Using the Anchoring Effect and the Cultural Dimensions Theory to Study Customers' Online Rating Behaviors

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Abstract

This study focuses on the effect of prior average ratings of a product on subsequent online ratings, and we further analyze whether culture moderates this effect. The anchoring effect theory and cultural dimensions theory serve as the theoretical foundations for our investigation. To our best knowledge, we are the first to introduce the anchoring effect theory into the online review context. This study is also among the first to investigate how culture influences customers' online evaluations. Empirical results suggest that the prior average rating positively influences subsequent customers' posted ratings, and this positive influence is significantly moderated by culture. Besides theoretical contributions, our insights may also strategically benefit online sellers by increasing customer satisfaction and improving long-term sales.

Keywords Online rating behavior · Online word-of-mouth · E-commerce · Anchoring effect theory · Culture · Hofstede cultural dimensions theory

1 Introduction

The past two decades have witnessed an increase in customers' reliance on the digital online opinions of others. Online product ratings (hereafter online ratings), which are a quantitative format of user-generated product opinions, are extensively considered by potential buyers as an important source of information on product quality (Gao et al., 2015; Ho et al., 2017; Moe & Trusov, 2011). Substantial anecdotal and academic evidence has repeatedly accentuated that customers today rely heavily on online ratings when making purchase decisions, from what film to watch (Dellarocas et al., 2004) to what beer to drink (Clemons et al., 2006) and what books to read (Sun, 2012). E-commerce managers are often interested in customers' online rating behaviors because customers' posted ratings are an important driver of product sales and success (Chang et al., 2010; Hsu et al., 2004; Lee et al., 2015; Li & Hitt, 2008; Moe & Schweidel, 2012).

The past two decades have also witnessed scholars' interest to investigate the impact of prior ratings on customers' subsequent rating behaviors. Research in this realm has suggested that customers' posted ratings are socially influenced by existing ones owing to various mechanisms, such as, life-cycle process (Li & Hitt, 2008), increased purchase errors (Godes & Silva, 2012), differentiation effect (Schlosser, 2005), information seeking (Moe & Trusov, 2011), selection and adjustment effects (Moe & Schweidel, 2012), thereby leading to opinion dynamics (e.g., a downward trend) in online product ratings.

Three related studies in the discussed strand have particularly focused on the positive impact of customers' observed prior average ratings on their posted ones (Guo & Zhou, 2016; Ma et al., 2013; Sridhar & Srinivasan, 2012). These studies have been generally theorizing within a social influence

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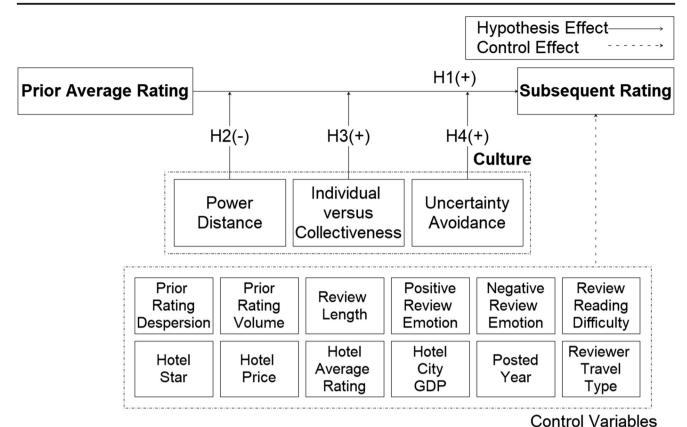
Fig. 1 Research conceptual model

framework, and suggested that the presence of social influence results in the tendency of subsequent reviewers to conform to the opinions generated by prior customers. In general, this social influence stems from two sources: (1) the case that customers tend to think that an aggregated evaluation generated by a majority of customers is relatively correct and (2) customers' tendency to conform to legitimate information (Guo & Zhou, 2016). Although the adoption of social influence theories in the three studies provide an ideal framework to conceptualize the discussed positive impact, we note that if the social influence mechanism is the only mechanism that drives the impact, then this impact should be further strengthened when a customer's observed prior average rating is generated by numerous customers, but Guo and Zhou (2016) found an opposite effect. They empirically determined that the volume of prior ratings tends to mitigate the positive impact of the prior average ratings on the subsequent ones.

The preceding paradox motivates us to further clarify the mechanism that drives the positive impact of customers' observed prior average ratings on their posted ones. We particularly infuse our theory with customers' common rating behaviors. To simplify, we consider the context that a customer is rating a hotel via an online travel agency. In the customer's purchase stage, it was a nearly impossible scenario that he/she directly booked a hotel without disregarding the real-time prior average rating of the hotel at all (Israeli, 2002; Moe & Trusov, 2011). The customer's observed prior average rating should have played a significant role in shaping her prior expectations and determined the corresponding purchase decision. Then, when entering the rating stage, the customer is highly likely to use such an important and aggregated information (Ma et al., 2013; Sridhar & Srinivasan, 2012), and consider it a starting point for evaluating the related experiences, thereby involuntarily undergoing a series of comparative thinking (e.g., "why prior customers posted 8 for such a bad hotel," "why an 8-rated hotel does not provide WiFi!" or "the prior customers are right; the hotel surely only deserves 8"). Eventually, the customer may reject such a prior average rating as being considerably high or low, and post an entirely different rating to reflect her true experience. However, anchoring effect theory suggests that the customer's observed prior average rating has already served as an anchor in the rating process, since the customer has already undergone an "anchor-and-adjust" process, in which "people begin with the anchor value and then adjust their answer toward a more plausible value" (Wegener et al., 2001, p. 62).

Therefore, we analyze the influence of customers' observed prior average ratings on their posted ones on the basis of anchoring effect theory. Anchor effect involves a heuristic processing of presenting a quantitative anchor, in which

participants provide quantitative evaluations (Tversky & Kahneman, 1974). Consistent with anchoring effect theories, which indicate that participants' evaluations are positively influenced by an initially presented anchor value (Furnham & Boo, 2011; Mussweiler & Strack, 2001; Wegener et al., 2010; Wegener et al., 2001), we postulate that prior average ratings can positively influence subsequent ratings. Such a postulation is explored via the following research question: *How and why does a customer's observed prior average rating influence his/her posted rating?*

Within an anchoring effect framework, we argue that the previously mentioned paradox (i.e., prior average ratings generated by only a few customers are found to exert a large impact on subsequent ratings) is justifiable because the anchoring literature has suggested that even uninformative or implausible anchors could induce equal, or even large, anchoring effects (Critcher & Gilovich, 2008; Jacowitz & Kahneman, 1995; Mussweiler, 2001; Tversky & Kahneman, 1974). Therefore, the prior average ratings generated by only a few customers are likely to exert an even larger anchoring effect that the ones generated by numerous customers. This evidence has unfolded the aforementioned paradox and further suggested the fitness to answer our research question from an anchoring perspective.

Given the potential positive impact of prior average on subsequent ratings, we also aim to provide a fine-grained investigation on the potential moderating roles. Given that anchoring effect theory suggests that the magnitude of anchoring varies along with decision makers' personalities, such as, conscientiousness (Eroglu & Croxton, 2010) and openness to experience (McElroy & Dowd, 2007), which are fundamentally shaped by individual culture (Bond & Smith, 1996; Sussman & Siegal, 2003), we argue that further opportunities are available to scrutinize the moderating effects of culture in our context. Accordingly, we propose our second research questions: *How does a customer's culture moderate the influence of a customer's observed prior average rating influence on the posted rating?*

To summarize, this study aims to analyze the relationships among prior average rating, customer's culture as the moderator, and subsequent rating. The empirical results are obtained by using the longitudinal secondary data collected from *Agoda.com* and *Itim International* for 2451 US hotels with 127,133 observations from 2011 to 2016. Our analysis results show that there exists a significant positive relationship between a customer's observed prior average rating of a product and his/her posted rating, and additionally, this relationship can be considerably moderated by culture.

Our study contributes to the literature in several ways. First, we contribute to the research stream on the impact of prior average ratings on subsequent ratings by introducing anchoring effect theory to explain the mechanism of this impact. Our theorizing is distinct from the traditional one, which is based on social influence theory, thereby providing new insights into the potential mechanisms that drive prior average ratings to positively influence subsequent ratings.

Second, although previous IS studies have attempted to find ways to recognize the importance of culture in the online behaviors of customers (Chau et al., 2002; Hwang & Lee, 2012; Ng, 2013; Sia et al., 2009; Stafford et al., 2004; Yoon, 2009), we note that prior research has generally failed to examine how culture matters to the impact of prior ratings on the subsequent ones. This lack of attention is concerning considering the current exponential growth of globalization and e-commerce. To the best of the authors' knowledge, the current study is among the first to provide insights into how customers' cultures moderate the relationship between their observed prior average ratings and posted ratings. Beyond this perspective, the corresponding analysis may help complement the potential "missing link" in investigating customers' susceptibility to the anchoring effect in the online rating context.

Third, we adopt Hofstede's (1984) cultural dimensions theory to capture the discrepancies between cultures in this study. While the uses of the anchoring effect and cultural dimensions theories are both substantially widespread, our study provides an initial linkage between these two classical theories, thereby contributing to the extant understanding of both theories.

The remainder of this paper is organized as follows: In Section 2, we describe the research framework and hypotheses. In Section 3, we introduce the data collection, construct the variables, and present our main analysis results. Finally, in Section 4, we present the discussion and conclusions.

2 Research Framework and Hypotheses

2.1 Prior Average Rating and Subsequent Rating

Research focusing on how prior ratings affect subsequent ratings is growing. Table 1 shows a summary of this stream of studies.

According to the literature reviewed in Table 1, the extant studies have presented diverse reasons that future ratings will be affected by prior ratings. The proposed causes may involve customers' different product preferences (Li & Hitt, 2008), diverse online WOM perception (Godes & Silva, 2012), prior ratings-based pre-purchase expectations of customers (Ho et al., 2017), differentiation effect (Moe & Schweidel, 2012; Schlosser, 2005), and bandwagon effect (Moe & Schweidel, 2012), and the effect of consensus (Ma et al., 2013; Moe & Schweidel, 2012). Furthermore, based on these studies, we also note the possible outcomes stemming from the effects of prior ratings on future ratings. The possible outcomes include the following: Future online ratings display a dynamic trend (Godes & Silva, 2012; Li & Hitt, 2008; Schlosser, 2005; Wu & Huberman, 2008), product sales are influenced (Moe &

Table 1 Literature on the Effect of Prior Ratings on Future Ratings

Literature	Product Type	Effect Type	Cause of Effect	Theoretical Background for Effect	Main Findings
Schlosser (2005)	No specific type	The effect of prior positive or negative reviews on future rating decisions	Differentiation effect	Negative bias theory	(1) Posters tend to negatively adjust their product evaluations after reading negative reviews. (2) Online ratings have a downward trend.
Li and Hitt (2008)	Books	The effect of posted time of prior ratings on posted ratings	Idiosyncratic preferences of early buyers	Information-motivated herding	(1) Initial product ratings tend to be provided by early customers.
Wu and Huberman (2008)	No specific type	The effect of the extremity of prior ratings on posted ratings	Tendency to speak out differently from others	Rational choice theory	(1) An online rating trend occurs wherein extreme views are increasingly involved in the reviews.
Moe and Trusov (2011)	Beauty products	The effect of social dynamics in the ratings environment on subsequent ratings	Selection effect and adjustment effects	Not specifically indicated	(1) The social dynamics of online product ratings have effects on sales and future ratings.
Godes and Silva (2012)	Books	The effect of time and ordinality of prior ratings on posted ratings	Decreased review diagnostic ability	Information-motivated herding and rational choice theory	(1) The self-selection behavior of consumers can cause systematic bias in reviews posted during early periods. (2) The online average numerical value of ratings decreases with the ordinality of the rating rather than with time.
Ho et al. (2017)	No specific type	The effect of disconfirmation from prior ratings on rating decisions	Pre-purchase expectation formulation and disconfirmation bias	Expectation-disconfirmation theory	(1) An individual tends to review highly when his/her encountered magnitude of disconfirmation is large. (2) The direction of the rating based on actual experiences is in accordance with the sign of disconfirmation.
Guo and Zhou (2016)	Restaurants	The effect of the prior average rating on subsequent ratings	Information diagnosticity, social influence	Social influence theory	(1) Either of volume or variance of prior ratings exerts a negative moderating effect on the influence of prior average rating on subsequent rating. (2) Such moderating effects are contingent on subsequent reviewers' connectedness and expertise
Sridhar and Srinivasan (2012)	Hotels	The moderating role of prior average rating on the relationship between product features and the posted ratings	Social influence	Social influence theory	(1) Other consumers' online ratings moderate the effects of positive and regular negative features of product experience, product failure, and product recovery (to address product failure) on the reviewer's online product rating.
Ma et al. (2013)	No specific type	The effect of the prior average rating on subsequent ratings	Expectation formulation	A mechanism similar to the one of social influence	(1) The effect of prior average rating on subsequent ratings can be moderated by the features of the review and the reviewer.

Trusov, 2011), customers' willingness to evaluate online is affected (Ho et al., 2017), and customers' posted ratings are different from the actual product experience (Ma et al., 2013).

In particular, three studies in the research stream have investigated how customers' observed prior average ratings impact their posted ratings. The referred studies have reach a consensus that such an impact is positive. In terms of the underlying mechanisms of this impact, they have provided explanations on the basis of social influence theory. For example, Sridhar and Srinivasan (2012, p.73) noted that "people experience conformity pressures from other members in a social group. The actions of others have a powerful effect on a given member' s behavior." Ma et al. (2013, p. 282) stated that "without any other dependable and readily available way to assess a product or a service before consumption, consumers tend to build their expectations on the average rating of prior reviews. These prior expectations serve as a foundation, or level of reference, for postconsumption evaluations."

We would like to further clarify the mechanism that drives the positive influence of prior average ratings on subsequent ratings within an anchoring effect framework. We adopt such a novel framework in our context because customers tend to retrieve information on prior average ratings during their actual ratings, and use the information as a starting point for adjustment and make comparative assessments (e.g., "why a hotel that rates 8.9 provides no breakfast!" or "oh, the hotel that rates 3 is not quite bad."). Anchoring effect theory suggests that comparative assessment make individuals generate information consistent with the anchor value in ways that bias the subsequent judgement (Epley & Gilovich, 2001; Jacowitz & Kahneman, 1995), thus, we argue that prior average ratings play as anchors during such customers' online rating processes.

Anchoring effect represents one of the most robust cognitive heuristics for decision-making that occurs daily and universally (Furnham & Boo, 2011). In terms of the source of the anchoring effect, scholars in recent years have widely accepted and cited "hypothesis-testing" conceptualization as an explanation (Chapman & Johnson, 1999; Mussweiler, 2001; Mussweiler & Strack, 1999; Wegener et al., 2010). That is, when a decision-maker considers an initially presented anchor, he/she will use the information as a starting point and tests the hypothesis that this anchor is a plausible answer to the judgment. In doing so, the decision-maker automatically compares the corresponding attributes of the target with his/her existing knowledge and searches for a series of ways in which the target shares commonalities with the anchor. This approach activates his/her ability to access the anchor-consistent knowledge to adjust his/her decision toward the initially presented anchor (Petty & Cacioppo, 1986).

In the online shopping context, the prior average rating of a product, as an explicitly displayed aggregated numerical opinion, will undoubtedly attract significant attention from a potential customer during his/her purchase (Dellarocas et al., 2007). Then, in the rating stage, the customer tends to use such information that comes to the mind for evaluating the experience and estimating the ratings. In the process, the customer will subconsciously and comparatively test the hypothesis that the prior average rating is a reasonable answer, thereby accessing to anchor-consistent information to bias his/her judgment. Thus, the customer's posted rating will be positively influenced by the anchor of the prior average rating. In other words, a high anchor (i.e., a high prior average rating) initially perceived by a customer will lead to a high evaluation judgment (i.e., a high subsequent rating). Accordingly, we propose the following hypothesis:

> HYPOTHESIS 1 (H1). *A customer's observed prior average rating of a product during purchase positively influences his/her posted rating during review process.*

2.2 Moderating Role of Culture

As the prior average rating serves as an anchor when a customer is posting a rating, the key to investigating the moderating role of culture lies in exploring the intervening role of the customer's culture on his/her level of stimulation by the anchoring effect.

The level of the anchoring effect is contingent upon the degree of extensive generation of anchor-consistent knowledge in the target subject (Mussweiler & Strack, 2001). A primary method proposed to enhance such knowledge generation is elaboration, the level of which varies with the motivation and cognitive efforts a decision-maker devotes to assessment (Petty & Cacioppo, 1986; Wegener et al., 2010). The degree of elaboration is high when he/she has additional motivation or effortful thinking. When a decision-maker's degree of elaboration is high, substantial target attributes that are common with the anchor are stimulated in his/her mind to adjust judgment. This highly motivated extensive pool of anchor-consistent information then yields a large anchoring effect. Simply put, significant motivation or further effortful thinking during evaluation will yield high levels of the anchoring effect.

Culture is a notion that contains multidimensional interpretations (Weber & Hsee, 1998). Hofstede's cultural dimensions theory (Hofstede, 1984), which represents the most extensively applied theory for capturing cultural differences (Leidner and Kayworth, 2006; Steenkamp, 2001), has been used in many studies. Based on this theory, cultural discrepancies can be captured in four dimensions, namely, power distance, individualism versus collectivism, masculinity versus femininity, and uncertainty avoidance (Hofstede, 1984). Given the online WOM context of our study, our model includes three dimensions, namely, power distance, individualism versus collectiveness, and uncertainty avoidance. These three dimensions are selected

considering their close linkage with service evaluation (e.g., Donthu & Yoo, 1998; Furrer et al., 2000; Malhotra et al., 2005; Mattila, 1999), which is the focus of this study. The cultural dimension of masculinity versus femininity, which focuses on how gender roles are stressed and distinctive in a society, is excluded from our model because this relationship is not strongly related to service expectations (Donthu & Yoo, 1998).

The three dimensions identify systematic differences in national cultures in different aspects. First, the dimension of power distance is defined as "the extent to which the less powerful members of organizations and institutions (like the families) accept and expect that power is distributed unequally" (Hofstede, 1994, p. 2). Consumers in a high-power distance culture tend to perceive a person with a high job position as an individual who possesses a high level of power, status, and authority (Ngai et al., 2007). Second, the dimension of individualism versus collectivism focuses on individuals' relationships with others (Hofstede, 1991). Individuals with high individualism tend to be substantially independent, have self-orientation and fairness, and primarily pursue their own interests but not others'; by contrast, individuals with high collectivism will display a high level of group loyalty and are ready to protect the interests of the members of their own group (Donthu & Yoo, 1998). Third, the dimension of uncertainty avoidance describes a society's tolerance of ambiguity (Hofstede, 1984) and deals with the way a society accommodates high levels of uncertainty and ambiguity in the environment (Hofstede, 1984; Soares et al., 2007). People from high-uncertainty avoidance cultures tend to be more resistant to change, more fearful of failure, and less likely to take risks than people from low-uncertainty avoidance cultures (Huang et al., 1996).

First, we consider how the influence of the prior average rating on subsequent ones is contingent upon the cultural dimension of power distance. Low power distance is shown to be positively related to the personality trait of conscientiousness (Hofstede & McCrae, 2004; McCrae & Terracciano, 2005). Therefore, reviewers in low-power distance societies are prone to feeling responsible for expressing their real product experiences to future customers through online evaluation, and these serious attitudes increase their degree of effortful thinking when posting evaluations. According to the anchoring effect theory, the stimulated extensive pool of anchor-consistent information during effortful thinking enhances the stimulated anchoring effect of a reviewer. Thus, ratings posted by customers who score low in power distance can be intensively affected by the prior average rating. Accordingly, we propose the following hypothesis:

HYPOTHESIS 2 (H2). *The positive influence of a customer's observed prior average rating on his/her posted rating is strengthened when the focal customer is from a society that ranks low on power distance.*

Second, in terms of the cultural dimension of individualism versus collectivism, individuals from individualistic societies tend to express their emotions to others, whereas those from collectivist societies do not prefer to express their emotions outwardly (Watkins & Liu, 1996). Similarly, consumers from individualistic cultures are more likely to engage in voice behaviors than individuals from collectivistic cultures (Liu & McClure, 2001). Therefore, individuals who score highly in individualism are likely to view online evaluation as a readily available way to engage in voice behaviors, and they tend to spend substantial effortful thinking in numerically evaluating their product experience online as feedback on their purchases. According to the anchoring effect theory, involvement in high levels of elaboration during their evaluation will enhance customers' susceptibility to the anchoring effect. Therefore, the ratings posted by customers from individualistic cultures can be intensively influenced by the initially presented anchors (i.e., prior average ratings). Accordingly, we propose the following hypothesis:

HYPOTHESIS 3 (H3). *The positive influence of a customer's observed prior average rating on his/her posted rating is strengthened when the focal customer is from a society that ranks highly on individualism.*

The third cultural dimension considered in this study is uncertainty avoidance. Individuals who score highly on the uncertainty avoidance dimension seek to preclude ambiguity and prefer to engage in thorough information-searching processes before making judgments (Hofstede & McCrae, 2004). Thus, when rating a product, customers in high-uncertainty avoidance cultures seek to engage in highly effortful thinking for evaluation, thereby stimulating a large pool of anchor-consistent information to increase their susceptibility to the anchoring effect.

Moreover, individuals with high uncertainty avoidance thinking are proposed to be open to experiences (Hofstede & McCrae, 2004). This notion is corroborated by McElroy and Dowd (2007), who note that individuals with high openness to experience are more sensitive to anchoring cues and can be more influenced by the presented anchors than those who have low openness to experience. Given all the evidence presented, we may infer that the effect of the prior average rating on subsequent ratings is escalated if the reviewer is from a high-uncertainty avoidance society. Thus, we present the following hypothesis:

HYPOTHESIS 4 (H4). *The positive influence of a customer's observed prior average rating on his/her posted rating is strengthened when the focal customer is from a society that ranks highly on uncertainty avoidance.*

Figure 1 illustrates the conceptual model with the proposed hypotheses.

3 Data and Analysis Results

3.1 Data Description

The data we use to provide empirical evidence for the hypotheses originate from two public sources. The first is a leading online travel agency website (*Agoda.com*),[1] from which we collected hotel online WOM data from 2011 to 2016. In particular, hotels evidently represent one of the products that are most frequently purchased by customers from all over the world. Given the present study focuses on the cross-cultural difference of customers' online rating behaviors, online WOMs for hotel products is highly fit for such an investigation.

We targeted hotels in six cities (i.e., New York, Boston, San Francisco, Honolulu, Chicago, and Washington), which are all representative US metropolises or well-known tourist cities. These hotels were chosen because the cities where they are located have numerous customers from different countries, thus ensuring the cultural diversity of the collected sample in this study.

On the basis of the abovementioned criteria, our data involve 2451 hotels. For each hotel, the complete WOM histories from 2011 to 2016 were obtained. The information collected from the data source mainly consists of three categories. The first category refers to individual-level online WOM records concerning customer-reported reviews in the following typical format: review title, review body, submission date, and overall product rating on a continuous scale ranging from 0 to 10. The second category includes individual-level reviewer characteristic records, which consist of reviewer's name, travel type, and nationality. The third category involves hotel characteristic records, which contain information about prices for each hotel room type, the hotel's location, its star level, and its total number of reviews. Hotels with fewer than 15 reviews were removed.[2] 127,790 observations were obtained.

The second data source we used is *Itim International* (http://www.geert-hofstede.com). We followed several prior studies (e.g., Rai et al., 2009) in collecting cultural dimension data from *Itim International*. Specifically, we collected cultural values involving three cultural dimensions, namely, power distance, individualism versus collectivism, and uncertainty

avoidance. Each dimension value is measured on a 100-point scale using items from *Itim International*. We merged the data collected from the two data sources according to nationality. Because the Itim International data do not contain the cultural dimensions of all countries in the world, 657 reviews for which the reviewer's cultural dimensions could not be found in the data were excluded from our study. The abovementioned process enabled us to derive our final data, which contain 127,133 observations.

3.2 Variable Descriptions

The dependent variable ($Rating_{ij}$) in our research is defined as reviewer i's online rating of hotel j. For each customer i of hotel j, his/her posted $Rating_{ij}$ is a value between 0 and 10.

In terms of the independent variables, we define $Pri\_AveRating_{ij}$ as the prior average rating of hotel j for customer i, which is calculated by the mean of all the ratings of hotel j that were posted before customer i posted his/her rating.

Cultural factors serve as moderators in this study. The three focused-on cultural dimensions in this study are power distance, individualism versus collectivism, and uncertainty avoidance. A customer's power distance value (PDI_{ij}) is equal to Hofstede's corresponding power distance value for his/her country/region of origin and then divided by 100. Values of individualism versus collectivism (IDV_{ij}) and uncertainty avoidance (UAI_{ij}) are measured using a similar process.

To guarantee the empirical rigor of this study, we include 12 controls to account for the potential unobserved heterogeneity that may bias estimation. First, given that the features of prior ratings can influence a customer's online rating evaluation (Ho et al., 2017; Li & Hitt, 2008), a first set of controls contains the dispersion ($Pri\_Dispersion_{ij}$) and volume (Pri_Volume_{ij}) of the prior ratings for customer i who experienced hotel j. Second, we control a set of variables concerning the hotel-specific features because they may directly influence the overall level of ratings. These features include the economic performance of the city that the hotel located ($H\_City\_Eco_j$), star level (H_Star_j), average price (H_Price_j), and total number of ratings ($H\_Ratingnum_j$) of hotel j. We also control a set of variables concerning the features of the online WOM, which are suggested to exert a direct influence on the rating levels (Yin et al., 2016). The controls in this category are the percentage of positive words in the review posted by customer i for hotel j (R_Posemo_{ij}), the percentage of negative words in the review posted by customer i for hotel j (R_Negemo_{ij}), the reading difficulty measured by the Gunning-Fog index of the review posted by customer i for hotel j (R_Diff_{ij}), the number of words in the review contents posted by customer i for hotel j (R_Length_{ij}), and the year of the rating posted by customer i for hotel j (R_Year_{ij}). Third, to control for heterogeneity across reviewers, we control the

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[1] Through *Agoda.com*, a customer who books a hotel will receive a survey from Agoda very soon after his/her hotel stay as an opportunity to rate the hotel property and write about his/her experience. Review and rating submission behaviors are totally voluntary and self-driven.

[2] Given the unavailability to collected data on prior average ratings during customers' purchase, we assume that customers' observed prior average ratings during their purchase are equal to the ones during ratings. Accordingly, we removed the hotels with fewer than 15 reviews from our dataset to avoid the significant fluctuate of values of average ratings during the period between a customer's purchase and his/her rating.

travel type of customer i who experienced hotel j ($C\_Traveltype_{ij}$).

Table 2 summarizes all the variables involved in the empirical analysis, while Table 3 presents the summary statistics and correlations between the selected variables. In the variable descriptions that follow, i indexes a reviewer, and j indexes a hotel.

3.3 Methodology

To test the hypotheses in this study, we formulate the following equation:

$$
\begin{aligned}
Rating_{ij} = {} & \theta_0 \text{Pri\_AveRating}_{(i-1)j} + \text{Pri\_AveRating}_{(i-1)j} \\
& \left(\sum_{m=1}^{3} \beta_m CultureDimensions_{mij} \right) \\
& + \sum_{n=1}^{3} \kappa_n CultureDimensions_{nij} + \sum_{r=1}^{12} \alpha_r Controls_{rij} + \varepsilon_{ij}
\end{aligned} \tag{1}
$$

where θ_0 indicates the main effect of $Pri\_AveRating$. In addition, κ_n, $n \in [1, 2, 3]$ captures the main effects of $CultureDimensions$, $m \in [1, 2, 3]$, where $CultureDimensions_{1i} = PDI_i$, $CultureDimensions_{2i} = IDV_i$, and $CultureDimensions_{3i} = UAI_i$.

3.4 Tests of Hypotheses

Equation (1) is estimated using an ordinary least-squares regression model, and the results are presented in Table 3. The results are based on 127,133 ratings for which all control and focal variables are available.

We include three models. Model 1 (Table 4) introduces the control variables. According to the results (Table 3), as expected, several factors, such as review length (R_Length), hotel star level (H_Star), total number of hotel ratings ($H\_RatingNumber$), and degree of positive emotion in reviews (R_Posemo), are all related to high ratings.

Model 2 (Table 4) introduces the $Pri\_AveRating_{ij}$ variable to test the main effects of the independent variable, that is, prior average rating ($Pri\_AveRating_{ij}$). The coefficient for $Pri\_AveRating_{ij}$ is positive and significant ($\beta = 0.726$, $p < 0.01$), thus indicating that a one-unit increase in the prior average rating increases the subsequent rating ($Rating_{ij}$) by 0.726. Therefore, H1, which states that the prior average rating will positively influence the subsequent rating, is supported.

Model 3 (Table 4) introduces the interaction terms of $Pri\_AveRating_{ij} \times PDI_{ij}$ to examine how power distance can moderate the relationship between the prior average rating ($Pri\_AveRating_{ij}$) and subsequent ratings ($Rating_{ij}$). The coefficient of $Pri\_AveRating_{ij} \times PDI_{ij}$ is significantly negative ($\beta = -0.183$, $p < 0.01$), thereby indicating that the positive effect of $Pri\_AveRating_{ij}$ on $Rating_{ij}$ is weak when PDI_{ij} is high. Therefore, H2, which states that power distance will weaken the relationship between the prior average rating and the subsequent rating, is supported.

Model 4 (Table 4) introduces the interaction terms of $Pri\_AveRating_{ij} \times IDV_{ij}$ to examine how individualism can moderate the relationship between the prior average rating and subsequent ratings. The significantly positive coefficient ($\beta = 0.115$, $p < 0.01$) of $Pri\_AveRating_{ij} \times IDV_{ij}$ indicates that the positive effect of $Pri\_AveRating_{ij}$ on $Rating_{ij}$ is strong when IDV_{ij} is high.

Model 5 (Table 4) introduces the interaction terms of $Pri\_AveRating_{ij} \times UAI_{ij}$ to examine how individualism can moderate the relationship between the prior average rating

Table 2 Variable Descriptions

Variables	Description	Source
$Rating_{ij}$	Online rating provided by customer i for hotel j.	Agoda.com
$Pri\_Average_{ij}$	Average of all the prior ratings of a hotel j before customer i posted a rating.	Agoda.com
PDI_{ij}	Power distance value of customer i who evaluated for hotel j, and then then divided by 100.	Itim International
IDV_{ij}	Individualism value of customer i who evaluated for hotel j, and then then divided by 100.	Itim International
UAI_{ij}	Uncertainty avoidance value of customer i who evaluated for hotel j, and then then divided by 100.	Itim International
Controls		
$Pri\_Dispersion_{ij}$	Standard deviation of all the prior ratings of hotel j before customer i posted a rating.	Agoda.com
Pri_Volume_{ij}	Rating volume of all the prior ratings of hotel j before customer i posted a rating, and then divided by 100.	Agoda.com
R_Length_{ij}	Number of words in the review posted by customer i for hotel j.	Agoda.com
R_Posemo_{ij}	Percentage of words indicating positive emotions in the review posted by customer i for hotel j.	Agoda.com
R_Negemo_{ij}	Percentage of words indicating negative emotions in the review posted by customer i for hotel j.	Agoda.com
R_Diff_{ij}	Gunning-Fog index of the reading difficulty of the review posted by customer i for hotel j.	Agoda.com
H_Star_j	Star level of hotel j.	Agoda.com
H_Price_j	Average price of all room types of hotel j, and then divided by 100.	Agoda.com
$H\_Rating\ Number_j$	Total cumulative number of ratings of hotel j at the time we collected the sample, and then divided by 1000.	Agoda.com
H_City_Eco	The natural logarithm of the gross domestic product (GDP) of the city that the focal hotel located.	U.S. Bureau of Economic Analysis (BEA) dataset
$Year_{ij}$	Year (2011/2012/…/2016) customer i posted a rating for hotel j.	Agoda.com
$Traveltype_{ij}$	Travel type (single/couple/family/business) of customer i who evaluated hotel j.	Agoda.com

Table 3 Descriptive Statistics and Correlations

	Variables	Mean	Standard Deviation		1	2	3	4	5
1	*Rating*	7.76	1.76		1.00				
2	*Pri_AveRating*	7.75	0.85		0.46	1.00			
3	PDI	0.50	0.18		−0.05	−0.02	1.00		
4	IDV	0.65	0.26		0.06	0.01	−0.71	1.00	
5	UAI	0.60	0.20		−0.04	0.03	0.32	−0.35	1.00
6	*Pri_Dispersion*	1.23	0.96		−0.34	−0.14	−0.01	0.04	−0.03
7	*Pri_Volume*	3.96	5.13		0.04	0.06	−0.01	0.00	0.09
8	*R_Length*	51.57	35.34		−0.08	−0.08	−0.01	−0.03	−0.05
9	*R_Posemo*	10.32	9.56		0.29	0.13	−0.01	−0.01	−0.05
10	*R_Negemo*	1.31	3.47		−0.32	−0.14	0.01	−0.01	0.03
11	*R_Diff*	9.09	8.39		0.04	0.03	0.08	−0.09	0.06
12	*H_Star*	3.07	0.87		0.29	0.59	−0.01	0.01	−0.01
13	*H_Price*	1.87	0.89		0.21	0.44	−0.01	0.02	0.01
14	*H_RatingNumber*	1.56	1.61		0.06	0.10	0.01	−0.01	0.13
15	*H_City_Eco*	20.40	0.82		0.08	0.17	0.03	−0.01	0.05
	Variables	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
6	*Pri_Dispersion*	1.00								
7	*Pri_Volume*	0.01	1.00							
8	*R_Length*	0.01	−0.13	1.00						
9	*R_Posemo*	−0.15	0.02	−0.34	1.00					
10	*R_Negemo*	0.22	0.01	−0.06	−0.15	1.00				
11	*R_Diff*	0.00	0.01	−0.23	0.22	0.07	1.00			
12	*H_Star*	−0.07	0.01	−0.01	0.07	−0.08	0.03	1.00		
13	*H_Price*	−0.06	0.02	−0.02	0.04	−0.06	0.03	0.59	1.00	
14	*H_RatingNumber*	0.01	0.76	−0.17	0.01	0.00	0.03	0.04	0.03	1.00
15	*H_City_Eco*	−0.02	0.25	−0.09	0.03	0.00	0.02	0.22	0.25	0.31

and subsequent ratings. The significantly positive coefficient of $Pri\_AveRating_{ij} \times UAI_{ij}$ ($\beta = 0.036$, $p < 0.1$) indicates that the positive effect of $Pri\_AveRating_{ij}$ on $Rating_{ij}$ is strong when UAI_{ij} is high, thereby supporting H4, which states that uncertainty avoidance can strengthen the relationship between the prior average rating and subsequent ratings.

At last, Model 6 (Table 4) includes all the moderators and shows entirely consistent moderating effects.

We summarize our results in Table 5.

4 Discussions and Implementations

4.1 General Discussion

The current study presents the following research questions:

(1) *How and why does a customer's observed prior average rating influence his/her posted rating?*

(2) *How does a customer's culture moderate the influence of a customer's observed prior average rating influence on the posted rating?*

We exerted theoretical and empirical effort to answer our research questions. For the theoretical aspect, we synthesized the extensive anchor effect theory literature and applied it in the online rating context.

We used the anchoring effect framework as the basis to propose that a customer's observed prior average rating plays as an anchor during a customer' rating process and thus drives the assimilation of his/her posted rating to the average one that he/she observed during the purchase. In addition, within the anchoring effect framework, we also propose that culture moderates such a positive effect via intervening customers' generated anchor-consistent knowledge.

For the empirical aspect, we tested our hypotheses based on 127,133 observations from 2451 hotels, covering the years from 2011 to 2016. Accordingly, we achieved empirical results that are entirely consistent with our predictions. That is,

Table 4 Estimation Results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Pri_AveRating		0.726***	0.816***	0.649***	0.709***	0.727***
		(120.54)	(57.51)	(47.65)	(47.23)	(19.50)
Pri_AveRating×PDI			−0.183***			−0.193***
			(−7.09)			(−5.16)
PDI			1.075***			1.700***
			(5.35)			(5.82)
Pri_AveRating×IDV				0.115***		0.038*
				(6.34)		(1.74)
IDV				−0.467***		0.149
				(−3.30)		(0.72)
Pri_AveRating×UAI					0.036*	0.124***
					(1.84)	(4.96)
UAI					−0.734***	−1.268***
					(−4.07)	(−6.56)
Pri_Dispersion	−0.447***	−0.395***	−0.396***	−0.399***	−0.399***	−0.402***
	(−99.30)	(−92.23)	(−92.42)	(−93.32)	(−93.31)	(−93.99)
Pri_Volume	−0.021***	−0.010***	−0.011***	−0.010***	−0.011***	−0.010***
	(−14.00)	(−7.29)	(−7.70)	(−7.40)	(−7.67)	(−7.52)
R_Length	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(4.50)	(5.89)	(5.60)	(6.30)	(5.32)	(6.12)
R_Posemo	0.038***	0.034***	0.034***	0.034***	0.033***	0.034***
	(77.65)	(73.86)	(73.50)	(73.87)	(72.17)	(72.82)
R_Negemo	−0.109***	−0.096***	−0.096***	−0.096***	−0.095***	−0.095***
	(−86.92)	(−80.37)	(−80.44)	(−80.32)	(−80.07)	(−80.12)
R_Diff	0.000	−0.000	0.001	0.001***	0.001	0.001***
	(0.66)	(−0.07)	(1.19)	(2.59)	(1.36)	(2.93)
H_Star	0.424***	0.077***	0.077***	0.076***	0.071***	0.073***
	(70.70)	(12.03)	(12.05)	(11.98)	(11.17)	(11.45)
H_Price	0.114***	0.014**	0.014**	0.012**	0.016***	0.014**
	(19.20)	(2.54)	(2.40)	(2.07)	(2.89)	(2.43)
H_RatingNumber	0.082***	0.044***	0.047***	0.048***	0.052***	0.053***
	(18.25)	(10.27)	(10.89)	(11.25)	(12.01)	(12.31)
H_City_Eco	−0.024***	−0.019***	−0.018***	−0.017***	−0.017***	−0.019***
	(−4.34)	(−3.49)	(−3.30)	(−3.28)	(−3.28)	(−3.68)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
TravelType Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	6.255***	2.023***	1.499***	2.390***	2.414***	1.885***
	(50.75)	(16.60)	(9.60)	(15.46)	(14.70)	(6.06)
N	126,358	126,358	126,358	126,358	126,358	126,358
R^2	0.293	0.366	0.368	0.370	0.369	0.371

t statistics in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

we found that customers' observed prior average ratings positively influence their posted ratings. Such an influence is strengthened by customers' low power distance, high individualism, or high uncertainty avoidance.

Our findings yielded substantial theoretical and practical implications, which are discussed as follows.

4.2 Theoretical Implications

The present study has several contributions to the academic literature. First, our study may advance the literature on the impact of prior ratings on subsequent customers' online behaviors. To the best of our knowledge, this study represents

Table 5 Summary of Results

Hypothesis	Result
H1: A customer's observed prior average rating of a product during purchase positively influences his/her posted rating during review process.	Supported
H2: The positive influence of a customer's observed prior average rating on his/her posted rating is strengthened when the focal customer is from a society that ranks low on power distance.	Supported
H3: The positive influence of a customer's observed prior average rating on his/her posted rating is strengthened when the focal customer is from a society that ranks highly on individualism.	Supported
H4: The positive influence of a customer's observed prior average rating on his/her posted rating is strengthened when the focal customer is from a society that ranks highly on uncertainty avoidance.	Supported

the first attempt to introduce the anchoring effect, a very robust cognitive heuristic, to individual online WOM behaviors. We draw on the anchoring effect to offer a novel theoretical explanation to analyze the influence of prior average ratings on subsequent ratings. Such investigation may remind future researchers that anchoring effect theory may serve as the theoretical foundation when exploring the influence of certain numerical contents on customers' online numerical evaluations.

Second, this study is among the first to investigate the effects of cultural differences on customers' online evaluation behaviors. We reinforce the notion that customers' online behaviors are distinct across cultures by demonstrating that culture can moderate the relationship between prior average and subsequent ratings. Therefore, future online rating researchers should incorporate the influence of culture into their models if they target cross-cultural studies. In addition, given that culture plays a fundamental role in molding individuals' personal characteristics (Hinde, 1987; Judge & Cable, 1997; Saffold III, 1988), our results echo the findings of Ma et al. (2013), in which the influence of the prior average and subsequent ratings was moderated by individual features.

Third, to the best of our knowledge, this study is also the first to link the anchoring effect and cultural dimensions theories, thereby providing new insights into both theories. Our findings demonstrate that cultural dimensions may act as moderators in stimulating the anchoring effect in the online WOM context. At the same time, our results may provide new insights into anchoring effects when targeting cross-cultural studies in other contexts.

4.3 Practical Implications

Apart from the theoretical implications, the empirical results also present several managerial implications. The results can remind managers of the important role of products' average ratings, as this study demonstrates that prior average ratings can significantly influence subsequent ratings, which are significant for product success (e.g., Moe & Trusov, 2011; Sun, 2012). Furthermore, the findings, which indicate that the positive influence of prior average rating on subsequent ratings can be strengthened in low-power distance, high-individualism, or high-uncertainty avoidance societies, are beneficial for managers' decision-making: If the average rating of a product is high, then managers may consider repeatedly highlighting such rating in a prominent position on the website to enhance the anchoring effects on future customers, particularly in countries with low power distance, high individualism, or high uncertainty avoidance. This strategy may help online sellers to achieve increased customer satisfaction and improved long-term sales.

4.4 Limitations and Future Research

Like the results of other empirical studies, the outcomes of the current research are subject to limitations, thereby possibly providing avenues for future research. First, cultural discrepancy exists among individuals within the same society. Hui and Triandis (1986) noted that cultures labeled as individualistic (or collectivistic) are simply cultures in which the majority of individuals have the corresponding personal features of individualism (or collectivism). Even in the same country, the cultural dimension values for different regions may exhibit distinctive qualities. Thus, the culture-related findings in this study can be used to indicate an overall societal trend, which may be valuable for managers when placing their products or services into diversified markets in different countries. Future studies may also investigate how the influence of prior ratings on future ratings is contingent upon certain individual-level factors, such as the five-factor model of personality (Costa Jr & Widiger, 1994).

Second, our context is specific to the product type of hotels, which inherently suggests that customers' average anchoring effect on hotels may be dissimilar to that on other products. The generalizability of our findings might also be limited to similar products. Therefore, future studies may concentrate on whether our constructs and relationships are available for other product types or categories (e.g., "experience goods" and "search goods").

Third, in this study, we only focus on the influence of the prior average rating on subsequent ratings. However, due to the specific, unique features of prior average ratings (e.g., numerical, explicit, and prominently displayed), we include other statistical features (e.g., deviation) of prior ratings as control variables in our model. Therefore, future studies may also investigate how other statistical features of prior ratings (e.g., deviation of prior ratings) matter to subsequent ratings as well as how the relationship can be moderated by culture.

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