International Journal of Hospitality Management 92 (2021) 102729

Contents lists available at ScienceDirect

International Journal of Hospitality Management

journal homepage: www.elsevier.com/locate/ijhm

Research Paper

Can time soften your opinion? The influence of consumer experience valence and review device type on restaurant evaluation

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ARTICLE INFO

Keywords:
Temporal distance
Review conformity
Experience valence
Review device
Restaurant evaluation

ABSTRACT

The objective of this study is to investigate how review temporal distance influences the conformity of consumer restaurant review ratings. By employing an innovative dataset pairing consumer reservation records and consumer online reviews, the findings of this study indicate that (1) in general, temporal distance has a positive influence on restaurant evaluation conformity; (2) consumption experience valence moderates the influence of review temporal distance on restaurant evaluation conformity, with a negative dining experience strengthening the positive effects; (3) review device moderates the influence of review temporal distance on review conformity, with reviews posted via mobile devices weakening the positive effect of temporal distance; and (4) compared to reviews posted via PCs, mobile reviewers appear less likely to be influenced by prior reviews. Findings from this study provide practical insights for restaurants' management of online reviews.

1. Introduction

Online reviews, a form of electronic word-of-mouth, have become one of the most powerful tools for influencing consumers' purchase decisions. It has been reported that roughly two-thirds of consumers always or often read online reviews before making the purchase decision (Kats, 2018), and nearly 80% of consumers trust online reviews as much as personal recommendations (BrightLocal, 2018). It is thus critically important for companies to maintain a positive online reputation and persuasive online reviews, which requires a thorough understanding of consumers' review posting behaviors. To date, extensive research has examined the influences of online reviews on consumers as only review readers along with their demand (Ye et al., 2009; Zhu and Zhang, 2010); however, much less scholarly work has investigated consumers' review posting behaviors and influencing factors on their review evaluations.

Several scholars have identified a tendency to conform among reviewers (e.g., Hong et al., 2016; Lee et al., 2015; Muchnik et al., 2013; Wang et al., 2018). Conformity, a type of social influence, refers to changes in consumers' attitudes and behaviors following exposure to reference groups' attitudes and behaviors (Lascu and Zinkhan, 1999). In the context of online reviews, conformity captures a phenomenon wherein subsequent reviewers tend to conform to previous reviewers' opinions and ratings, resulting in potentially biased aggregated evaluations of products or services. Conformity to earlier positive online reviews increases the number of such reviews, thus contributing to a more positive online review profile for a product or service over time (Muchnik et al., 2013). It is therefore important to study one's tendency to conform in online reviews; business owners could leverage this propensity to obtain more positive online reviews.

Research has shown that conformity to prior online reviews can be influenced by the valence of prior reviews (Muchnik et al., 2013), reviewers' cultural backgrounds (Hong et al., 2016), and review posters' tie strength to referenced reviewers (Lee et al., 2015; Wang et al., 2018). In a hospitality context, Yang et al. (2018) reported that review-posting time significantly affects review extremity (i.e., the extent to which review ratings deviate from the average, based on online reviews posted prior to and after the focal review); however, review extremity does not equal conformity, which examines one's tendency to conform to prior reviews. Hence, the influence of review posting timing on reviewers' tendency to conform remains largely unknown. More recently, Li et al.

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https://doi.org/10.1016/j.ijhm.2020.102729
Received 24 October 2019; Received in revised form 3 September 2020; Accepted 11 October 2020
Available online 29 October 2020

(2019) uncovered the positive role of "consumption-review" temporal distance in prior review ratings' social influence. However, no potential moderators on the role of temporal distance on review conformity have been tested to date; it is still unclear how temporal distance works jointly with other important factors to affect review conformity. Li et al. (2019) further pointed out that experience valence could be a potential moderator on the influence of review timing on review social influence due to the memory decay. More specifically, positivity bias effect suggests that negative memories tend to fade faster than positive ones over time (Huang et al., 2016; Walker et al., 2003). As such, reviews of negative consumption experience are more likely to conform to prior reviews over time than that of positive ones because of the difficulty in retrieving relevant information from memory.

In addition, review posting time could be directly related to the type of devices used to submit online reviews. Mobile devices have made it easier and more convenient than personal computers (PCs) for consumers to post online reviews on the move: instantly after consumption, or even during a service consumption (Wang et al., 2013; Yang et al., 2018). Moreover, scholars have reported how online reviews are generated and perceived differently across device types (mobile devices vs. PCs) due to the unique characteristics of mobile devices (Lurie et al., 2014; Mariani et al., 2019; März et al., 2017; Ransbotham et al., 2019). Mobile reviews tend to be more self-focused and less socially oriented (Lurie et al., 2014); hence, regardless of temporal distance, mobile reviews are less likely to conform to prior reviews. In contrast, reviewers using PCs have more convenient access to prior reviews as PC has a larger screen size and information capacity; thus reviewers using PCs are more subject to conformity tendencies. Therefore, review device type could also affect how temporal distance shapes reviewers' tendency to conform.

Given the above discussion, the main objective of this study is to test how temporal distance influences review evaluation conformity, i.e., the moderating effects of consumption experience valence and review device type. Review temporal distance in this study is measured by the time interval between review-posting time and consumption time for a specific consumer's consumption experience. Additionally, this study aims to verify the findings regarding the role of temporal distance using a more direct way of measuring review social influence, i.e., review deviation between the current review rating and the average of all prior review ratings before the current one.

This work contributes to the online review literature in several ways. First, our study is one of the earliest attempts to investigate the role of temporal distance on review conformity; findings suggest that temporal distance positively influences reviewers' tendency to conform. Second, this study tests the conditions under which the role of temporal distance on review conformity is strengthened or attenuated; our results imply that temporal distance has a stronger impact on review conformity when reviewers had a negative consumption experience (vs. a positive one), and the effect of temporal distance on conformity is significantly weaker for reviews submitted via mobile devices (vs. PCs). Third, we explore the direct effect of review device type on review conformity and discover that this review device factor appears consistent and significant in predicting review conformity. Taking the restaurant industry as a case, our results offer valuable implications for restaurant business owners regarding how to manage online reviews on the basis of reviewers' tendency to conform.

2. Literature review and research hypotheses

2.1. Temporal distance

Temporal distance refers to the time between a perceiver's direct experience and a stimulus (object or event) (Bar-Anan et al., 2007; Trope and Liberman, 2003). In the context of online consumer reviews, temporal distance, otherwise known as temporal contiguity, can be defined as "the temporal closeness between product/service consumption and the time at which a review is posted" (Li et al., 2020b, p.1; Yang et al., 2018, p.120). Consumers may post reviews that reflect their consumption experiences whenever they want (immediately or later) thanks to the mobile technology in today's digital age. However, people only directly experience the present (i.e., here and now), thus how people transcend their immediate experience and evaluate more distant objects or events becomes a more essential psychology research question (Liberman and Trope, 2008). Temporal distance affects individuals' judgments and decisions by changing their mental representations of events (Trope and Liberman, 2003, 2010). Therefore, temporally distant events are construed in a more abstract manner, which allows people to experience beyond what is present (Liberman and Trope, 2014).

Temporal distance is the first proposed dimension in psychological distance studies (Liberman and Trope, 1998). It is an important dimension of psychological distance along with social distance, spatial distance, and hypotheticality (Henderson et al., 2006; Soderberg et al., 2015; Trope and Liberman, 2010). Previous studies have reported that temporal distance not only affects construal level, but also influences other psychological distance dimensions (Huang et al., 2016; Stephan et al., 2011). For example, Stephan et al. (2011) revealed that increased temporal distance affected other psychological distance dimensions such as producing a sense of social distance. Similarly, Huang et al. (2016) demonstrated that temporal distance can amplify the effect of spatial distance on consumer evaluation.

Studies in social psychology have documented the effects of temporal distance on mental representations (Trope and Liberman, 2003) and decision making (Ding and Keh, 2017). Temporal distance systematically changes the way people mentally construe events, which in turn influences people's subsequent prediction, evaluation, and behavior (Liberman and Trope, 2014; Trope and Liberman, 2003, 2010). In the context of post-purchase evaluations, Pizzi et al. (2015) found that temporal distance affected the overall satisfaction judgments of a service experience. Moreover, recent research revealed that temporal distance had a positive effect on review positivity, mediated by construal level (Huang et al., 2016; Stamolampros and Korfiatis, 2018).

2.2. Impact of temporal distance on review conformity

The current study focuses on the role of temporal distance in consumers' rating behavior. Review conformity can be defined as consumers' tendency to conform to prior reviews posted by others (Hong et al., 2016). According to social influence theory, consumer reviews do not exist in isolation; rather, subsequent reviewers tend to conform to prior opinions, driven by a motivation to acquire product information from others (informational influence) or a need for social approval (normative influence) (Deutsch and Gerard, 1955; Zhou, and Guo, 2017). In the context of hospitality online reviews, studies have empirically reported the social influence of prior reviews on subsequent reviews (Li et al., 2020a,2020b; Ma et al., 2013; Sridhar and Srinivasan, 2012). For example, prior research has documented a positive effect of prior average rating on subsequent ratings, as well as the moderating effects of review and reviewer characteristics (Li et al., 2020a; Ma et al., 2013). Specifically, Ma et al. (2013) found that reviewers with more experience, more geographic mobility, and a large number of friends relied less on prior reviews. In terms of review characteristics, they found that the impact of prior reviews on subsequent ones was stronger for shorter reviews or for longer time intervals between reviews. Similarly, Li et al. (2020a) revealed that reviewers with non-elite status, moderate consumption experience, and less cognitive effort in review writing relied more on prior reviews. They also found that the social influence was weaker when the variance in existing reviews was high. However, there is a lack of study examining how timing of review posting may influence review conformity.

This study proposes that review temporal distance could influence review conformity. Construal-level theory (CLT) suggests that distant events are more likely to be represented by higher level of construal with

abstract, general, and decontextualized characteristics, whereas psychologically close events are represented by lower level of construal with concrete, incidental, and contextual features (Henderson et al., 2006). The social side of distance and abstraction is similarly pivotal in the extent to which social influence shapes people's evaluations. Specifically, psychological distance and abstraction can broaden individuals' mental horizons and increase the impact of cross-situational information, leading to greater conformity to group opinion (Burgoon et al., 2013; Ledgerwood and Callahan, 2012). When considering more psychologically distant objects, individuals tend to transcend their local context and incorporate more global social information into their evaluations, which reflects a general social influence often encountered across situations (Ledgerwood, 2014). Therefore, when evaluating temporally distant events, reviewers are more likely to be affected by others' prior opinions.

In addition, when integrating CLT with social learning theory, research has suggested that distance prompts consumers to acquire information socially that extends beyond the self and one's direct experience (Kalkstein et al., 2016). Learning, as a process of gaining and internalizing new information, can occur through personal experience or from others (Bandura, 1977). In a service evaluation context, temporally distant events are more difficult to evaluate than temporally close events due to the intangibility of service products (Ding and Keh, 2017). Therefore, when evaluating temporally distant consumption, consumers tend to rely on external information, such as others' opinions, as an anchor (Yang et al., 2018). Distance and high-level construal thus expand the scope of information from which people learn. Based on the above discussion, we propose that as time passes, consumers are more likely to conform to aggregate prior ratings driven by cross-contextual information and social learning.

Hypothesis 1(H1). Review temporal distance is positively related to review conformity: reviewers who review a restaurant at a greater temporal distance are more likely to conform to prior consumer review ratings than those who review at a smaller temporal distance.

2.3. Moderating effect of experience valence

Experience valence refers to the positive or negative orientation of information related to an object or consumption experience (Frijda, 1986; Kusumasondjaja et al., 2012). In this study, we propose that experience valence could moderate how temporal distance influences consumers' conformity tendencies. This moderation effect can be explained by the positivity bias effect when consumers make decisions about more temporally distant events (Huang et al., 2016). As temporal distance from an action increases, considerations in favor of the action (pro) become relatively more salient than considerations against the action (con) (Eyal et al., 2004). In decision making, positive aspects of an experience are superordinate to negative aspects and reflect higher-level construal, leading to more prominent pros when an evaluation is temporally distant. Moreover, according to the psychology literature, the positivity bias for distant events is consistent with the fading affect bias in autobiographical memory (Piccoli, 2016; Walker et al., 2003). In other words, negative and positive emotions associated with a remembered event fade asymmetrically over time; negative emotional memories tend to fade faster than positive ones (Walker et al., 2003). Scholars (Unkelbach et al., 2008) have also found that positive information has higher density in memory; over time, negative information is discounted more heavily than positive information (Lewin, 1951). Therefore, temporal distance, when interacting with experience valence, may exert an asymmetric effect on consumers' evaluations. As temporal distance increases, individuals generate more pros and form more favorable attitudes, which may create greater inconsistency and uncertainty when assessing negative experiences. Following the social influence literature, inconsistency or uncertainty increases social influence (Kim and Hollingshead, 2015) and evokes a higher need for social interaction regarding negative experiences.

In the context of this research, the social influence of prior online restaurant reviews over time is thought to be conditioned by experience valence. We incorporate positivity bias into the word-of-mouth literature and presume that the positive effect of temporal distance on review conformity may be amplified for negative experiences compared to positive experiences. Availability/diagnosticity theory posits that word-of-mouth effects are situation-dependent and should be more influential when consumers face ambiguous situations, such as disconfirming events (Bone, 1995). For negative experiences, as review temporal distance increases, positive aspects of the experience become more salient and coexist with the negative nature of the experience. Over time, these contradictory factors lead to inconsistent, vague information and may produce more informational social influences when evaluating distant events. Therefore, consumers are more likely to conform to prior ratings for negative, distant experiences. Conversely, for positive experiences, the direction of positivity bias over time is consistent with the positive nature of the experience, leading to less ambiguity when evaluating distant events. Positive experiences are therefore subject to fewer social influences in terms of temporal distance, reducing the magnitude of the temporal distance effect on review conformity. Accordingly, we anticipate that the positive effect of review temporal distance on review conformity is stronger for negative dining experiences. The following hypothesis is thus proposed:

Hypothesis 2(H2). Experience valence moderates the effect of review temporal distance on review conformity.

2.4. Moderating effect of review device

Technology access shapes how consumers create electronic word-of-mouth (März et al., 2017). Studies have demonstrated systematic differences in online reviewing behavior via mobile devices and non-mobile devices; distinctions involve review features (Lurie et al., 2014), rating distribution (Mariani et al., 2019), and perceived helpfulness (März et al., 2017). Mobile devices are small computing devices, typically with a touchscreen interface and limited keyboard (Wang et al., 2016), that offer greater portability and accessibility than traditional desktop or laptop computers (Ransbotham et al., 2019). Given these unique features, mobile devices have inherently altered the review creation process (Melumad, 2017). Specifically, mobile devices can be considered extensions of the self; users have strong personal connections with their devices (Brasel and Gips, 2014). Studies of mobile consumer behavior have indicated that mobile-generated customer reviews are often more self-focused, less socially oriented, more affective, and less reflective than non-mobile reviews (Lurie et al., 2018, 2014; Melumad, 2017; Ransbotham et al., 2019). The self-focused nature of mobile devices affords individuals more personal control and agency, which further influences construal (Spassova and Lee, 2013). Moreover, mobile reviewers tend to think less about others and are less interested in identifying socially with other reviewers, resulting in less need for social approval. Mobile reviewers are therefore less susceptible to normative social influence.

The mobile survey literature has revealed another critical factor distinguishing mobile devices from PCs: the need to scroll due to screen size (Couper and Peterson, 2017). Compared to mobile devices, PCs better facilitate information reception and transmission given their larger screens and keyboards (Lurie et al., 2018). Over time, PC reviewers tend to be exposed to more external information (i.e., prior reviews) than mobile reviewers.

On this basis, the effect of temporal distance on review conformity may possibly be conditioned by review device. For reviewers using PCs, informational social influence may play a greater role in review creation when constructing mental representations for distant consumption. By contrast, the self-focused nature of mobile devices may weaken the positive effect of review temporal distance on review conformity. When

using mobile devices, a more coherent self-mindset for distant events tends to reduce normative social influence. In addition, compared to PCs, the smaller screen sizes and multitasking features of mobile devices limit consumers' exposure to new and external information, including others' reviews (Gutt et al., 2019). Over time, informational social influence may have less effect on reviewers using mobile devices. Therefore, the positive effect of temporal distance on review conformity would presumably be weakened for reviewers using mobile devices compared to reviewers using PCs, hence the following hypothesis is proposed:

Hypothesis 3(H3). Review device moderates the effect of review temporal distance on review conformity.

In line with the preceding hypotheses, the research framework guiding this study is illustrated in Fig. 1.

3. Methodology

3.1. Data collection

An innovative dataset collected from a popular restaurant reservation website in China, *Xiaomishu*, was used for data collection. *Xiaomishu* hosted over 3,000,000 members in the year 2014 and offered restaurant reservation services in more than 350 Chinese cities in the year 2012 (Xiaomishu, 2018). *Xiaomishu* was chosen as the study context due to the fact that consumers can reserve restaurants via *Xiaomishu* and post reviews about the reserved restaurant on the same website after consumption. When consumers make a reservation, dining information (e.g., dining time, date, and number of diners) is recorded, and this information is appended to the corresponding posted online review. The unique design of the website makes it possible to combine the datasets of dining reservations and dining reviews to calculate the temporal distance between dining time and review time.

Shanghai, China was chosen as the target setting because it is the headquarter of *Xiaomishu* and hosts the largest proportion of users on the site. We then developed a crawler and parser to download restaurant webpages into a database, including reservation and review information. There are two different types of online reviews on the website, namely regular reviews and reservation reviews. Reservation reviews contain both reservation information and customer reviews for the reserved dining experience; regular reviews do not. The review information we collected included the review time, review rating, review text, number of embedded photos, and review-posting device. Reservation information included the reservation time, dining time, and number of diners. In addition, we collected the IDs of all individual reviewers/diners in Shanghai along with their historical *Xiaomishu* review data within and outside Shanghai. Regarding restaurant-related variables, the information on the lowest and highest per-capita consumption prices as well as restaurant cuisine style was collected. All restaurant review data in Shanghai from November 2008 to April 2017 were collected, resulting in 4951 restaurants with a total of 191,668 reservation reviews. The number of reservation reviews for these restaurants ranged from a minimum of 1 to a maximum of 1211. Among them, 2974 restaurants had 10 or fewer reservation reviews, and 1977 restaurants received more than 10 reservation reviews. The average number of reservation reviews for a restaurant was 39 with a standard deviation of 94. Reservation reviews without ratings were not included in the formal data analysis.

Regarding the characteristics of the restaurants used in our study, the per capita consumption of these restaurants ranged from 131.06 yuan (i.e., mean of the lowest price) to 220.87 yuan (i.e., mean of the highest price). Approximately 37.91% (N = 1,877, mean of service ratings $>=$ 4) and 37.97% (N = 1,880, 4 $>$ mean of service ratings $>=$ 3) of these restaurants had high- and medium-level service quality, respectively. Furthermore, these selected restaurants can be categorized into 136 restaurant cuisine styles, such as Cantonese, Japanese, and Korean.

3.2. Variable measurement

Rating conformity is the dependent variable, which was measured by restaurant review rating deviation (*Deviation*). Similar to Hong et al. (2016), *Review rating deviation* was calculated based on the absolute deviation between an individual review rating and the average of all prior review ratings before this specific review of a restaurant. To calculate the average review rating before each review, we first sorted all reviews of a restaurant by time. The prior average review rating for the n^{th} review was calculated as the average of ratings from the first to *(n - 1)*th review for a specific restaurant *j*.

The independent variable was review temporal distance (*TemporalD*), denoting the time difference between the review time and associated dining time of a specific dining experience. The unit of measurement for this variable was the day, with by-minute accuracy.

Moderating variables included experience valence (*ExpValence*) and review-posting device (*Device*). *ExpValence* was coded as 1 if the review rating was equal to or below 3 (i.e., a negative experience) and coded as 0 otherwise (i.e., a positive experience). Restaurant review rating (*Rating*) was measured by a value from 1 (i.e., very dissatisfied) to 5 (i.e., very satisfied). *Device* was coded as 1 if a review was posted via a mobile device (i.e., smartphone or tablet) and 0 if a review was posted via PC. For details about these key variables, please see Table 1.

We further controlled variables deemed important in prior literature in our econometric models, including review-, restaurant-, and time-

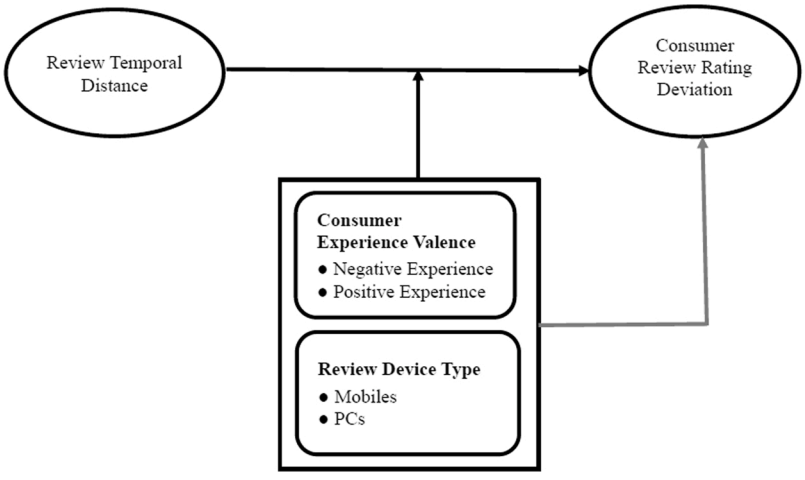

Fig. 1. Conceptual Framework.

Table 1
Key Variable Description.

Variable	Description
Dependent Variable	
Deviation	Absolute deviation between the current review rating and the average of all prior review ratings before this specific review of a restaurant
Independent Variable	
TemporalD	Time interval between review posting time and dining time in the unit of day, with accuracy to the minute
Moderating Variables	
ExpValence	Calculated based on restaurant review rating. A positive dining experience is coded as 0 (i.e., review rating is above 3); a negative dining experience is coded as 1 (i.e., review rating is equal to or below 3)
Device	Device is coded as 1 for a review submitted via mobile device (smartphone or tablet) and 0 for a review submitted via PC

relevant variables (Huang et al., 2016). The control variables at review level included number of characteristics (*RevText*) and number of pictures (*RevPic*) in a specific review. To account for the restaurant heterogeneity effect, the number of reviews and the variance of review ratings before the current review of a restaurant (*RatingNum* and *RatingVar*), restaurant cuisine style (*CuisineStyle*), as well as the restaurant lowest and highest price of per capita consumption (*LowPrice* and *HighPrice*) were controlled. Furthermore, the year and month fixed effects (*Year* and *Month*) were both controlled to account for the temporal heterogeneity effect.

Table 2 shows the variables' descriptive analysis, while Fig. 2 demonstrates the distributions of review temporal distance, dining experience valence, review device, and the number of reviews written in each year. Fig. 2 shows that 27.43% of all reviews were written within 24 h after customers' dining experiences, and another 26.90% were written between 24 h and one week after their dining experiences. It also indicates that slightly more consumers reported a positive dining experience (53.51 %), and most reviews were posted via PC (68.49 %).

3.3. Econometric model

The following econometric model was established, taking *Deviation* as the dependent variable, *TemporalID* as the independent variable, and *ExpValence* and *Device* as moderating variables:

$$\begin{aligned} Deviation_{ijt} = {} & \alpha_0 + \alpha_1 \mathrm{TemporalD}_{ijt} + \alpha_2 \mathrm{ExpValence}_{ijt} + \alpha_3 \mathrm{Device}_{ijt} \\ & + \alpha_4 \mathrm{ExpValence}_{ijt} \times \mathrm{TemporalD}_{ijt} + \alpha_5 \mathrm{Device}_{ijt} \times \mathrm{TemporalD}_{ijt} \\ & + \alpha_6 \mathrm{RevText}_{ijt} + \alpha_7 \mathrm{RevPic}_{ijt} + \alpha_8 \mathrm{RatingNum}_{ijt} \\ & + \alpha_9 \mathrm{RatingVar}_{ijt} + \alpha_{10} \mathrm{LowPrice}_j + \alpha_{11} \mathrm{HighPrice}_j \\ & + \alpha_{12} \mathrm{CuisineStyle}_j + \sum_{T_1} \lambda_t * \mathrm{Year}_t + \sum_{T_2} \tau_t * \mathrm{Month}_t + u_{ijt} \end{aligned} \quad (1)$$

where i denotes the consumer, j denotes the restaurant, t denotes the time, and u_{ijt} is a normal distribution; *CuisineSyle* represents a number of dummy variables measuring the restaurant's cuisine style; Year_t represents year fixed effects with the reference year as 2008; and Month_t is month fixed effects with the reference month as January.

Table 2
Variable Descriptive Analysis.

Variable	Observations	Mean	Std. Dev.
Deviation	182,769	0.66	0.54
TemporalD	182,769	122.05	313.15
RevText	182,769	39.47	64.22
RevPic	182,769	0.15	0.99
RatingNum	182,769	206.13	243.65
RatingVar	182,769	0.76	0.30
LowPrice	182,769	131.06	86.66
HighPrice	182,769	220.87	165.18

4. Results

4.1. Main results

Estimation results are listed in Table 3. Model 1.1 is the major model estimated based on Eq. (1). Compared with the Model 1.1, Model 1.2 included two reviewer-level variables, including (1) the number of prior reviews written by a specific reviewer before the current review (*ConNoRating*), and (2) the average rating of prior reviews written by a specific reviewer before the current review (*ConAveRating*). We added reviewers' past review posting behaviors (i.e., number of reviews written before and average rating of prior reviews) as control variables in Model 1.2 in order to control reviewers' heterogeneity in their review patterns. Furthermore, including these control variables in Model 1.2 would exclude the first-time reviewers whose past reviewing behaviors are not available. The estimation results were consistent between Models 1.1 and 1.2.

The estimation results demonstrated that review temporal distance had a significant and negative (positive) influence on restaurant review rating deviation (conformity) ($\mathrm{coefficient}_{Model1.1}$ = -0.0000319, $p < 0.01$; $\mathrm{coefficient}_{Model1.2}$ = -0.0000108, $p < 0.05$). Essentially, consumers who posted reviews with greater temporal distance were less likely to deviate from the prior average review rating for a specific restaurant; that is, they were more likely than other reviewers to conform to prior review ratings. Therefore, Hypothesis 1 was supported.

We conducted further analysis to test the moderating roles of experience valence and the review posting device. As shown in Table 3, rating deviation (conformity) behavior tended to be negatively (positively) affected by review temporal distance; but this impact was strengthened by experience valence, as shown by a significantly negative coefficient of the interaction term between experience valence and review temporal distance ($\mathrm{coefficient}_{Model1.1}$ = -0.0000837, $p < 0.01$; $\mathrm{coefficient}_{Model1.2}$ = -0.0000849, $p < 0.01$). In this case, the negative (positive) effect of review temporal distance on review deviation (conformity) was stronger for negative dining experiences; Hypothesis 2 was thus supported.

Our data analysis also revealed that the negative (positive) influence of review temporal distance on restaurant rating deviation (conformity) was weakened by review device, evidenced by a statistically significant and positive interaction term ($\mathrm{coefficient}_{Model1.1} = 0.0000757$, $p < 0.01$; $\mathrm{coefficient}_{Model1.2}$ = 0.0000604, $p < 0.01$). For consumers posting restaurant reviews via PCs, review temporal distance exerted a negative (positive) effect on review rating deviation (conformity) behavior. For consumers posting via mobile devices (i.e., a smartphone or tablet), the negative (positive) effect of temporal distance on review rating deviation (conformity) was weaker. Accordingly, Hypothesis 3 was supported.

Regarding the direct effect of moderating variable *Device*, it had a direct positive (negative) influence on consumer restaurant rating deviation (conformity) ($\mathrm{coefficient}_{Model1.1}$ = 0.0566787, $p < 0.01$; $\mathrm{coefficient}_{Model1.2}$ = .0727281, $p < 0.01$), indicating that consumers who posted reviews via mobile devices tended to deviate from prior review ratings; that is, they were less likely to be socially influenced by prior reviews.

To illustrate the moderating effects of dining experience valence and review device, a marginal effect was calculated using STATA 13 as displayed in Figs. 3 and 4. Fig. 3 indicates that as the review temporal distance increased, restaurant rating deviation (conformity) declined (increased) faster for consumers with negative dining experiences (*ExpVal* = 1) than for those with positive dining experiences (*ExpVal* = 0). Fig. 4 displays the degree of change in restaurant rating deviation (conformity) with the change in temporal distance based on review device (PC vs. mobile). As review temporal distance increased, the review rating deviation (conformity) declined (increased) significantly for

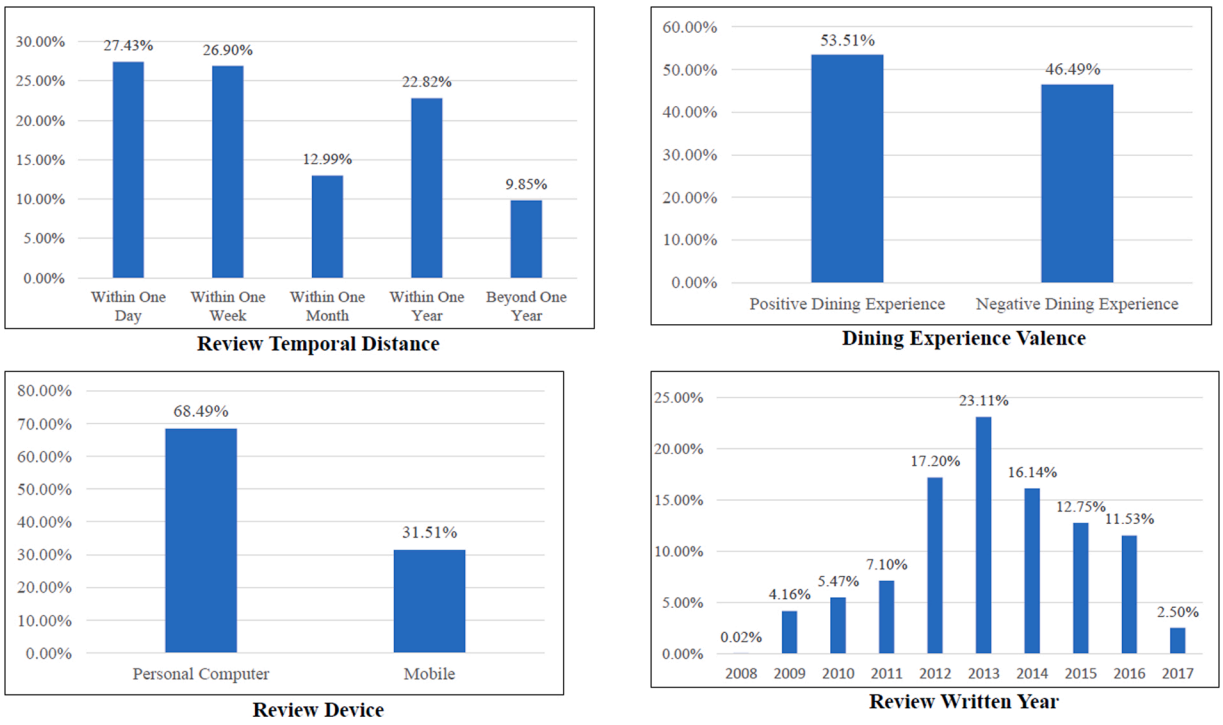

Fig. 2. Distribution of Key Variables.

Table 3
Estimation Results (DV = *Deviation*).

	Model 1.1	Model 1.2
Constant	−.1005845***	−.1203049***
	(.0214724)	(.0203987)
TemporalD	−.0000319***	−.0000108**
	(5.15e-06)	(5.31e-06)
ExpValence	−.0262375***	−.0117276***
	(.0027889)	(.0031606)
Device	.0566787***	.0727281***
	(.0035524)	(.0038721)
ExpValence × TemporalD	−.0000837***	−.0000849***
	(7.42e-06)	(7.62e-06)
Device × TemporalD	.0000757***	.0000604***
	(7.80e-06)	(8.06e-06)
ConNoRating		−.0000122***
		(2.49e-06)
ConAveRating		.0205299***
		(.0029878)
RatingNum	−.0000445***	−.0000489***
	(5.94e-06)	(6.44e-06)
RatingVar	.1534138***	.1398118***
	(.0056919)	(.0062895)
RevText	.0005319***	.0005007***
	(.0000322)	(.0000345)
RevPic	−.0071574***	−.0059992***
	(.0013056)	(.0013723)
Lowest price	−.0000906**	−.0000806**
	(.0000362)	(.0000385)
Highest price	.0000368*	.0000378*
	(.0000197)	(.0000209)
CuisineStyle	Yes	Yes
Review Year FE	Yes	Yes
Review Month FE	Yes	Yes
Consumer FE	No	No
Observations	182,769	147,792
F	364.36	324.35
Pro > F	0.0000	0.0000
R-squared	0.0494	0.0541
Adj *R*-squared	0.0485	0.0531

Note: *, **, and *** indicate the significance level at 10 %, 5%, and 1%; Values in brackets are robust standard errors.

reviews posted via PC (*Device* = 0) but increased (declined) slightly for reviews posted via mobile (*Device* = 1). The negative (positive) influence of review temporal distance on review rating deviation (conformity), when the review was posted via PC, was therefore attenuated when the review was posted via mobile. Moreover, Fig. 4 shows that compared to reviews posted via PCs, consumers were more (less) likely to deviate from (conform to) prior average review ratings when posting reviews via mobile devices.

The relatively small coefficients in our analyses were unsurprising given our measurements of dependent and independent variables. As presented in Table 3, the dependent variable of review rating deviation had a fairly small value and standard deviation. Conversely, the independent variable, review temporal distance, had a fairly large value and standard deviation.

4.2. Robustness check

Robustness check by excluding extreme outliers. First, we excluded the extreme outliers whose review temporal distance was beyond 366 days; the estimation results are shown in Model 2.1 in Table 4. Second, given that the reviews posted via mobile device only became available since 2010, we removed the extreme outliers whose reviews were posted before the year 2010, with estimation results displayed in Model 2.2 in Table 4. Both estimation results were found to be quantitatively similar to those in Table 3.

Robustness check by incorporating consumer fixed effects into the econometric model. Although Model 1.2 in Table 3 controlled for consumers' historical reviewing behavior (i.e., the number and average rating of all reviews posted by a specific reviewer before his/her current review), the model did not consider other aspects of consumer heterogeneity unlikely to change over time (e.g., gender, income, and education). Another robustness check including consumer fixed effects was therefore conducted to avoid spurious regression. These fixed effects can be used to account for the heterogeneity among different consumers (Rishika et al., 2013). Specifically, consumer fixed effects are measured by a series of dummy variables (number of dummies = *n*-1; *n* stands for number of consumers), and each dummy is coded as 1 (or 0) if the

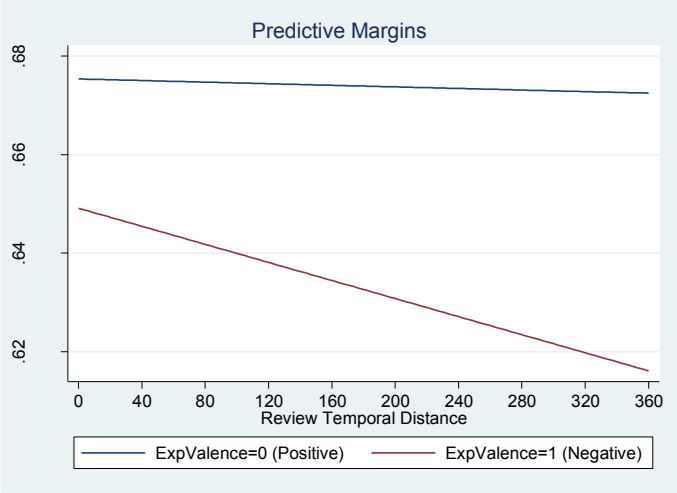

Fig. 3. Influence of Review Temporal Distance on Review Rating Deviation by Dining Experience Valence Value.

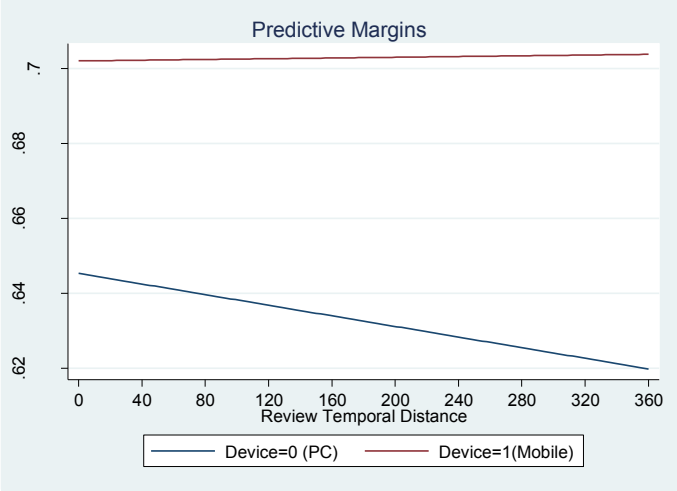

Fig. 4. Influence of Review Temporal Distance on Review Rating Deviation by Device Value.

observation falls within (or beyond) a specific consumer (Amato and Amato, 2007). Ultimately, 48,840 consumer dummies (i.e., 48,841 consumers) were incorporated into econometric Model 1.1; estimation results are shown in Model 2.3 in Table 4. Another 25,529 dummies (i.e., 25,530 consumers) were incorporated into Model 1.2, with estimation results displayed in Model 2.4 in Table 4. Both estimation results were quantitatively similar to those in Table 3 regarding the coefficients of variables of our interest, except that ConNoRating became not significant in Model 2.4. It was possibly due to a certain collinear relationship between "Consumer Fixed Effects" and the variable "ConNoRating"; thus the influence of the latter factor on review deviation was deprived and reduced to be insignificant.

5. Discussion and conclusion

This study investigates the effect of review temporal distance on consumer review rating conformity along with the moderating effects of consumer dining experience valence and review device type. Using data from a popular Chinese restaurant reservation website, we tested our research framework using econometric models with and without consumer fixed effects. Findings indicate that the longer the temporal distance between visiting a restaurant and reviewing it, the more likely a consumer's restaurant evaluation is to conform to the prior average rating. More importantly, we uncovered significant moderating effects of experience valence and review device type on the relationship between temporal distance and review conformity. Specifically, the positive influence of temporal distance on review conformity is stronger for negative experiences than for positive ones, and this effect is attenuated for reviewers using mobile devices (vs. PCs). Furthermore, it was found that compared to reviews posted via PCs, mobile reviewers generally appear less likely to conform to prior reviews.

5.1. Theoretical implications

Theoretically, our study contributes to relevant research in several ways. First, we enrich the online review literature by examining the role of temporal distance on reviewers' conformity behavior. Building on the CLT framework and social influence theory, we found that temporal distance positively influences review rating conformity; in other words, online reviewers are more prone to social conformity when writing a review for temporally distant consumption compared to temporally close consumption. The relationship between review-posting time and consumers' rating behavior found in our study is consistent with Li et al. (2019), who also indicated that the timing of review posting moderates the social influence of prior reviews on subsequent reviews. Furthermore, this study extends previous research (e.g., Hong et al., 2016) on the factors which affect review rating conformity by directly regressing the social influence outcome – review conformity – on the temporal

Table 4
Robustness Check — With Consumer Fixed Effects.

	Model 2.1 (< = 366)	Model 2.2 (> = 2010)	Model 2.3	Model 2.4
Constant	−.1028942***	.9275393***	.0086003	−.0880127
	(.0221647)	(.0097262)	(.0981717)	(.0947089)
TemporalD	−.0000415*	−.0000211***	−.0000289***	−.0000284***
	(.0000228)	(5.15e-06)	(6.89e-06)	(6.65e-06)
ExpValence	−.0140589***	−.0187709***	.021868***	.0225466***
	(.003094)	(.0028434)	(.0038616)	(.0038111)
Device	.0503088***	.0611422***	.0558962***	.0624343***
	(.0038195)	(.0035623)	(.0062527)	(.0061768)
ExpValence × TemporalD	−.0004056***	−.0000932***	−.0000605***	−.0000571***
	(.0000352)	(7.44e-06)	(9.00e-06)	(8.67e-06)
Device × TemporalD	.0002608***	.0000746***	.00005***	.0000483***
	(.0000408)	(7.81e-06)	(.0000104)	(.0000101)
ConNoRating				−4.47e-06
				(3.71e-06)
ConAveRating				.0737874***
				(.0074013)
RatingNum	−.0000448***	−.0000384***	−.0000334***	−.0000312***
	(6.43e-06)	(5.93e-06)	(7.44e-06)	(7.27e-06)
RatingVar	.1574803***	.0802591***	.1221755***	.1092647***
	(.0059208)	(.0059655)	(.0071641)	(.0071067)
RevText	.000543***	.0006499***	.0007736***	.0007602***
	(.0000331)	(.0000363)	(.0000541)	(.0000536)
RevPic	−.0077311***	−.0085998***	−.0075856***	−.0074136***
	(.0013096)	(.001331)	(.0018872)	(.0018343)
Lowest price	−.0000976**	−.0001154***	−.0000901**	−.0000842*
	(.0000383)	(.0000364)	(.0000452)	(.000044)
Highest price	.00004*	.0000323	.0000317	.0000294
	(.0000207)	(.0000197)	(.0000245)	(.0000238)
CuisineStyle	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	164,759	174,774	182,769	147,792
F	336.12	284.60	23.45	–
Pro > F	0.0000	0.0000	0.0000	–
R-squared	0.0504	0.0440	0.4103	0.3252
Adj *R*-squared	0.0494	0.0431	0.1943	0.1832

Note: *, **, and *** indicate the significance level at 10 %, 5%, and 1%; Values in brackets are robust standard errors.

factor. The findings reveal that as the temporal distance from a dining experience increases, a current reviewer is more likely to conform to the prior average review rating.

Second, building on the positivity bias effect (Huang et al., 2016) and fading affect bias in autobiographical memory (Walker et al., 2003), our study unveils asymmetric valence effects over time in the context of hospitality online reviews. As temporal distance increases, reviewers with negative consumption experiences are more likely to conform to prior ratings than reviewers with positive experiences. This pattern coincides with Eyal et al. (2004), who reported differential effects of pros versus cons in decision making. Whereas prior research has suggested an interaction between experience valence and time in terms of individual evaluations (Freling et al., 2014; Yang et al., 2018), findings from our work advance valence–time interaction effects by investigating how experience valence conditions the temporal effect of review rating conformity from a social influence perspective. Results from this study further indicate that over time, consumers with negative dining experiences are more likely to be socially influenced by the prior average rating, presumably due to more ambiguous situations in decision making as postulated in availability/diagnosticity theory (Bone, 1995).

Third, the current research adds to a growing body of literature on the role of review devices in online reviews (Mariani et al., 2019; Ransbotham et al., 2019). Built on these studies, our work documented that review device type exerts a significant positive effect on review conformity. Specifically, compared to reviews posted via PCs, mobile reviewers generally appear less likely to be influenced by prior reviews. This finding corroborates the self-focused nature of mobile devices indicated in previous studies (Lurie et al., 2018). Use of a mobile device (vs. PC) also enhances relative self-importance; thus, mobile reviewers have less of a need to seek approval and information from others, resulting in fewer social interactions during the review creation process. Moreover, this study makes a unique contribution to the online review literature by testing the moderating effect of review device type in the role of temporal distance on review conformity, which has not been explored previously. Mobile reviewers' clearer self-focus weakens the positive effect of temporal distance on social influence.

5.2. *Managerial implications*

The findings of this study provide important practical implications for restaurants in terms of managing their online review profiles by leveraging social influence. Our results imply that with a larger temporal distance between consumption and review posting, consumers are more likely to conform to prior group opinions. Therefore, temporal distance (or proximity) could be used as an intervention to orient consumers toward a socially shared opinion (or a unique opinion) when writing online reviews. When managers are satisfied with restaurant review ratings, encouraging delayed review-posting behavior could prompt relatively consistent and positive word-of-mouth. Therefore, restaurants with high ratings may not encourage immediate reviews from customers. In other words, these restaurants should avoid posting signs or offering discounts for immediate customer reviews; instead, it is more viable to follow up with customers later to ask for a review. In contrast, when managers wish to collect detailed contextual information and constructive reviews distinct from earlier reviews, encouraging immediate review-posting behavior could immerse consumers within the

local context and reflect individualized information. In addition to offering incentives (e.g., freebies or discounts) in exchange for immediate reviews, restaurants may leverage location-based data from online review platforms to identify when a customer completes a dining experience and departs from the restaurant (Burtch and Hong, 2014). For example, Twitter enables consumers to share location information for individual tweets. As these location-based tweets are more current (Poddar et al., 2019), restaurants can target consumers for immediate reviews when they check in or tweet with their locations.

Our findings also highlight the importance of encouraging delayed review-posting behavior among dissatisfied customers. For negative experiences, consumers were found to be more likely to conform to prior opinions for temporally distant events. Time can facilitate recovery from incidental service failure: as temporal distance increases, consumers tend to move beyond their own negative experiences and incorporate decontextualized information from others. Restaurant managers and social media marketers should therefore consider the role of timing in forming consumers' judgements and capitalize on the timing of reviews as a coping mechanism in memory. Consumers who had negative experiences should be contacted later rather than sooner in the follow-up evaluation, so as to trigger psychological immunity and improve customer satisfaction on the service recovery.

Lastly, our findings suggest that restaurant managers could use review devices strategically to guide consumers' evaluations of self-perceptions and other-perceptions. Generally, to maximize the social influence of aggregated prior ratings, use of PCs should be encouraged to prompt other-perceptions. When average ratings are favorable, PCs should also be encouraged to facilitate informational interactions and exchanges between previous and future reviewers. For example, restaurants with high ratings may encourage reviewers to use PCs by providing incentives to PC respondents or by sending email invitations rather than short message service (SMS) invitations. On the contrary, restaurants with relatively low ratings may provide incentives to mobile reviewers or send text message invitations. Restaurant managers could further leverage the interaction effect between timing and review device to shape review conformity. For PC users, delayed posting time will more likely protect current word-of-mouth; however, for mobile device users, the temporal effect is weakened such that immediate or delayed review posting does not substantially affect social influence. Therefore, restaurants with high ratings may send out delayed emails rather than text messages when soliciting customer reviews.

5.3. Limitations and future study

While this study generated important theoretical and practical implications regarding temporal distance in online review-posting behavior, it is not without limitations. First, similar to earlier literature (Lee et al., 2015; Ma et al., 2013), our study was conducted based on the assumption that consumers are more likely to check publicly available restaurant review ratings. However, we cannot verify this assumption based on secondary online big data; future research could address this limitation by employing the experimental design method. Second, due to limited measures of social influence, we were unable to differentiate between normative social influence and informational social influence. To better understand the social influence process, subsequent studies should measure the effects of these two different types of social influences. Third, this study utilized a dataset from China. Hence, the findings may not be generalizable to other countries or cultures. Existing research indicates that review posting behavior can be impacted by reviewers' cultural background, and Chinese consumers tend to post less negatively extreme reviews and are more likely to conform to prior reviews compared to their western counterparts (Fang et al., 2013; Hong et al., 2016). Therefore, future research should consider cultural difference as a potential moderator when studying the role of temporal distance on review conformity.

Acknowledgments

The authors acknowledge the support of research funds from the National Natural Science Foundation of China (71902169 and 71671049) and The Hong Kong Polytechnic University Start-up Fund (Project No. 1-BE1X).

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