The moderating effect of agglomeration on horizontal differentiation and online reviews: the case of Paris hotels

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Abstract

Purpose – Hotels are immersed in a very competitive environment and hoteliers have to plan and redesign their strategies to stay in the hospitality industry while faced with a steady rise in competition. Hoteliers can employ horizontal differentiation strategies and pricing decisions to gain a competitive advantage over their competitors. The goal of our work is to analyse the effect of pricing and horizontal differentiation strategy of a hotel on its online reputation and to analyse if the hotel location and agglomeration of competitors moderates their relationship with online reputation.

Design/methodology/approach – With a sample of 264 hotels from Paris, an empirical study is developed that aims to analyse, using regression techniques, the impact of price, differentiation, location and competitive environment on online ratings given by consumers in the hospitality context.

Findings – The paper provides empirical evidence of how a good location improves the online reputation of a company and how pricing strategies should take into account the location and number of competitors since a good location allows premium prices to be valued positively by consumers while an inappropriate location can produce the opposite effect. Depending on location, the number of competitors can intensify or reduce the effect of price on online reputation. Finally, online reputation only benefits from horizontal differentiation strategies when the degree of agglomeration is low.

Originality/value – This work provides insights about how hotels can strengthen their online reputation through pricing and differentiation strategies, incorporating elements of their environment such as location and competition in this decision-making process.

Keywords Online rating, e-WOM, Price, Horizontal differentiation, Competence, Location

Paper type Research paper

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1. Introduction

Online consumer review (OCR) is considered the most relevant way in which eWOM occurs (Kim *et al.*, 2018b), playing an essential role in recommender systems (Verma and Yadav, 2021). Indeed, when planning a purchase, 51% of French consumers always do some research on the Internet first, with 41% finding customer online reviews very helpful when planning a purchase (Statista, 2020). Indeed, it has become critical for a firm's performance (Xie *et al.*, 2016), with an expanding relevance under the New Normal (Arora *et al.*, 2020).

Extant literature has evaluated eWOM across several industries and settings (Kitirattarkarn *et al.*, 2020). Without pretending to be exhaustive, a literature review reveals that research has primary focused on senders' messages and channel related variables, such as the antecedents of a sender's reviews (e.g. Kim *et al.*, 2018a), the consequences for receiver's attitude and behaviours (e.g. Flanagin and Metzger, 2013; Wakefield and Wakefield, 2018), the cognitive information structure of the review (Ruiz-Mafe *et al.*, 2020), the consequences of the review for the receiver (e.g. Yoon *et al.*, 2019), the role of platforms in online review activity (Lee and Youn, 2009), the influence of brand awareness (Stojanovic *et al.*, 2018) or its effects on firm performance (Kim *et al.*, 2015; Ladhari and Michaud, 2015). However, a systematic review performed by Rosario *et al.* (2020) reveals that understanding how product characteristics shape eWOM search behaviour remains under-analysed.

Consumer review behaviour is conceived as a way of engagement, in which firm attributes and competitive alternatives induce reviews, either requesting higher quality or affecting the perceived value of the products (Van Doorn *et al.*, 2010). Specifically, firm-based contributions have mainly focused on factors such as brand engagement (Hollebeek *et al.*, 2014), customer service (e.g. Prentice *et al.*, 2019), consumer information or consumer loyalty (So *et al.*, 2016). Consequently, most of the previous studies focused on the analysis of the determining factors of online rating adopt a consumer perspective while the analysis of the role played by product characteristics or the location of a service in the online reputation are scarce. Likewise, although eWOM reviews have called for further investigation into the influence of the competitive environment on online reviews (see You *et al.*, 2015), there are few studies that address this relationship.

The purpose of our study is to fill this gap and try to analyse the impact of price, differentiation, location and competitive environment on online ratings given by consumers in the context of hospitality with a sample of 264 Parisian hotels, since it is a sector where pricing (Abrate *et al.*, 2012), location (Fang *et al.*, 2019) and competition (Becerra *et al.*, 2013) are very relevant aspects and hotels can horizontally differentiate their services according to customer preferences (Neirotti *et al.*, 2016). Also, economic outcomes in the hotel industry are influenced by online reviews (Yang *et al.*, 2018b). Specifically, we have focused on urban tourism because location plays a relevant role when tourists seek a good location to the detriment of other attributes or additional services (Yang *et al.*, 2018a) and we have contextualized our study in the Parisian hotel industry, as it is a relevant case of a city with a special interest for urban tourism research (Pearce, 1999), in the year 2017 when Paris was the second European city in bednights (European cities, 2018) and the one with the highest value (HVS, 2018).

Additional arguments justify our analysis. Firstly, from a company perspective, rating is an information rich OCR cue because high review ratings can act as a substitute for advertising spending (Hollenbeck *et al.*, 2019). Secondly, contributions to the literature regarding the effect of product attributes are very limited and generic. Previous findings show that product category has been revealed to moderate the influence of online review motivators on sales (Li *et al.*, 2020), and product characteristics have been identified as being a determinant of consumer review creation (Rosario *et al.*, 2020). However, existing research about product differentiation and online review has only found an indirect effect of

differentiation on online reviews through the dispersion of ratings (Clemons *et al.*, 2006). Product attributes such as horizontal differentiation strategy (Makadok, 2010) driven to specific segments has not been examined.

Thirdly, closely related to product evaluation is pricing, since it is linked to the product quality evaluation and affects user ratings as a quality cue (De Langhe *et al.*, 2016). Though literature supports the existence of a negative effect of price on eWOM (Masiero and Nicolau, 2016), the effect of price in hospitality does not have a straightforward effect, being influenced by trigger points' as price is the reason behind a stay (Lockyer, 2005). Also, previous studies have identified a self-selection bias in online reviews for early consumers that could benefit firms but may decrease consumer surplus (Li and Hitt, 2008).

Finally, although the previous literature has provided evidence that competitive intensity can transfer to the online environment (You *et al.*, 2015), there are few previous studies that address this issue (Gutt *et al.*, 2019; Liu *et al.*, 2018) and these do not take into account how physical distance can play a relevant role in OCRs, since the physical distance between users conditions the effectiveness of OCR and, as a consequence, of the advertising and communication strategy (Todri *et al.*, 2021) and based on the literature of spatial competition, a shorter distance between competitors can intensify rivalry (Lee, 2015) even in the online environment (Mayzlin *et al.*, 2014).

Theoretically, this work aims to contribute to the literature on the influence of firm's marketing decisions on online review literature. Firstly, it extends the previous studies about OCRs by incorporating a competition perspective to explain the online review ratings. Secondly, it helps firms to adopt marketing actions according to the perceived value generated for the customer, meeting Kannan and Li's call (2017). And thirdly, our study aims to clarify the importance and role of location on the generation of online ratings.

2. Literature review

2.1 Importance of online rating in tourism and hospitality

The advance of information technology, a key factor for the development of sectors such as tourism (Liberato *et al.*, 2018), has promoted the popularity of OCRs among consumers (Plotkina and Munzel, 2016) who consider this to be an essential tool to evaluate alternatives in their decision making process when purchasing products online and offline (Park and Nicolau, 2015). This common form of electronic word of mouth (eWOM) (Kim *et al.*, 2018b) can impact on the purchase decisions of consumers (Filieri and McLeay, 2014) and foster the sales of products in different industries (Chevalier and Mayzlin, 2006; Li *et al.*, 2019; Öğüt and Onur Taş, 2012).

The hospitality industry has not been an exception to this phenomenon since it is a service industry that, due to the intangible nature of experience goods, presents a high information asymmetry (Manes and Tchetchik, 2018) and consequently consumers frequently employ OCRs to support their decision-making process (Gretzel and Yoo, 2008; Tiago *et al.*, 2021), which, as in other industries, translates into an impact on sales (Öğüt and Onur Taş, 2012). Thereby, OCRs constitute a reliable source of information in the hospitality industry not only for consumers (Yen and Tang, 2019) but also for managers (Torres *et al.*, 2014).

The OCRs generally count with a numerical rating, mainly explained by service quality and the lodger's experience, that provide a general landscape of the attitude of consumers towards the product and the service consumed (Park and Nicolau, 2015). Extensive literature has highlighted the role that OCR ratings play in hospitality since a higher online rating can increase the monetary value of a company (Jang *et al.*, 2012), hotel performance (Yang *et al.*, 2018b), occupancy (Viglia *et al.*, 2016), sales (Öğüt and Onur Taş, 2012), revenues of companies (Neirotti *et al.*, 2016) and the willingness to pay (Nieto-Garcia *et al.*, 2017). Consequently, the hospitality context is an appropriate framework for OCR research since

hotels continually seek ways to enhance their online reputation to improve their competitiveness and profitability (Tiago *et al.*, 2021).

Despite the importance of a high rating in the hospitality context, research on the characteristics that influence the rating of OCRs mainly takes an approach based on consumer characteristics (Leung and Yang, 2020; Li *et al.*, 2021; Xue *et al.*, 2020; Yeng and Tang, 2019) with scarce previous studies that adopt an approach that encompasses the characteristics of the product and the strategic decisions of the company (Radojevic *et al.*, 2017; Yeng and Tang, 2019). For this reason, this work aims to analyse whether price, horizontal differentiation, location and agglomeration affect the online rating, given the value of a high rating both from the perspective of the company and the consumer in the hospitality industry.

2.2 Price and OCRs

Previous literature considered that product price can negatively impact on online ratings since it is likely that low price generates positive reviews from consumers who share their satisfaction with the low prices they pay (You *et al.*, 2015). Additionally, price can act as a pre-purchase quality cue (Wolinsky, 1983) that consumers can employ in the face of an uncertain purchase (Völcker and Hoffman, 2007) and consequently, based on the expectation disconfirmation theory (EDT) (Oliver, 1980) which postulates that the customer's experience with the product can lead to negative disconfirmation if it falls below expectations, while if the experience exceeds expectations positive disconfirmation occurs, price being a key factor that influences the consumers post–purchase satisfaction (Varki and Colgate, 2001) due to confrontation between expectations and the received quality post-consumption (Abrate *et al.*, 2021). Since OCRs can be driven by disconfirmation which influence ratings (Ho *et al.*, 2017), under this approach, price can impact negatively on online ratings of products and services (Li and Hitt, 2010; Abrate *et al.*, 2021).

In the hospitality context, price has been considered as an essential factor for customer choice (Gupta *et al.*, 2007). Furthermore, a reasonable price level is a critical factor that impacts on customer satisfaction (Pantelidis, 2010) and due to the existence of a significant relationship between consumer-generated ratings and customer satisfaction (Torres *et al.*, 2014), consumer reviews of products and services take price paid into account with a negative effect on online ratings (Ye *et al.*, 2014).

Despite some conflicting results (Martin-Fuentes, 2016; Radojevic *et al.*, 2017), this negative effect of the price on the online rating has found empirical evidence in hospitality research (Abrate *et al.*, 2021; Zhang *et al.*, 2014; Zhu *et al.*, 2019; Ye *et al.*, 2014). Thus, Ye *et al.* (2014) and Abrate *et al.* (2021) find that price impacts negatively on value perception of consumers about hospitality services and consumers take price into account negatively in their online ratings. The negative effect of price on ratings in the hospitality industry is also confirmed by Zhang *et al.* (2014). Zhu *et al.* (2019) found that consumers who enjoy a price reduction tend to give higher online scores when evaluating a hospitality service. Due to the above reasons, we establish the following hypothesis about the influence of price on online ratings:

H1. The price of hospitality products or services has a negative impact on online ratings provided by consumers.

2.3 Horizontal differentiation and OCRs

Horizontal differentiation is based on the heterogeneity of consumer preferences in the selection of the set of desirable attributes in a product or service so that although the products are offered at the same price, each will have a different market share (Makadok, 2010).

Nowadays, companies engage in the development of innovations to seek or generate new markets (Tiberius *et al.*, 2021), and they are able to produce any product that a consumer

might want, something which can lead to consumer overload due to the wider offer. Although OCR platforms allow companies to promote their sales through appropriate horizontal differentiation strategies since they make it easier for consumers to search for a product with characteristics which meet their preferences (Clemons *et al.*, 2006), there are some reasons to justify that horizontal differentiation strategies can be harmful to online reputation (Li and Hitt, 2008; Liu *et al.*, 2018).

First, although there is empirical evidence that horizontal differentiation strategies can foster a greater volume of eWOM (Lovett *et al.*, 2013), an inappropriate degree of differentiation between competitors in a commercial zone can have the opposite effect (Liu *et al.*, 2018). Second, horizontal differentiation can enhance the effect of positive self-selection bias (bias generated by wrong decisions that did not meet expectations due to different preferences with respect to previous consumers) so that its main effect is the reduction of the average rating of a product or service (Li and Hitt, 2008). Finally, within the hospitality industry, it has been found that the less horizontally differentiated companies have a higher benefit from the effect of online rating on economic results (Manes and Tchetchik, 2018) so that OCRs can discourage companies from adopting horizontal differentiation strategies.

However, to the best of our knowledge, there are few previous studies that have analysed the impact of horizontal differentiation strategies on OCRs in the hospitality industry (Manes and Tchetchik, 2018; Radojevic *et al.*, 2017) and few studies have considered alternatives to incorporating competition in the measurement of horizontal differentiation (Urtasun and Gutiérrez, 2017).

Due to the aforementioned reasons and given that horizontal differentiation is evaluated by consumers based on their subjective preferences, we establish the following hypothesis:

H2. The horizontal differentiation of products and services has a negative impact on online ratings provided by consumers.

2.4 Location and OCRs

Location is an essential factor and long-term strategic decision for the success of a company in the hospitality industry (Fang *et al.*, 2019; Yang *et al.*, 2012) since a good location is associated with higher occupation, higher income and profitability (Lado-Sestayo *et al.*, 2016; Luo *et al.*, 2016; Yang *et al.*, 2014) and lower failures (Parsa *et al.*, 2011) and it allows the payment of fixed capital investments to be reduced (Chou *et al.*, 2008). A good location, in addition to improving the profitability of the company can also influence consumer choice (Masiero *et al.*, 2019) and customer behaviour (Shoval *et al.*, 2011).

Moreover, location is one of the key factors that positively influence customer satisfaction (Xu and Li, 2016), particularly in urban tourism, where tourists, as essential actors in the maintenance of high street vitality (García-Milon *et al.*, 2021), need accessible hotels close to the main attractions of the urban area (Ritter, 1986) in order to maximize their utilities and optimize their trip duration (Yang *et al.*, 2018a) and do not require additional services that can entail a higher price (Liu *et al.*, 2020), and hence location can influence the customer evaluations through OCRs (Aksoy and Ozbuk, 2017). A convenient location is associated with positive comments and higher online ratings and it is therefore a critical success factor (Fuentes-Medina *et al.*, 2018). Thus, several previous studies in the hospitality industry have confirmed a positive effect of location on online ratings (Radojevic *et al.*, 2017; Yang *et al.*, 2018a). Therefore, we consider the following hypothesis:

H3. A good location has a positive effect on the online rating

On the other hand, the location of the hotel also has a positive influence on the price of the product or service (Chen and Rothschild, 2010) and the client's willingness to pay (Aznar, 2020). Thus, based on EDT, through a convenient location, hotels can exceed expectations of

customers and can turn the disconfirmation related to price from negative to positive. For these reasons, we establish the following hypothesis:

H4. A good location mitigates the negative effect of price on the online rating of consumers.

2.5 Competence and OCRs

The hospitality literature has highlighted the relevant role of the competitive environment in the performance of a company (Abrate *et al.*, 2012; Becerra *et al.*, 2013; Falk and Hagsten, 2015; Lee, 2015; Lee and Jang, 2015; Marco-Lajara *et al.*, 2016), although there are contradictory findings in this regard that can be supported by the confrontation framework of two opposite effects: agglomeration versus competition (Lu *et al.*, 2017). Thus, the hospitality literature has provided empirical support for the theoretical argument (Shaked and Sutton, 1982) from the Industrial Organization approach that suggests that a higher level of competition can negatively affect the performance of hospitality companies since it can decrease the price of a service (Abrate *et al.*, 2012; Becerra *et al.*, 2013; Falk and Hagsten, 2015), but on the other hand, previous studies (Lee and Jang, 2015; Marco-Lajara *et al.*, 2016) have also supported the theoretical arguments from agglomeration theories (McCann and Folta, 2008) that postulate benefits associated with a greater concentration of competitors such as the improvement in the innovation performance of the company (Turkina *et al.*, 2019).

Further, the marketing literature has analysed how the competitive environment can affect the online environment, that is, the eWOM generated by consumers (Gutt *et al.*, 2019; Liu *et al.*, 2018; Luca and Zerbas, 2016; Mayzlin *et al.*, 2014; Neirotti *et al.*, 2016; You *et al.*, 2015). Thus, the competitive environment can moderate both the effect of rating on sales (You *et al.*, 2015) and the effect of the rating on revenues and profitability (Neirotti *et al.*, 2016).

Given the aforementioned importance of the competitive environment in the hospitality industry, most of the previous studies that have analysed the relationship between competition and OCR have used this industry as a study framework (Gutt *et al.*, 2019; Liu *et al.*, 2018; Luca and Zerbas, 2016; Mayzlin *et al.*, 2014; Neirotti *et al.*, 2016). Despite a higher level of competition being able to generate a greater volume of OCRs (Liu *et al.*, 2018), based on EDT, when there are few alternatives, consumers have low expectations about their ability to match their preferences (Diehl and Poynor, 2010), which can stimulate the occurrence of positive disconfirmation. In fact, it has been found that markets with a greater number of competitors have a lower average online rating (Gutt *et al.*, 2019) and when a company faces a greater number of competitors, it is more likely to suffer negative fake reviews (Luca and Zerbas, 2016). Although these previous studies have not analysed the impact of competition on the rating of OCRs at the company level, they suggest that the competitive environment can negatively affect online ratings. Therefore, we establish the following hypothesis:

H5. The number of competitors of a hospitality company has a negative impact on online ratings provided by consumers.

Concerning the effect of distance on OCRs, hospitality research has found empirical support (Lee, 2015) for the postulates of spatial competition theory (Pinkse *et al.*, 2002), which states that competitive intensity increases with smaller distances. Additionally, competitive intensity can overlap to the online environment because a smaller distance to competitors also increases the probability of online fake reviews so hotels with close competitor neighbours are more likely to suffer negative fake review attacks from nearby competitors than hotels in isolated areas (Mayzlin *et al.*, 2014), and this can cause an attacker to overshadow its competitors in terms of online visibility (Lappas *et al.*, 2016). Due to these reasons, we establish:

H6. Distance from competitors has a positive effect on the online rating of consumers.

On the other hand, in the hotel industry several results support that a higher number of hotels entails a reduction of average room price (Abrate *et al.*, 2012; Becerra *et al.*, 2013; Falk and Hagsten, 2015) due to the fact that a large number and concentration of hotels allows consumers to access higher quality (Lee, 2015). Consequently, we assume that a greater number of competitors increases the negative effect of price on online rating:

H7a. The number of competitors intensifies the negative effect of price on the online rating of consumers.

Finally, it has been found (Sanchez-Pérez *et al.*, 2020) that the benefits associated with horizontal differentiation in the hospitality industry are conditioned by the degree of agglomeration, perhaps due to the higher cost associated with horizontal differentiation together with the fact that this type of differentiation hinders collaboration between competitors (Silva, 2015). Furthermore, hotels that are less horizontally differentiated have lower costs of manipulation and are more likely to engage in review manipulations against differentiated hotels (Mayzlin *et al.*, 2014), with the consequent loss of online visibility (Lappas *et al.*, 2016) that may encourage differentiated hotels to locate far away from the competition to avoid attacks (Lappas *et al.*, 2016). Consequently:

H7b. The distance from competitors mitigates the negative effect of horizontal differentiation on the online rating of consumers.

3. Methodology

3.1 Research setting

We will carry out an empirical analysis in which we will consider the Paris hotel industry in 2017 as a frame of reference. There are several reasons for choosing the hotel industry as a framework to explore the factors that enable the improvement of online rating. Firstly, an increase in online rating can provide several benefits in the hotel industry. Hotels with higher online ratings can benefit from higher sales (Öğüt and Onur Taş, 2012), higher occupancy rate (Viglia *et al.*, 2016) and higher hotel performance (Yang *et al.*, 2018b). Secondly, the hotel industry offers a framework in which services may exhibit horizontal differentiation in terms of customer preference (Neirotti *et al.*, 2016), and it is an industry with intensive horizontal competition (Liu *et al.*, 2020). Additionally, pricing (Abrate *et al.*, 2012), competition and agglomeration (Becerra *et al.*, 2013) and location (Fang *et al.*, 2019) also play a key role for success in the hotel industry. Concerning the Parisian tourist sector in 2017, Paris was ranked as the second European city in international arrivals and the sixth city worldwide with 15.8 million (Euromonitor, 2018). Furthermore, Paris was ranked as the second European city in bednights with 48.1 million (European cities, 2018) and the Parisian hotel industry topped the Hotel Valuation Index in 2017 (HVS, 2018) which indicates that the hotel sector in Paris is a strong and consolidated sector that has been considered as a framework in the previous literature on OCRs (Öğüt and Onur Taş, 2012).

The sample includes 264 hotels located in Paris and has been obtained from the information system of an international Group Travel Agencies (GTA) and the commercial areas defined by GTA are considered as areas of geographic competition between hotels for a correct measurement of the horizontal differentiation of a hotel with respect to its competitors. All statistical analysis has been performed with the statistical software *R* Version 4.0.3. Table 1 shows the main descriptive statistics for all variables in the sample.

3.2 Models and variables

We propose two models to test the hypotheses established in the work:

Table 1.
Sample descriptive statistics

	Min	Q1	Median	Q3	Max	Mean	SD
Score	6.300	8.180	8.560	8.920	9.920	8.505	0.643
Size	7	29	48	47	1025	50.05	91.259
Age	1	11	13	18	218	25.33	38.579
Price	50.55	100.10	125.30	157.60	1270	125.30	99.608
Differentiation	0	0.524	1.550	2.612	12.220	1.814	1.870
Location	1	2.750	3	4	5	3.201	0.873
*N*_Comp	3	53	77	129	155	84.75	41.821
Distance	0	0.700	0.875	1.060	4.110	0.941	0.406
Congress	No	Yes					
%	96.59	3.41					

Model 1:

$$Score_i = \alpha_0 + \beta_1 Size_i + \beta_2 Age_i + \beta_3 Congress_i + \beta_4 Price_i + \beta_5 Differentiation_i + \beta_6 Location_i + \beta_7 N\_Comp_i + \beta_8 Distance_i + \varepsilon_i$$

Model 2:

$$Score_i = \alpha_0 + \beta_1 Size_i + \beta_2 Age_i + \beta_3 Congress_i + \beta_4 Price_i + \beta_5 Differentiation_i + \beta_6 Location_i + \beta_7 N\_Comp_i + \beta_8 Distance_i + \beta_9 Price_i \cdot Location_i + \beta_{10} Price_i \cdot N\_Comp_i + \beta_{11} Differentiation_i \cdot Distance_i + \varepsilon_i$$

where *Score* denotes the dependent variable that measures the yearly average online rating of each hotel. This rating from consumers consists of a score between zero and ten, where zero represents the worst rating and ten represents the best rating (Manes and Tchetchik, 2018).

Among the independent variables, we distinguished between:

Control variables. We used the following variables to control for the potential effects of differences between hotels:

(1) *Size*. Large company size can result in a deterioration of the services offered which results in a negative impact on the online valuation of customers (Radojevic *et al.*, 2017), so we control for the size of the hotel by the number of rooms.

(2) *Age*. We controlled for the age of the hotel by the number of the operation years since old facilities may be the source of dissatisfaction among consumers regarding a product or service (Xu and Li, 2016).

(3) *Congress*. Given the different preferences between business travellers and leisure travellers and that business travellers report significantly lower levels of satisfaction than leisure travellers (Radojevic *et al.*, 2017), we controlled whether the hotel is a congress hotel through a dummy variable.

Explanatory variables. To test the hypotheses established in the previous section, we considered the following variables:

(1) *Price*. The yearly average room rate for a standard double room in 2017 for each hotel (Lee, 2015).

(2) *Differentiation*. This variable accounts for the horizontal differentiation based on the service offer of each hotel with respect to the remaining hotels in the same commercial

area. We considered a distance applied in product differentiation literature (Chisholm *et al.*, 2010). Specifically, each hotel is represented by a vector of services V_i that indicates with 1 the availability of the service while with the value 0 it indicates the absence of a service. The services considered in V_i includes hotel style, sports activities and food services. Specifically, for a hotel in the area A_i is defined as:

$$(Differentiation)_i = \sum (V_i) * \text{mean}_{j \text{ in } A_i}(d(V_i,\ V_j))$$

where $d(V_i, V_j)$ is the differentiation of hotel V_i respect to V_j. It takes the value 0 if hotel V_j offers more services than hotel V_i and all services offered by V_i. Otherwise, it takes the following value:

$$d(V_i,\ V_j) = \frac{\left(\cos^{-1}\frac{V_i \cdot V_j}{\|V_i\| \cdot \|V_j\|}\right)}{\left(\frac{\pi}{2}\right)}$$

(1) *Location*. A valuation of Parisian hospitality commercial zones (Mona, 2020) based on transport nodes, externalities or attractions. It ranges from 1 (the worst valuation) to 5 (the best valuation).

(2) *N_Comp*. The total number of hotels in the same commercial area (Becerra *et al.*, 2013).

(3) *Distance*. The average distance of each hotel with respect to other hotels located in the same area in kilometres (Becerra *et al.*, 2013).

Model 1 includes all the main effects of the explanatory variables to contrast the hypotheses about direct effects (H1, H2, H3, H5 and H6), whereas Model 2, in addition to the main effects, also includes the interaction terms to contrast hypotheses H4, H7a and H7b related to moderating effects. Both models were estimated with OLS and bootstrap methods were used to estimate standard errors (Davison and Hinkley, 1997). Table 2 provides the results obtained in the estimation of the two models using OLS. The adjusted R^2 value from Model 2 shows a better adjustment than Model 1. To test the significance of Model 2 versus Model 1, we conducted an *F*-test, the results of which confirmed the significance of Model 2 versus Model 1 (*p*-value 0.014).

4. Results

The results of Model 1 show that only price and horizontal differentiation have an effect on online ratings but, from Model 1, only hypotheses H2 is confirmed, since *Differentiation* has a negative effect whereas *Price* has a positive effect.

Now, since Model 2 fits significantly better than Model 1, we will focus on the results obtained in Model 2 which shows different results compared to Model 1. Although the results of Model 2 also confirm the hypotheses H2, unlike Model 1 it does confirm the hypothesis H1 and H3. Therefore, according to Liu *et al.* (2018), horizontal differentiation may harm some cues related to online reputation. Price has mainly a negative effect on rating as seen in the results of previous studies in the hospitality context (Zhang *et al.*, 2014; Zhu *et al.*, 2019; Ye *et al.*, 2014) and contrasting with the results from Martin-Fuentes (2016) and Radojevic *et al.* (2017). Also, the location of a hotel positively influences the online rating in accordance with previous hospitality studies (Radojevic *et al.*, 2017; Yang *et al.*, 2018a). Additionally, the interaction between price and location is significant and its coefficient is positive which confirms the hypothesis H4 and consequently the location mitigates the negative effect of price on online rating. To better illustrate this moderation effects, Figure 1 displays the effect

	Model 1	Model 2
Intercept	8.277***	8.055***
Size	9.2E-6	8.6E-6
Age	−7.4E-4	−0.001
Congress	0.435*	0.316
Price	7.8E-4*	−0.008**
Differentiation	−0.052*	−0.056**
Location	0.062	0.129**
*N*_Comp	2.5E-5	−0.001
Distance	0.023	0.022
Price × Location		0.003***
Price × *N*_Comp		−3.7E-5**
Differentiation × Distance		0.073*
R^2	0.054	0.093
Adjust R^2	0.025	0.054

Note(s): *10; **5; ***1%

Table 2.
Models estimation

of price on online rating for two levels of location and two levels of number of competitors. For both *Location* and *N_Comp*, Figure 1 shows the effect of price for the mean ± one standard deviation. Regardless of the number of competitors, Figure 1 shows how location changes the effect of price on rating when hotels face low competition (black and blue lines) and high competition (red and green lines). Therefore, a good location can change the negative effect of price to a positive one, thus reconciling previous contradictory results on the price effect by linking its effect with location.

Regarding competition, results from Model 2 do not confirm the hypotheses H5 or H6. Consequently, the competition environment does not directly influence the online ratings at company level contrary to those at market level (Gutt *et al.*, 2019), unlike other online reputation indicators (Liu *et al.*, 2018).

However, because hypotheses H7a and H7b are confirmed by the results of Model 2, the competition environment influences the online rating indirectly through both *N_Comp* and *Distance*, so that the effect of price and horizontal differentiation is moderated by the competitive environment of hotels. Figure 1 also displays the moderation effects related with H7a and H7b and it shows how a higher number of competitors intensifies the negative effect of price on ratings when location has a low value (black and red lines) and how it moderates the positive effect of price when location has a high value (green and blue lines). It is worth highlighting the key role of location, since it can counteract the negative effect associated with price even if it is accentuated by a high number of competitors. The stronger positive effect of price occurs with the combination of low competition and high location, whereas the stronger negative effect occurs with the combination of high competition and low location. Finally, the distance to competitors changes the effect of horizontal differentiation on rating. Thus, horizontal differentiation has a negative effect in agglomerated areas (small distance between competitors), which may be due to the fact that hotels have more fake negative reviews from nearby competitors with less differentiation (Mayzlin *et al.*, 2014) while it has a positive effect in isolated areas (large distance between competitors).

5. Conclusion, limitations and future research

The present work tries to provide some theoretical and practical contributions. Firstly, compared to other theoretical contributions our study, through the horizontal differentiation index, overcomes the limitations of previous studies in the hospitality context which

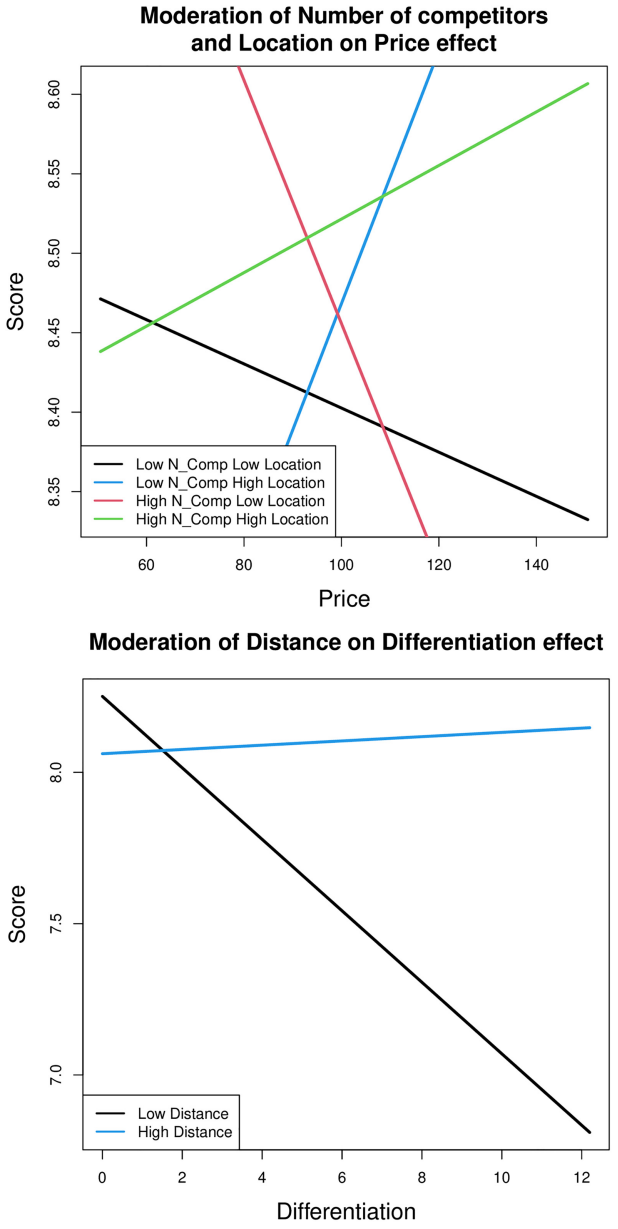

Figure 1.
Moderating effects on the impact of price and horizontal differentiation on online rating

individually analysed how the availability of a service affects online reputation (Radojevic *et al.*, 2017) and it complements previous studies on the negative impact of differentiation in other online reputation metrics (Liu *et al.*, 2018) concluding with a negative effect on the rating subject to the competitive environment in such a way that horizontal differentiation strategies benefit online reputation when the degree of agglomeration is low. In this way, our

study contributes to the analysis of variables not directly related to management that influence the success of innovation strategies (Tiberius *et al.*, 2021).

Regarding the competitive environment, we did not find a direct impact on online reputation at the company level, unlike at the market level (Gutt *et al.*, 2019) or with other metrics (Liu *et al.*, 2018), although indirectly it can negatively affect a consumer's online evaluation through price.

Concerning price, although we conclude with a main negative price effect, based on EDT, our study allows us to reconcile previous studies with contradictory results in the context of hospitality (Zhang *et al.*, 2014; Ye *et al.*, 2014; Radojevic *et al.*, 2017) since the effect of price is linked to the location of services. Consequently, we highlight the role of location in online reputation, but unlike previous studies that only highlighted the direct positive effect of location (Radojevic *et al.*, 2017; Yang *et al.*, 2018a), we also establish how a good location allows a premium price not to necessarily result in a negative user rating even in areas with a high number of competitors.

Next, among the managerial implications, our work shows the convenience of a good location as it improves the online reputation of a company. Additionally, pricing decisions should be subject to the location and the number of competitors. Managers from hotels with a good location can charge a premium price since it does not result in a penalty in the customer valuation. This price premium associated with a good location will be evaluated positively by customers the fewer the number of competitors the hotel has. On the contrary, to compensate for bad location, managers can offer price discounts to improve their online reputation especially if the competitive intensity is high. Additionally, hotel managers will benefit from making marketing decisions based on location as it is implied that customers give more importance to the location of the hotel than to the services that the customer is looking for, since the location choice of the customer replaces the greater differentiation of services offered by a hotel with a higher price.

Finally, this work has several limitations. Firstly, from a methodological point of view, online reputation can show spatial autocorrelation because hotels share externalities. Therefore, future work should consider the use of estimation methods that take spatial autocorrelation into account, for a better modelling of online reputation (Nicholls and Kim, 2019). Secondly, the proposed model does not incorporate characteristics of each customer when evaluating a hotel. Future works should consider whether these characteristics can moderate the relationships proposed with our model. Additionally, future work should consider alternative ways of evaluating locations that are not based on third-party evaluations, by defining an appropriate index that encompasses different types of location factors.

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