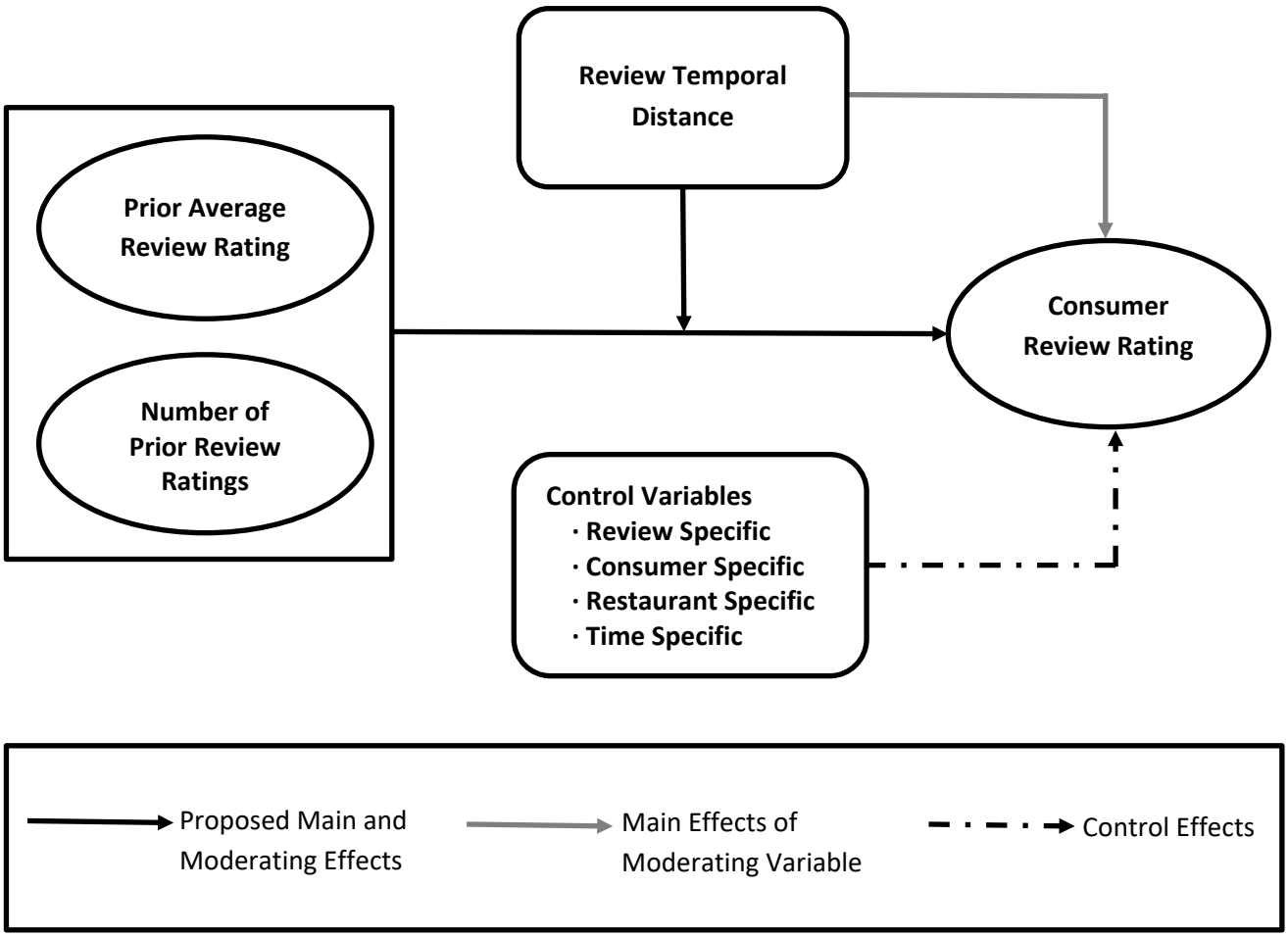

Table 1. Variable Description

Variable	Description	Mean	Std. Dev.
Dependent variables			
Rating	The valence of a review rating. *Rating* is measured by an integer from 1 to 5 (1 = "very dissatisfied"; and 5 = "very satisfied").	4.10	0.82
Independent variables			
AveRating	The average review rating before the current review for a specific restaurant	4.06	0.25
RatingNum	The number of reviews before the current review for a specific restaurant	220.97	251.36
Moderators			
TemporalD	The duration between dining time and review time of a dining experience, in the unit of day (accuracy to minute)	132.77	328.23
Control Variables			
(1) Review			
RevText	The number of characters in the current review	35.44	53.05
RevPic	The number of pictures in the current review	0.16	1.02
Device	The device via which the review is posted. If a review was posted via mobile (smart phone or tablet), *Device* is coded as 1; it is coded as 0 if it was posted via a personal computer.	--	--
(2) Consumer			
ConAveRating	The reviewer's average review rating before the current review	4.03	0.57
ConRatingNum	The reviewer's volume of posted reviews before the current review	45.26	372.09
(3) Restaurant			
LowPrice	The lowest price of per capita consumption for a specific restaurant	131.82	86.84
HighPrice	The highest price of per capita consumption for a specific restaurant	222.84	166.69
CuisineStyle	The cuisine style of a specific restaurant, measured by a series of dummy variables	--	--
(4) Time			
Year	The year when the review was written on the platform with the year of 2011 as the reference, measured by a series of dummy variables	--	--
Month	The month when the review was written on the platform with January as the reference, measured by a series of dummy variables	--	--

Table 2. Estimation Results

	Model 1.1	Model 1.2
AveRating	0.8964913***	0.8839552***
	(0.0222206)	(0.0253108)
RatingNum	0.0001379***	0.00017***
	(0.0000227)	(0.000026)
TemporalD	-0.0008733***	-0.0006551**
	(0.0002681)	(0.0002827)
TemporalD × AveRating	0.0002031***	0.0001535**
	(0.0000669)	(0.0000707)
TemporalD × RatingNum	0.000000145***	0.000000121**
	(0.0000000489)	(0.0000000524)
RevText	-0.0047451***	-0.0032877***
	(0.0001075)	(0.0001151)
RevPic	0.0721845***	0.0653521***
	(0.0049287)	(0.0052931)
Device	-0.7373566***	-0.5914688***
	(0.0123368)	(0.0140737)
ConAveRating		1.561991***
		(0.0107217)
ConRatingNum		-0.000106***
		(0.0000147)
Lowest price	0.0013577***	0.0014721***
	(0.0001465)	(0.0001643)
Highest price	0.0003669***	0.0004541***
	(0.0000789)	(0.0000885)
CuisineStyle	Yes	Yes
Review Year FE	Yes	Yes
Review Month FE	Yes	Yes
/cut-1	-0.4872112***	5.214414***
	(0.0938503)	(0.1142594)
/cut-2	0.6496024***	6.490076***
	(0.0918621)	(0.1120937)
/cut-3	2.679193***	8.76187***
	(0.0913335)	(0.1122758)
/cut-4	4.883844***	11.32704***
	(0.0919704)	(0.1142048)
Observations	164,309	134,530
Pseudo *R*-squared	0.0312	0.1087
LR chi2	11762.42	33412.74
Prob > chi2	0.0000	0.0000
LL	-182793.17	-136950.46

Note: The values in parentheses indicate the standard errors. ***, **, and * mean the coefficient is statistically significant at the 1%, 5%, and 10% significance level.

Table 3. Robustness Check— Ordered Logit Model with Consumer Fixed Effects

	Model 2.1	Model 2.2
AveRating	1.131***	1.129***
	(0.036194)	(0.036501)
RatingNum	0.000310***	0.000322***
	(0.000037)	(0.000037)
TemporalD	-0.000901**	-0.000908**
	(0.000386)	(0.000388)
TemporalD × AveRating	0.000193**	0.000193**
	(0.000096)	(0.000097)
TemporalD × RatingNum	0.000000228***	0.000000234***
	(0.000000)	(0.000000)
RevText	-0.00383***	-0.00384***
	(0.000200)	(0.000202)
RevPic	0.0647***	0.0640***
	(0.008001)	(0.008056)
Device	-0.937***	-0.925***
	(0.027263)	(0.027595)
ConAveRating		0.240***
		(0.039690)
ConRatingNum		-0.0000524***
		(0.000017)
Lowest price	0.00244***	0.00246***
	(0.000219)	(0.000221)
Highest price	0.000778***	0.000782***
	(0.000117)	(0.000118)
CuisineStyle	Yes	Yes
Review Year FE	Yes	Yes
Review Month FE	Yes	Yes
Consumer FE	Yes	Yes
/cut-1	0.254	1.064*
	(0.587061)	(0.608529)
/cut-2	1.658***	2.494***
	(0.586132)	(0.607612)
/cut-3	4.253***	5.102***
	(0.586041)	(0.607554)
/cut-4	7.478***	8.340***
	(0.586505)	(0.608062)
Observations	86,160	84,971
Pseudo *R*-squared	0.237	0.239
LR chi2	46261.7	46024.1
Prob > chi2	0.0000	0.0000
LL	-74517.3	-73235.0

Note: The values in parentheses indicate the standard errors. ***, **, and * mean the coefficient is statistically significant at the 1%, 5%, and 10% significance level.

Table 4. Robustness Check—OLS Estimation Method

	OLS without consumer fixed effects		OLS with consumer fixed effects	
	Model 3.1	Model 3.2	Model 3.3	Model 3.4
AveRating	0.367281***	0.3235824***	0.3351088***	0.3317547***
	(0.0100079)	(0.0101729)	(0.0114177)	(0.0112611)
RatingNum	0.0000577***	0.0000699***	0.0000813***	0.0000852***
	(0.00000952)	(0.00000940)	(0.0000105)	(0.0000103)
TemporalD	-0.0003403***	-0.0002669***	-0.0003081***	-0.0002859***
	(0.0001125)	(0.0001021)	(0.0001085)	(0.0001049)
TemporalD × AveRating	0.0000833***	0.0000659***	0.0000729***	0.0000673***
	(0.0000278)	(0.0000253)	(0.0000268)	(0.0000259)
TemporalD × RatingNum	0.0000000521***	0.0000000355***	0.0000000553***	0.0000000558***
	(0.0000000189)	(0.0000000167)	(0.0000000179)	(0.0000000174)
RevText	-0.0020373***	-0.0014104***	-0.0015922***	-0.0014709***
	(0.0000725)	(0.0000667)	(0.0000963)	(0.0000925)
RevPic	0.0307646***	0.0254242***	0.0239231***	0.0235451***
	(0.0022175)	(0.0020837)	(0.0027984)	(0.0027126)
Device	-0.3069893***	-0.2279945***	-0.3057855***	-0.2970137***
	(0.0051888)	(0.0052855)	(0.008443)	(0.0083664)
ConAveRating		0.5204261***		-0.1519391***
		(0.004345)		(0.0120141)
ConRatingNum		-0.0000433***		-0.0000257***
		(0.00000641)		(0.00000447)
Lowest price	0.0005105***	0.000492***	0.0006657***	0.0006429***
	(0.0000581)	(0.0000571)	(0.0000645)	(0.0000629)
Highest price	0.0001153***	0.0001197***	0.0001617***	0.0001762***
	(0.0000315)	(0.0000312)	(0.0000358)	(0.0000349)
Cuisine style	Yes	Yes	Yes	Yes
Review Year FE	Yes	Yes	Yes	Yes
Review Month FE	Yes	Yes	Yes	Yes
Consumer FE	No	No	Yes	Yes
Observations	164,309	134,530	164,309	134,530
R-squared	0.0703	0.2020	0.5393	0.4764
Adj R-squared	0.0694	0.2010	0.3741	0.3661

Note: The values in parentheses indicate the robust standard errors. ***, **, and * mean the coefficient is statistically significant at the 1%, 5%, and 10% significance level.

Table 5. Summary of Hypotheses Testing Results

Hypotheses	Empirical Support
Hypothesis one: Restaurant prior average review rating has a positive influence on the subsequent review rating.	√
Hypothesis two: The number of prior reviews of a restaurant has a positive influence on the subsequent review rating.	√
Hypothesis three: The influence of prior average review rating on subsequent rating is moderated by the review temporal distance.	√
Hypothesis four: The influence of the number of prior reviews on subsequent rating is moderated by the review temporal distance.	√