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ORIGINAL PAPER

Explaining hotel breakfast pricing under spatial heterogeneity and competitive environments

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Abstract

The literature on pricing of additional components to the base service, e.g., add-ons, is fairly scant, although these items are often the basis on which a pricing strategy is developed. In service industries such as hospitality, breakfast is a service component that attracts customers, featuring as part of the service or in addition to it. In particular, it is the focus of active strategies to attract customers or build customer loyalty, in the form of offering additional services at a low price or even free of charge. Given the limited interest of the literature in understanding the price formation of additional components, or add-ons, this study attempts to explain how hotel managers set the price of breakfast using factors related to hotel strategy and reputation but also considering competition and location. Specifically, a novelty of this model is to incorporate geographic location to explain the price of an add-on. Using a sample of 2111 hotels from Spain, France, Italy and the United Kingdom, we estimated a geographically weighted regression with a set of explanatory variables. Our findings show that while category and online reputation act as filtering criteria and allow hoteliers to set higher prices, horizontal differentiation can act both as a stimulus and a screening tool depending on the hotel location. Similarly, in some locations there is an agglomeration effect derived from the competitive environment that allows hoteliers to set higher prices while in other locations there is a competition effect due to the pressure of greater competition that leads to lower prices.

Keywords Add-on · Breakfast · Geographically weighted regression · Hospitality · Pricing

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1 Introduction

Nowadays, in an industry as globally prominent as hospitality, globalization and the expansion of international chains (Yu et al. 2014) have brought about both the standardization of services and increased competition (Lee 2015). In this scenario, hoteliers have sought a marketing mix to maximize the value perceived by consumers (Liu et al. 2020) and hotel income (Silva 2015). Thus, this paper aims to explain the price of breakfast, as a component of growing importance in the hotel service offer, incorporating spatial location as a characteristic aspect of the hotel industry and a novel element with respect to previous research.

Breakfast, as a component of the service or as an add-on, despite being an omnipresent practice in the marketing of hospitality services, is a scarcely researched issue (e.g., Anguera-Torrell and Nicolau 2025; Leite-Pereira et al. 2019). Scholars (i.e., Soifer et al. 2021) and practitioners (i.e., Hospitalitynet 2023) recognize the current relevance that breakfast has acquired as a component of the service offered and as an integral part of the hotel guest experience. Thus, from the supply side, hoteliers have evidenced the role of breakfast service as a component of a horizontal differentiation strategy (Liu et al. 2020). Both hotel management scholars (Kim et al. 2016), and hoteliers (Hospitalitynet 2022; Webrezpro 2022) have identified breakfast as an essential service with which to satisfy hotel guests. Further, from the local development perspective, breakfast is an essential tool with which hotels can promote local gastronomy (Kontis and Gkoumas 2017), this being a factor that plays a crucial role in the overall satisfaction of the tourist experience (Hendijani 2016; Mak et al. 2012). And from the demand side, breakfast is recognized as a guest satisfier (Kim et al. 2016), being a relevant part of the lodging experience (Leite-Pereira et al. 2019) from which guests can obtain memorable experiences (Sthapit 2019). Consequently, breakfast service is one of the dimensions considered by the hotel customer in their online review (Soifer et al. 2021), determining the online reputation of the hotel.

A review of the extant literature reveals four main debates around breakfast that pose a major challenge for hoteliers' product and pricing policies. A first debate is based on whether to offer breakfast (as a hotel add-on) as part of a bundle or to offer it as an individual component. Specifically, hotel industry bundles low-end services and products, probably due to differentiation constraints (Shugan et al. 2017). Indeed, Nicolau (2012) suggests that consumers evaluate the bundle differently than the individual components due to different psychological influences and found that a zero-effect emerges if a hotel bundle includes a free breakfast, which then becomes a dominant alternative. In this case breakfast is conceived as a service component and any price promotion is linked to the whole bundle.

A second debate concerns breakfast pricing. Free breakfast positively affects consumers' perceived value (Liu et al. 2020) and influences their hotel choice (Nicolau and Sellers 2012; Leite-Pereira 2019). However, the free breakfast strategy may have heterogeneous consequences depending on the cost-to-value ratio linked to the add-on and the vertical differentiation of the hotel (Lin 2017). Most vertically differentiated hotels are aimed at a target audience that is less price sensitive and therefore willing to pay for higher quality services (Liu et al. 2020), thus missing the opportunity to obtain additional income (Nicolau and Sellers 2012). This issue together with

the cost of providing this service can generate losses in hotels and influence their performance (Juvan et al. 2018). Additionally, hotels that provide this service free usually include its cost in the room price (Liu et al. 2020) which can render negative the influence of the free breakfast on the customer's perceived value. Consequently, a free breakfast policy may not be the most profitable option making it necessary to set a price for this service (Lin 2017). However, both marketing (Fruchter et al. 2011; Gao et al. 2022; Geng and Shulman 2015; Shulman and Geng 2013) and hospitality literatures (Lin 2017; Liu et al. 2020; Nicolau and Sellers 2012) have focused solely on analyzing under which conditions it is more suitable to offer an add-on for free or for a fee (Fruchter et al. 2011).

A third area discussed is about differentiation strategy. Concerning vertical differentiation (i.e., regarding hotel category), free breakfast allows hoteliers to compete vertically against other initially more attractive higher quality alternatives (Nicolau and Sellers 2012; Shugan et al. 2017). But previous studies have also limited the analysis of vertical differentiation regarding hotel category to the existence of a zero-price effect (Lin 2017; Nicolau and Sellers 2012), confirming that a higher category induces hoteliers to set prices for extra services (Lin 2017), but have not addressed whether a higher category allows them to set higher prices in search of less price-sensitive customers.

The fourth issue under discussion relates to the effects of competition. Previous approaches have limited the analysis of horizontal differentiation and the competitive environment to a dichotomous decision (i.e., yes/no), which does not allow adequate graduation of the horizontal differentiation strategy with respect to the competition (Deephouse 1999), or, in particular, to the degree of differentiation from what other hotels have to offer.

The novelty of this study lies in the following issues. First, to the best our knowledge, there are no previous studies that have analyzed what the determinants are of hotel breakfast pricing, this being critical to assess the cost-to-value ratio and, therefore, in the proper design of a profitability pricing strategy. In this way we also hope to contribute to the literature on the pricing of add-ons (Lin 2017). Second, a more enriching perspective is to consider differentiation with respect to the standard offered by competitors, taking into account the benefits of being co-located with other hotels (McCann and Folta 2008) and the disadvantages faced due to the competitors' offer (Shaked and Sutton 1982). Third, previous studies have overlooked the role that online reputation can play in the analysis of add-ons and, given that this can considerably influence the booking intention (Viglia et al. 2016) and willingness to pay (Nieto-García et al. 2017), the management of add-on pricing could be different depending on the online reputation enjoyed by the hotel.

Additionally, as the hotel industry is one of the most location-sensitive industries, spatial heterogeneity and spatial dependence (Nicholls and Kim 2022) can condition the effect of room price determinants (Kim et al. 2020a; Latinopoulos 2018; Zhang et al. 2011b). Indeed, previous literature on hotel add-ons has recognized that not considering the role that geographic location can play in the analysis of add-on price management is a limitation (Liu et al. 2020). Previous studies have only estimated models with static relationships between the dependent variable and the explanatory variables, without taking into account spatial heterogeneity and spatial dependence. For this reason, our approach includes the use of Geographically Weighted Regres-

sion (GWR) (Fotheringham et al. 2003), overcoming those modelling limitations. Based on a sample of 2,111 hotels located in Spain, the United Kingdom, France and Italy, we try to elucidate whether the hotel category, its online reputation, the differentiation in breakfast services and the competitive environment influence the price of this service through a regression model estimated using GWR, a technique that is especially recommended when the dependent variable shows spatial autocorrelation, as is the case of hotel prices (Kim et al. 2020a; Latinopoulos 2018; Zhang et al. 2011b).

2 Theoretical framework

2.1 Specificities of hospitality management

Tourism and hospitality play a key role in the world economy, making up a 9.1% percent share of the total global GDP (WTTC 2024). According to the Travel & Tourism Development Index (TTDI) (World Economic Forum 2024), France, Spain, Italy and the United Kingdom are among the top five European countries in terms of tourism development and policies to support the sustainable development of the travel and tourism sector. Indeed, statistics on the economic activity of this industry in the four countries identified indicate its size and economic relevance (Statista 2023, 2024). Specifically, they are among the most visited countries in Europe, with international tourist arrivals in 2023 reaching 100, 85.17; 57.25 and 37.22 million visitors, respectively, being intensive in terms of employment reaching some 700,000 people. Indeed, the GNP share of this industry in these countries is very significant, reaching, in 2023, 8.6%, 14.5%, 10.5%, and 8%, respectively. This intense tourist activity has resulted in these countries having a high number of companies in the lodging industry, totalling 72,987 hotels and similar establishments, which reached a combined turnover between the four countries of USD 59 billion in that year.

To understand current hotel management, it is necessary to bear in mind that the hospitality industry has undergone a serious setback as a result of the highly chaotic environment generated by the COVID-19 pandemic and its massive impact on companies internationally (Vázquez-Martínez et al. 2024). This crisis resulted in dramatically lower revenues along with numerous financial challenges (i.e., liquidity, debt repayments) for the industry (Deloitte 2022), but has also accelerated the digitalization of the sector (Martín-Rojo and Gaspar-González 2024) as well as resulting in changes in operations and significant changes in consumer behaviour. Kim and Han (2022) identified an extensive number of adopted measures in hotel operations which they classify as "Tools & equipment", "Social distancing" and "Cleaning & disinfection", and which the consumers identify as being their most important concerns for a good experience: hygiene, cleanliness, social distancing, safety screens, QR-code based entry logs or density, among others.

The hotel industry is highly differentiated in different geographic locations (Shugan et al. 2017). Unlike other industries, accommodation companies are 24–7 services, demand can suffer fluctuations, the service offered is produced and consumed at the same time and imitation among competitors is the rule (Sandstrom

and Reynolds 2020). Additionally, every hotel has distinctive features and requisites that can require stringent managerial exigencies (Bharwani and Talib 2017). Consequently, successful hotel management is a complex, labour-intensive task where both short-term and long-term decision-making are influenced by the narrow margin between product perishability and consumption (Patiar and Wang 2020).

From a management approach, given that hotels have a variety of departments and tasks with specific organizational characteristics and multiple hierarchical management levels (Rutherford and O'Fallon 2007; Shum et al. 2018), management and cost control systems (such as the Uniform System of Accounts for the Lodging Industry (USALI)) have a strong and long-standing implementation in the hotel industry (Schmidgall and DeFranco 2015). In addition, the hotel workforce is highly diversified, with a diversity of management practices and skills to cater for a diversified demand (Yadav and Rajak 2022). Specifically, hotel management needs to adapt to the disruption from the innovative technological developments to be competitive (Calderon-Monge and Ribeiro-Soriano 2024), so managers need to incorporate digital technologies capabilities such as digital transformation strategy, data analytics and data science, revenue management skills, digital innovation or digital customer experience engagement (Busulwa et al. 2022).

Nowadays, the adoption of dynamic management of hotel room rates is a growing practice to maximize financial results through so-called revenue management (RM) (Matsuoka 2020). RM, originally named yield management, first began in the airline industry but was quickly adopted by the hotel industry and the concept was redefined as the group of tools and process employed for assigning the right type of capacity to the right customer at the right price at the right time through the right distribution channel with the aim of optimizing revenues (Denizci Guillet and Mohammed 2015; Ivanov et al. 2021; Kimes 1989). Several features such as perishable assets, fixed capacity, high fixed cost, low variable costs, variability in demand for perishable products and the possibility of booking in advance, make the hotel industry suitable for applying RM strategies (Ivanov et al. 2021; Vinod 2022). Given the different degrees of willingness to pay for the same hotel service among different customer segments as well as the fluctuations that hotel demand may experience (Vinod 2022), the science of RM is essential for matching hotel demand with hotel supply and enables hoteliers to make the number of bookings that maximize profits by considering the opportunity to save a unit of their resources for a potential future consumer who is willing to pay a higher price rather than selling it today (Ferguson and Smith 2014; Ivanov et al. 2021).

Although RM practices result in a maximization of short-term financial measures, they can also foster customer perceptions of price unfairness, worsening the customer relationship and finally leading to a decrease in long-term financial indicators (Matsuoka 2020). Thus, from attribute-based room pricing (Vinod 2022), hoteliers can evolve the traditional hotel model of selling rooms to one of selling experiences in which customers can choose those room attributes or add-ons that interest them for a memorable stay and allows hoteliers to orient revenue management tools to personalized pricing that can anticipate customer needs (Viglia and Abrate 2020). With personalized pricing, RM can increase fairness perception (Richards et al. 2016) since customers associate that a higher price due to a higher cost is fair and they are willing

to pay a premium price for products or extra high-cost services (Anguera-Torrell and Nicolau 2025; Yang and Leung 2018). In particular, breakfast is an add-on that hoteliers usually charge as a constant extra fee to add to the room reservation (Anguera-Torrell and Nicolau 2025) but one that represents high marginal costs (Yang and Leung 2018). Under the cost to quality approach, providing the breakfast service may include prevention or appraisal costs and both internal and external failure costs that globally could represent between 12 and 16% of the revenues generated by this service against the recommendation of keeping them between 2 and 4% (Ramdeen et al 2007). However, if RM managers apply dynamic pricing to the breakfast service, this add-on can be a source of additional revenues (Anguera-Torrell and Nicolau 2025) that help to balance their high costs.

Finally, managing today's high customer demands not only requires social media skills (Leung et al. 2013) but due to the high level of competition in the hotel industry today (Becerra et al. 2013; Lee 2015) it also requires appropriate strategies such as discounts (Han et al. 2024; Kim and Tanford 2021; Lee 2016) or differentiation strategies (Becerra et al. 2013; Kim et al. 2020b; Lee 2015) to achieve competitive advantages. However, hotel management needs to balance pricing strategies with successful long-term performance (Croes and Semrad 2012), which are perhaps less sustainable strategies than differentiation strategies (Köseoglu et al. 2015), but the latter require dynamic management (Abrate and Viglia 2016) to differentiate the service offer from the competition while satisfying customers (Leite-Pereira 2019; Liu et al. 2020).

2.2 Breakfast in the hotel service offering: perspectives and determinants

A growing concern from the point of view of marketing management has been deciding between fixing prices for products/services as separate items or as a bundle (e.g., Venkatesh and Mahajan, 1993). Additionally, under an approach rooted in behavioural economics, a differential effect on the consumer has been detected when hotel breakfast is offered as a separate item with respect to a combined package (unbundling *vs* bundling) (Nicolau 2012). One change arising from this decision has been the emergence of the fee or free dilemma (Fruchter et al. 2011; Lin 2017), which analyzes whether hotels can achieve a competitive advantage by offering certain extra services (i.e., add-ons), as is the case of breakfast (Liu et al. 2020; Nicolau and Sellers 2012). As a restaurant service, breakfast provides comfort to guests, since it saves them from having to look for a place to have this meal when they are in an unknown destination (Lee et al. 2018) and do not know the schedule for the next meals (Leite-Pereira et al. 2019) consequently, breakfast is the restaurant service most requested by guests in hotels (Kapera 2015).

On the one hand, based on a zero-price effect (Shampanier et al. 2007), offering the add-on for free can increase the value of the base product/service and attract customers. On the other hand, offering the add-on for a fee can save costs (Shulman and Geng 2013) and based on the effects of persuasion resistance, most consumers resist switching brands due to the price promotions of competing brands, strengthening loyalty to incumbent ones (Pratt et al. 2023). Previous literature has analyzed, with mixed results, the conditions under which it is better to increase profits, providing the

add-on for free or for a fee, (Fruchter et al. 2011; Gao et al. 2022; Geng and Shulman 2015; Lin 2017; Shulman and Geng 2013) showing that the appropriate add-on pricing policy depends on factors such as competition (Lin 2017; Geng and Shulman 2015), asymmetric consumers' valuations for the base product/service and the add-on (Fruchter et al. 2011); cost savings (Gao et al. 2022; Geng and Shulman 2015; Shulman and Geng 2013); add-ons pricing heterogeneity through sale channels (Gao et al. 2022) and the cost-to-value ratio for add-ons (Lin 2017).

In the hotel industry, hoteliers must also rise to the challenge of designing a suitable add-on pricing strategy (Lin 2017). Given the high level of competition (Becerra et al. 2013; Lee 2015) and the wide choice of offer available to the consumer (Kucukusta 2017), based on the zero price effect, hotels can achieve a short-term competitive advantage over the competition with an appropriate combination of the base product and free add-ons such as breakfast, WiFi, parking or accepting pets (Bulchand-Gidumal et al. 2011; Kucukusta 2017; Liu et al. 2020; Nicolau and Sellers 2012) that can drive customer to book rooms with a higher perceived customer value (Kucukusta 2017; Liu et al. 2020; Nicolau and Sellers 2012). Hospitality research has also found that, in addition to perceived value, customer satisfaction and online ratings can also be increased through offering free add-ons (Bulchand-Gidumal et al. 2011). Additionally, (Shampanier et al. 2007), offering free add-ons can allow hotels to boost additional purchases and foster booking through their own website avoiding the high OTA commissions (Kim and Tanford 2021).

However, offering free add-ons may not always increase profits (Lin 2017) or enhance customer value (e.g. business center) (Bulchand-Gidumal et al. 2011). The underlying reason for the latter is that free add-ons could be linked to hidden costs for consumers (Liu et al. 2020) to balance the costs of providing a specific add-on (Juvan et al. 2018). Furthermore, the short-term competitive advantage attained by offering a specific free add-on could be diminished if the same strategy is widespread among competitors (Liu et al. 2020). Additionally, a discount may negatively influence the spending intention of less price-sensitive customers (Jang and Moutinho 2019) and selling add-ons allows hotel managers to achieve additional revenue by customizing services based on customer preferences (Cozzio and Masiero 2024). Thus, previous studies on hotel add-ons (Bulchand-Gidumal et al. 2011; Kucukusta 2017; Lin 2017; Liu et al. 2020; Nicolau and Sellers 2012) have established the strategic relevance of the pricing policy for add-ons, with breakfast service being one of the services analyzed (Liu et al. 2020; Nicolau and Sellers 2012).

From a management approach, hospitality research (Liu et al. 2020; Nicolau and Sellers 2012) has identified breakfast as one of the add-ons that hoteliers can use as bait in their marketing strategy to capture new consumers who initially would choose other hotel options, due to the existence of the zero price effect associated with free breakfast (Nicolau and Sellers 2012), that increases the perceived value for customers (Liu et al. 2020; Nicolau and Sellers 2012). However, free breakfast has also been identified as the service with the lowest marginal effect on customer perceived value when competing hotels adopt this same strategy, and it may even have a negative influence on consumer perception because free breakfast is usually linked to an increase in the room prices (Liu et al. 2020). Additionally, offering breakfast service can have a considerable cost for hoteliers (Ramdeen et al 2007) which can be greatly

increased due to plate waste per guest if there are more people in the breakfast area (Juvan et al. 2018). Thus, given the relevance of the cost-to-value ratio in the pricing policy of add-ons in the hotel sector, free breakfast might not to be the most profitable pricing policy, and it may be necessary to set a price for this service (Lin 2017) according to the room price offered (Anguera-Torrell and Nicolau 2025).

2.2.1 Hotel category and breakfast price

Based on Signalling Theory (Spence 1978), research has been done into how hoteliers consider quality signals to reduce the strong information asymmetry in the hotel industry and attract customers with hotel category being one of the most used indicators (Manes and Tchetchik 2018). As a quality signal, a higher category usually advises customers of better physical facilities and greater adherence to quality programs (Abrate et al. 2011) and previous literature has extensively confirmed that a higher category not only enables hotels to attain both static and dynamic price premium (Abrate et al. 2012) but also positions category as being the most influential determinant of room price (Abrate et al. 2012; Becerra et al. 2013; Kim et al. 2020a; Latinopoulos 2018; Lee 2015; Zhang et al. 2011a,b). Further, the positive impact of a high category may vary from one destination to another (Mathur 2019) and may even vary spatially within the same destination (Kim et al. 2020a; Latinopoulos 2018; Zhang et al. 2011b). Additionally, a higher category reduces the geographic boundaries of competition, (Lee 2015) protecting hotels when competition intensity rises (Becerra et al. 2013) and allows hoteliers to maintain a steadier room price policy over time (Abrate et al. 2012).

Regarding add-ons, the strong vertical differentiation associated with the hotel category (Becerra et al. 2013) influences the impact of the different amenities (including breakfast) on the perceived value of guests (Soifer et al. 2021) and hence the hotel category conditions the profitability of the pricing policy through the cost-to-value ratio so that lower-category hotels usually use promotional strategies based on free add-ons such as WiFi to attract customers who initially prefer higher-category alternatives, whereas higher-category hotels prefer to charge a higher price for these services and use screening strategies in the search for a less price-sensitive customer and thereby not forego extra income (Lin 2017). Specifically for breakfast, under the free or fee dilemma, on the one hand previous studies have found that the room price premium associated with free breakfast is lower in higher category hotels (Baldassin et al. 2017) and that the increased perceived value achieved through free breakfast in higher category hotels is not diminished if the free breakfast strategy is widely adopted by lower category competitors (Liu et al. 2020).

On the other hand, as guests of higher-category hotels have higher expectations regarding quality than guests of lower-category hotels (Jang and Moutinho 2019) and price has a negative influence on perceived value, but has a positive impact on perceived quality, this impact being greater the higher the hotel category is (Ye et al. 2014), customers from higher-category hotels are thus willing to pay a premium for hotel amenities (Heo and Hyun 2015). Further, price promotions such as free breakfast (Nicolau and Sellers 2012) can positively influence the spending intentions of customers from lower-category hotels (Kim and Tanford 2021) but may dampen the perception of quality of high-category hotel consumers who would be less willing to

pay for extra hotel services (Jang and Moutinho 2019). In fact, due to the information asymmetry in the hotel industry, hoteliers from higher categories employ fenced conditions to maintain price separation between categories (Hyun Lee and Bai 2014) and do not usually offer discounts when the level of competition increases (Becerra et al. 2013) or price promotions for fear of this being interpreted by customers as a signal of lower quality (Mohammed et al. 2019) or opaque price mechanisms (Huang et al. 2019) endeavouring to transmit a price stability image to their costumers (Abrate et al. 2012; Mohammed et al. 2019). Additionally, the higher the hotel price, the greater relevance customers give to breakfast (Beerli-Palacio et al. 2020) and hence the higher their willingness to pay more for it (Fruchter et al. 2011). And since a higher category implies a room price premium that varies spatially (Kim et al. 2020a; Latinopoulos 2018; Zhang et al. 2011b), the following hypothesis can be stated:

H1 Hotel category has a positive spatial varying effect on the breakfast price.

2.2.2 Online reputation and breakfast price

With the advent of the digital age, customers mostly use online travel agencies (OTAs) to conduct their searches and bookings. This is a search-click-through-book process that turns customer-generated opinions, such as consumer-generated ratings, incentives or social badges, into customers' determinants (Xu and Luo 2023; Xie and Lee 2020). Of the set of possible items that can be promoted at a discount on the hotel's website, those directly related to the hotel's core sector (e.g., food & beverage) are more likely to be purchased than those with a more indirect or simply unrelated relationship (Kim and Tanford 2021).

Online reviews are critical for the hotel industry because of their relevance in consumer decision-making, willingness to pay and pricing (Nieto-García et al. 2017; Viglia et al. 2016). In fact, the lower the online reviews, the higher the hotel's advertising spending, with the two components substituting each other (Hollenbeck et al. 2019).

There are different perspectives and results when it comes to explaining the relationship between the online-rating and pricing. Thus, we can distinguish between situations with high or positive evaluations and those with low or negative evaluations. In the first case, we can situate the application of the expectations theory, according to which expectations constitute the reference against which consumers evaluate their experience (Rust and Oliver 1994). In the context of online hotel booking, customer expectations are determined by the influence of third parties through ewom, which can also act as a mechanism to reduce information asymmetries (Manes and Tchetchik 2018). Expectations have a powerful effect on customer ratings through the placebo effect (Irmak et al. 2005), so when the published online rating is high, customer expectations will be high and they will be willing to pay more for breakfast. Similarly, online reputation also increases the customer's willingness to pay (Nieto-García et al. 2017), so managers can use online reputation as a screening tool to search for customers who are willing to pay more for additional services and given the breakfast service relevance for travellers when booking a room (Kucukusta 2017; Leite

-Pereira et al. 2019; Webrezpro 2022), a better online reputation can allow hotels to set a higher price for the breakfast service.

When online reviews are low or negative, the expectations theory may be insufficient to explain consumer decisions. Thus, when ratings are very low (e.g., an average score of 2.3 out 5), the intention to book is very low, influenced neither by price nor by familiarity with the hotel brand (Wen et al. 2021). This is because the nature of the consumer is risk-averse (Kahneman and Tversky 1979). Thus, prospect theory suggests that people make choices based on comparisons in relation to a reference point by minimising risk over profit, so that when the online rating difference is small, a price reduction translates into a more than proportional increase in preference for that hotel. However, when the rating difference is large, reductions in price do not translate into increases in purchase intention (Han et al. 2024). This implies that price management is different depending on the online rating of the hotel, and that the higher the online rating, the higher hotels are able to set the breakfast price. Since hotel location plays a fundamental role in online customer reviews (Yang et al. 2018) and the effect of the online reputation achieved by a hotel on the price of the core product (room price) varies spatially (Latinopoulos 2018), we can propose that:

H2 The online reputation has a positive spatial varying effect on the breakfast price.

2.2.3 Horizontal differentiation in services and breakfast price

The current lodging industry has reached a high level of standardization in services promoted by the expansion of hotel chains (Woo and Mun 2020), but on the other hand, this standardization can lead to a loss of authenticity and does not satisfy customers who seek unique experiences based on local culture (Yu et al. 2014). Thus, previous hospitality literature has shown contradictory results on the benefits associated with horizontal differentiation in services since it has been shown that both the standardization of services (Silva 2015) and their differentiation (Sánchez-Perez et al. 2020) can increase room price competition among hotels. Consequently, in accordance with the postulates of the theory of strategic balance (Deephouse 1999), hotels need to weigh the adequate differentiation strategy related to competitors to achieve a higher and better long-term performance (Kim et al. 2020b; Urtasun and Gutiérrez 2017). Thus achieving the appropriate horizontal differentiation degree in services is a challenge for hotel managers that depends on the competitive environment and evidently on the geographical hotel location (Urtasun and Gutiérrez 2017).

Concerning add-ons, previous literature has considered horizontal differentiation within the fee or free dilemma (Liu et al. 2020), a limited approach since it does not allow hotels to adequately set their horizontal differentiation strategy with respect to competitors according to strategic balance theory (Deephouse 1999). In fact, it has been found that the competitive advantage derived by offering free add-ons as a horizontal differentiation strategy is lessened if the same strategy extends to competing neighbours (Liu et al. 2020) and since this kind of horizontal differentiation strategy can be easily adopted by competitors, it could lead to a minimum level of differentiation with respect to the competition that can threaten hotel long-term performance (Kim et al. 2020b). Among previously analyzed add-ons, breakfast is the one with

the lowest marginal effect on consumers' perceived value and even depending on the competitive environment, a horizontal differentiation strategy based on a free breakfast can negatively influence the value perceived by the consumer and shows that the competitive advantage from horizontal differentiation associated with breakfast can vary spatially.

Our study aims to overcome these previous limitations and tries to analyze whether a breakfast service offering differentiated from the standard offer of the competition can be a relevant source of differentiation (Beerli-Palacio et al. 2020). On the one hand, a breakfast service differentiated from the standard offering can work as a screening tool to attract less price-sensitive customers since breakfast as a gastronomic service with several potential benefits ranging from local hospitality, authenticity, togetherness, social interactions or the memorability (Kodas 2024) can attract less price-sensitive tourists with high purchasing power (Jiménez Beltrán et al. 2016) allowing hotels to achieve a price premium for the breakfast service. On the other hand, a differentiated breakfast service based on local tastes can both increase and decrease the customers' perceived value (Chang et al. 2010; Kontis and Gkoumas 2017) with the standard breakfast being preferred by some (Lee et al. 2018). Thus, hoteliers must adequately choose the degree of horizontal differentiation with respect to standard offering, being able to use an adequately service differentiated at a low price as a promotional tactic to encourage reservations from those customers who do value a differentiated breakfast service (Kontis and Gkoumas 2017). Given that setting the horizontal differentiation degree in services is strongly linked to geographical hotel location (Urtasun and Gutiérrez 2017) we posit the following hypothesis:

H3 The effect of differentiation on price breakfast varies spatially so hoteliers can use differentiation as a promotional or screening strategy.

2.2.4 Competitive environment and breakfast price

Concerning competition environment, hospitality research has extensively revealed the coexistence of two opposite effects, competition and agglomeration (Becerra et al. 2013; Kim et al. 2020b; Lee 2015; Lee and Jang 2015; Sánchez-Pérez et al. 2020). On the one hand, based on Industrial Organization theory (Shaked and Sutton 1982), an increase in competition due to a higher concentration or hotels in a specific physical area can lead to lower profits and higher risk in hotel performance (Kim et al. 2020b), increasing failure rates in concentrated areas (Kalnins 2016). On the other hand, based on agglomeration theories (McCann and Folta 2008) hoteliers want to locate next to incumbent hotels and seek benefits through externalities and resources (Canina et al. 2005), access to market knowledge from experienced hotels (Woo and Mun 2020) and enhancement of the demand (Canina et al. 2005) with the consequent improvement in hotel performance (Lee and Jang 2015). Regarding hotel price, previous studies have also highlighted the confrontation between competition and agglomeration, whereby greater agglomeration can both reduce room price (Becerra et al. 2013; Lee 2015) and allow hoteliers to achieve room price premium (Sánchez-Pérez et al. 2020) but the imbalance between the two effects depends on the destina-

tion (Illescas-Manzano et al. 2023) and is linked to the spatial hotel location and both effects can coexist within the same destination (Illescas-Manzano et al. 2023).

Regarding add-ons, incorporating the competitive environment is essential for designing a profitable pricing strategy (Lin 2017; Liu et al. 2020). Furthermore, the competitive environment can influence add-on pricing because, while hotels can achieve a competitive advantage by offering several add-ons for free (Liu et al. 2020; Nicolau and Sellers 2012), this advantage is reduced if there are neighbouring hotels employing the same strategy, with free breakfast being the amenity with the lowest marginal effect on perceived value compared to add-ons such as WiFi or parking and even showing both a positive and negative effect depending on the competition level (Liu et al. 2020). Therefore offering breakfast for free is conditioned by the level of competition that the hotel faces.

However, to the best our knowledge it is yet to be analyzed whether the spatial imbalance in agglomeration versus competitive confrontation in hotel room price (core product) can also extend to the add-on price policy, which is plausible since the level of relevance given by customers to the breakfast service and their willingness to pay more for it is conditioned by the room price (Beerli-Palacio et al. 2020; Fruchter et al. 2011) and price fluctuations in the core product may cause adjustments in the price of the add-on to maintain the profitability of the add-on pricing policy established by the hotel (Lin 2017). Our study aims to analyze whether an add-on price (i.e. breakfast price) can benefit from agglomeration or if a greater concentration of competitors leads to a price reduction and given that the imbalance in this confrontation in the room price varies spatially (Illescas-Manzano et al. 2023), the following hypothesis can be proposed:

H4 The confrontation between agglomeration and competition effects on price breakfast varies spatially.

Figure 1 depicts conceptual model proposed.

3 Methodology

3.1 Empirical setting and sample

The study framework for the empirical study is the hotel industry in four European countries, Spain, France, Italy and the United Kingdom during the year 2021. Although between 2020 and 2022 the tourism industry suffered the a severe crisis during the COVID-19 pandemic, in this period the four countries under consideration continued to be four relevant countries in the tourism industry worldwide with similar figures in terms of international tourist arrivals and international tourism receipts. Regarding arrivals, France, Spain and Italy maintained their positions worldwide (first, second and fifth position respectively) while the UK rose from tenth place to seventh. Regarding receipts, Spain and Italy also maintained their positions worldwide (second and sixth position), the UK rose from fifth to third place while France fell from third to sixth place (UNWTO 2023).

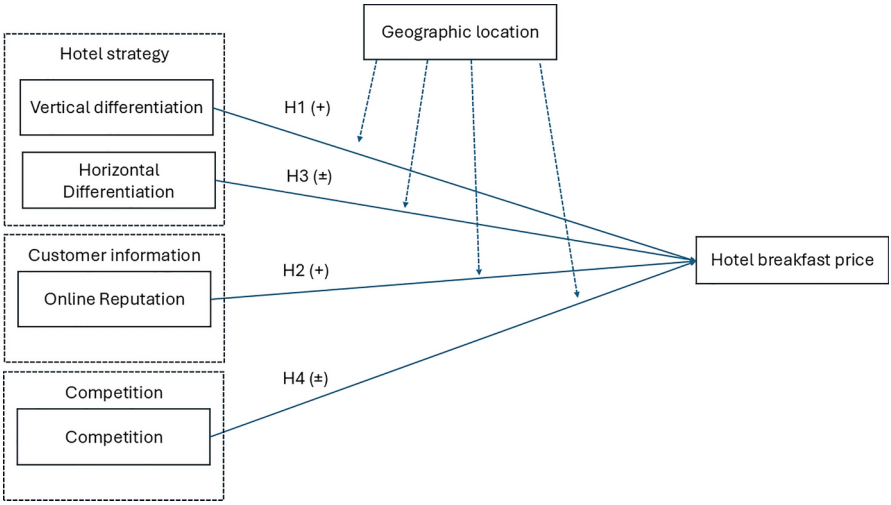

Fig. 1 Conceptual model of breakfast pricing

The sample used in the study is a large database of hotels located in the four aforementioned countries and has been collected mainly by crawling and web scraping techniques developed with routines programmed with the R software (Team R Core 2024) using the tools provided by the "Rcrawler" package (Khalil 2018; Khalil & Fakir 2017). First, the information regarding the hotel locations (address, GPS coordinates, city), hotel attributes (e.g., hotel size, hotel age, hotel category or breakfast services available) and yearly average prices for breakfast service during 2021 were retrieved from the hotel websites. Second, at the end of 2021 the information concerning online reviews and competition was collected from Veturis, an international wholesaler that groups together several travel agencies (London Stock Exchange Group 2017). Several reasons justify the use of this source of information both with regard to hotel online reputation and hotel competition. Regarding online review information, Veturis only allows real consumers to post online reviews after their stay so it is a trusted source for hotel online reputation and can be considered a similar source as Online Travel Agencies (OTAs), which have been widely considered in hospitality research (Abrate and Viglia 2016; Latinopoulos 2018; Liu et al. 2020; Kim et al. 2020a, b; Zhang et al. 2011a), but unlike some OTAs such as TripAdvisor, Veturis does not allow fake reviews (Schuckert et al. 2016). Regarding competition, several cities with different geographic sizes and different hotel distribution are included in the sample so it is difficult to establish a common radius around a hotel to delimit its competition area, therefore we considered commercial areas defined by Veturis as geographic competition areas for hotels (Kalnins 2016; Neirotti et al. 2016). Once the competition areas had been established, we computed for each hotel the number of competitors located in the same competition area, once again with programmed R software routines.

The sample initially obtained contained 2,324 hotels distributed in the four countries under consideration, but because several units were incomplete, a new attempt was made to complete the missing information both from the hotels' own websites

and from the wholesaler's information system. After this final attempt, those hotels that still had missing information were discarded. The final sample size contains 2111 hotels distributed in 135 cities and 563 competition areas, thus overcoming limitations of previous studies on hotel breakfast service that were based on data from a single hotel establishment (Anguera-Torrell and Nicolau 2025) or on customer-based experiments (Nicolau and Sellers 2012).

Most of the attributes included in the sample, such as category, hotel size, GPS coordinates, city or services offered, are static with respect to the specific date of data extraction, which makes them free of bias caused by the strong seasonality that affects the tourism industry (Duro and Turrión-Prats 2019) and the lodging sector (Wang et al. 2019). However, prices in the hotel industry (Abrate and Viglia 2016; Vives and Jacob 2020) display a time dynamic character and can be biased by seasonality (Vives and Jacob 2020; Wang et al. 2019). Additionally, hotel price can be biased by the occurrence of sport or commercial events (Falk and Vieru 2021; Herrmann and Herrmann 2014). Given that seasonality is strongly connected to geographical location (Duro and Turrión-Prats 2019) and our sample covers four countries with different geographic destinations and different types of tourism (city, sun-beach, winter alps, etc.), it was difficult to select a specific date to collect the price of the breakfast service free of bias deriving from seasonality and the occurrence of special events. Similarly, online consumer reviews may be affected by the specific date of data extraction (Teichert et al. 2024; Zhang et al. 2022) as well. Thus, the yearly average of both the price of the breakfast service and the rating of consumers' online reviews were considered to mitigate the effect of seasonality, so acute in tourism and hospitality. Nevertheless, the sample did not include measurements of the cost of providing breakfast services that may bias the breakfast price given the relevance of the cost in the add-on pricing (Lin 2017). Additionally, the sample did not include measurements of peer-to-peer markets in the 135 destinations included in the sample, which may have produced biases in hotel prices due to the impact that this market has on the hotel industry (Huarng and Yu 2019; Zervas et al. 2017).

3.2 Variable definition

To analyze the impact that variables such as hotel category, online reputation, horizontal differentiation and competitors have on the breakfast price, we will apply multivariate regression models where the dependent variable, **B_Price** measures the average price for the breakfast service in euros during the year 2021. To compute the dependent variable, we fixed at zero the breakfast price when hotels included this add-on in the room price. The yearly average pricing is a measure of hotel pricing frequently considered in hospitality pricing research (Abrate et al. 2011; Becerra et al. 2013; Kim et al. 2020a; Lee 2015; Silva 2015; Zhang et al. 2011a, b) that is not influenced by special events, seasonal effects or distribution channels (Lee 2015).

Among explanatory variables, we considered the followings determinants for breakfast pricing:

- Category. Following several previous studies in hotel pricing (Baldassin et al. 2017; Becerra et al. 2013; Illescas-Manzano et al. 2023; Neirotti et al. 2016;

Silva 2015; Zhang et al. 2011b), this variable measures the official hotel category which is assigned by the agencies based on governmental regulations and it ranges from one to five stars (Becerra et al. 2013; Silva 2015). Product comparability is assured by including a vertical differentiation indicator that allows perfect substitutability to be established between the different analytical units and ensures an assessment of the level of vertical competition.

- Online_Rep. Based on several previous studies in hospitality research (Baldassin et al. 2017; Latinopoulos 2018; Manes and Tchetchik 2018; Viglia et al. 2016; Zhang et al. 2011a), to measure the online reputation of hotels, we consider the yearly average customer 10-point rating review for each hotel from reviews posted in Veturis during 2021. As we mentioned earlier, Venturis is a trusted source for online reputation, as only real guests can post online reviews after experiencing their stay at the hotel (Sanchez-Lozano et al. 2021).
- H_Diff. The horizontal differentiation in breakfast services offered by a hotel j has been computed with respect to hotels that share the same commercial area C_j with a product differentiation distance measure (Chisholm et al. 2010) defined as follows:

$$\mathbf{H\_Differentiation}_{\mathrm{j}} = \mathrm{sum}\left(\mathrm{V_j}\right) \cdot \underset{l \in C_j l \neq j}{\mathrm{mean}} \left(\mathrm{d}\left(\mathrm{V_j}, \mathrm{V_l}\right)\right)$$

where $\mathrm{V_j}$ represents a vector of breakfast services available in hotel j with a set of eight dummy variables for available breakfast services (healthy breakfast, breakfast buffet, continental breakfast, breakfast menu, breakfast a la carte, local breakfast, American breakfast and breakfast in bed) and where $d(V_j, V_l)$ is the distance of V_j respect to V_l that is set as zero if hotel j has all the services offered by hotel l. In the remaining cases, it is defined as follow:

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

Thus, the greater the horizontal differentiation a hotel has, the higher the **H_Diff** value it will attain. Similar approaches have been considered in previous studies on hotel research (Liu et al. 2020; Silva 2015; Urtasun and Gutiérrez 2017).

- **N_Hotels.** To account for hotel competition in the regression model, following previous studies (Baldassin et al. 2017; Latinopoulos 2018; Neirotti et al. 2016) this variable measures for each hotel j, the number of hotels located in the same commercial area C_j.

Additionally, since hotel size and age can influence the add-on policies (Lin 2017), the following control variables will be included in the models considered:

L_Size. Since hotel pricing policy can be influenced by the hotel size (Silva 2015), following previous studies (Baldassin et al. 2017; Becerra et al. 2013; Kim et

Table 1 Sample descriptive statistics

Variable	Mean	St. dev	Min	0.25	Median	0.75	Max
B_Price	18.416	16.054	0	10.105	17	23.845	239.100
Category	3.498	0.755	1	3	4	4	5
Online_Rep	7.449	1.090	0.200	7	7.600	8	10
H_Diff	1.489	0.956	0	1	1.414	2.236	5.292
N_Hotels	88.228	169.732	1	9	30	83	993
L_Size	4.428	0.767	1.609	3.912	4.394	4.909	7.595
L_Age	2.866	0.479	1.099	2.639	2.833	2.996	6.100

Table 2 Distribution of sampled hotels by category and country (%)

Category/Country	Spain	France	Italy	UK
1*	1.350	0.708	0.592	1.130
2*	5.601	21.555	5.325	6.780
3*	32.861	48.763	36.095	36.723
4*	55.128	27.562	52.663	50.282
5*	5.061	1.413	5.325	5.085

al. 2020a; Lee 2015; Zhang et al. 2011b), this variable controls the hotel size by measuring the logarithm of the number of rooms.

L_Age. Since hotel age can influence hotel pricing policies, to control possible differences between newer and older hotels, following previous studies (Kim et al. 2020a; Zhang et al. 2011a,b), this variable measures the logarithm of the number of years of hotel operations.

Finally, the main descriptive statistics for all variables considered in the empirical study are provided in Tables 1 and 2 provides the percentages of hotels in the sample by category and country to gain a better understanding of the profile of hotels included in the sample.

The descriptive statistics from Table 1 show that the average breakfast price during 2021 was 18.416 euros with a standard deviation of 16.054. The descriptive statistics also highlight the notable average value of consumer ratings (7.449 out of 10), with ratings ranging from 7 to 8 between the 25 and 75 percentiles. Hotels in the sample display a moderate grade of horizontal differentiation in breakfast services with an average value of 1.489 and a median value of 1.414. Finally, the average numbers of competitors per commercial area was 88.228 and was characterized by a high standard deviation value (169.732).

Moreover, Table 2 shows that the distribution by hotel category of the hotels included in the sample in the four countries are very homogeneous, so that the sample of hotels in Spain, Italy and the United Kingdom display very similar percentages by category with a predominance of 4-star and 3-star hotels while there is a lower percentage of both 5-star hotels and hotels of the two lowest categories. In the case of France, there is a lower percentage of 4-star hotels in favour of a higher percentage of 2-star hotels. Nevertheless, the distribution by hotel category is fairly homogeneous across countries.

3.3 Model specification and estimation methods

In order to analyze if explanatory variables can influence the breakfast price, the following regression model was proposed:

$$\begin{aligned} B\_\,\mathrm{Price}_j = {} & \alpha_0 + \beta_1 Category_j + \\ & \beta_2 Online\_\mathrm{Rep}_j + \\ & \beta_3 H\_Diff_j + \beta_4 N\_Hotels_j + \\ & \beta_5 L\_Size_j + \beta_6 L\_Age_j + \varepsilon_j \end{aligned}$$

First, we considered a global estimation of the proposed model by ordinary least squares (OLS). A fundamental assumption for employing OLS is the existence of a stationary relationship between the dependent and independent variables, but our model incorporates some variables relating to spatial features (e.g. relating to commercial areas) that may exhibit spatial dependence against the no-autocorrelation assumption of OLS, so a global model can lead to a biased estimation (Latinopoulos 2018; Kim et al. 2020a, b). In addition, autocorrelation in hotel add-on prices such as breakfast price may appear since some externalities such as services, amenities, and attractions are shared by hotels located in the same area. Finally, since competition can influence pricing add-on policies (Liu et al. 2020) and competition impact in the hotel industry is conditional on geographic location (Park et al. 2022), the competition effect on breakfast price can show spatial heterogeneity.

To account for the existence of spatial autocorrelation and spatial heterogeneity, we assumed a non-static relationship between the dependent variable and explanatory variables across the study sample by employing the geographically weighted regression (GWR) (Fotheringham et al. 2003). This recent estimation technique provides for each unit in the sample a specific set of regression parameters by weighting observations according to their geographical locations. Explicitly, the GWR model (local model) for a specific unit with geographical coordinates u, is defined as follows:

$$\begin{aligned} B\_\,\mathrm{Price}_j(u) = {} & \alpha_0(u) + \beta_1(u)\, Category_j \\ & + \beta_2(u)\, Online\_\mathrm{Rep}_j + \beta_3(u)\, H\_Diff_j \\ & + \beta_4(u)\, N\_Hotels_j + \beta_5(u)\, L\_Size_j \\ & + \beta_6(u)\, L\_Age_j + \varepsilon_j \end{aligned}$$

with $\beta_i(u)$ given by:

$$\beta(u) = \left(X^T W(u) X\right)^{-1} X^T W(u) \cdot \mathbf{B\_Price}_{\mathrm{i}}(u)$$

where X is the matrix with independent variables and W(u) is the weighting matrix that encompasses the weights for each sample unit according to the distance concerning the point with coordinates u. Among the numerous ways of specifying the weighting matrix (Fotheringham et al. 2003), we calculated W(u) with the Euclidean distance and a Gaussian kernel function. A fixed number of nearest neighbours were set as an adaptive kernel bandwidth by minimizing the AICc (the corrected Akaike

Information Criterion score; Hurvich et al. 1998). Thus, in contrast to the global model based on OLS, the local model based on GWR can explore local variations in the relationships between the breakfast price and explanatory variables.
Finally, to explore spatial clusters based on local coefficients we considered the Hot spot analysis with Local Indicators of Spatial Association (LISA) (Anselin 1995). Specifically, we used the global Moran's I statistics as LISA statistics to measure the existence of spatial autocorrelation of local coefficients and classify units in spatial clusters or spatial outliers (Kim et al. 2020a, b; Urtasun and Gutiérrez 2017). Clusters are locations with positive spatial autocorrelation (spatial units geographically close with similar values of local coefficients) whereas outliers are locations with negative spatial autocorrelation (spatial units with dissimilar values of local coefficients). Based on global Moran's I statistics, clusters were classified into HH (High-High) called hot spots (areas that encompass high local coefficients surrounded by other high coefficient values) and LL (Low-Low) called cold spots (areas that encompass low local coefficients surrounded by other low coefficient values). On the contrary, outliers were classified in High-Low (HL) outliers (areas with high local coefficients surrounded by low values) and Low–High (LH) outliers (areas with low values surrounded by high values).

The model estimation procedures with OLS and GWR were performed with R software, version 4.2.1 whereas the Hot Spot analysis was performed with QGIS software, version 3.28. All the maps and figures included in the study were elaborated by the authors using QGIS software and using OpenStreetMap® and Contributors for the reference map (https://www.openstreetmap.org/copyright).

With the proposed methodology, as opposed to previous studies on hotel breakfast that have mainly adopted a demand-based approach (Anguera-Torrell and Nicolau 2025; Liu et al. 2020; Nicolau and Sellers 2012), the aim is to delve into the formation of breakfast price by using supply-based data instead of an experimental approach or a hypothetical context from the customer perspective (Nicolau and Sellers 2012) or analysis based on individual customer data (Anguera-Torrell and Nicolau 2025; Liu et al. 2020) that have all tried to delve into customers behaviour. Neither have previous studies (Anguera-Torrell and Nicolau 2025; Liu et al. 2020) taken into account that the hotel industry is a location-sensitive industry and they have ignored the incorporation of spatial analysis despite the fact that it has been recognized as a relevant limitation in the analysis of hotel add-ons (Liu et al. 2020) and therefore the existence of spatial autocorrelation and spatial heterogeneity has not been taken into account, which can lead to misleading estimation and models (Nicholls and Kim 2022).

4 Results

4.1 Model estimation and hypothesis testing

Previous to the modelling estimation, as the potential presence of global and local multicollinearity could have been a critical issue in GWR (Wheeler and Tiefelsdorf 2005), the analysis was carried out with the variance inflation factor (VIF). Since both

global and local VIF values are less than 1.598, multicollinearity was not a critical problem in the proposed model. Table 3 displays the model estimation for the global model with static coefficients, and for the local model with non-constant coefficients. According to the OLS results, all the explanatory variables have a significant impact on breakfast price, except for **H_Diff** and **L_Age**. Specifically, hotel category, online reputation, and hotel size positively impact breakfast price, whereas the number of competitors in the same commercial area was negatively associated with the breakfast price which implies a competition effect. In summary, higher category hotels with a higher online reputation and more rooms attain higher prices for breakfast, but hotels with more competitors in their area charged lower breakfast prices.

Next, violations of the assumptions of OLS and significance for the global model were checked. The Jarque–Bera test for normality and the Koenker (BP) test for heteroscedasticity and/or nonstationarity suggest a lack of normality and heteroscedasticity and nonstationarity, so the global model may lead to inaccurate regression results. Concerning model significance, the F-test verifies the significance of the global model but due to the presence of heteroscedasticity and/or nonstationarity, the model significance was also verified with the Joint Wald Statistic.

The aforementioned violations of the OLS assumption can be produced by spatial autocorrelation in the residuals of the global model so a Moran's I test was performed (Zhang et al. 2011b). The Moran's statistic (MI = 0.056; Z score = 7.534) was found to be significant (p-value = 4.9E-14), so there is a significant positive spatial autocorrelation for OLS residuals that suggests an incorrect model estimation, possibly due to non-stationarity.

To account for spatial dependency, we considered the local model (Table 3). According to the GWR results, the local model shows better model fit measures, with higher values of R^2 and adj R^2 and lower values of AIC and AICc. The local R^2 values range from 0.083 to 0.201 with a mean of 0.144 so all of them are higher than the R^2 value from the global model. Additionally, an F1-test (Leung et al. 2000)

Table 3 Global and local model estimation

	OLS	Geographically weighted regression						F3-test (p-value)
		Min	0.25	Median	Mean	0.75	Max	
Intercept	245.260	− 1043.564	− 60.088	141.001	121.243	372.429	791.833	0.997
Category	3.850***	3.003	3.895	4.357	4.704	5.444	10.020	2.2E-16***
Online_Rep	0.770*	0.022	0.767	1.160	1.413	1.648	3.663	2.2E-16***
H_Diff	0.216	− 1.120	-0.293	-0.048	0.102	0.563	1.456	1.8E-5***
N_Hotels	− 0.005*	− 0.067	-0.010	0.009	0.002	0.014	0.048	2.2E-16***
L_Size	2.519***	0.103	1.269	1.743	1.620	1.961	3.065	1.000
L_Age	− 33.828	− 100.571	− 48.202	− -14.546	− 10.672	16.086	134.796	0.997
Local R^2		0.083	0.129	0.147	0.144	0.159	0.201	
R^2	0.081	0.160						
Adj R^2	0.078	0.141						
AIC	17,547.93	17,376.23						
AICc	17,548	17,415						

*Significant at 10%

**Significant at 5%

***Significant at 1%

and an F-test (Fotheringham et al. 2003) were performed to check the significance of the local model over the global one. Results from both tests verify the significance at level 0.01 of the GWR model over the OLS model. The F3 test (Leung et al. 2000) was considered to check if the effect of independent variables on breakfast price has a significant spatial variation in accordance with the four hypotheses previously established. On the one hand, range for local coefficients of **Category** only encompasses positive values and the F3 test confirms a significant spatial variability in the local coefficients at the 0.001 level supporting **H1**. Similarly, hypothesis **H2** is confirmed by the F3 test since there is a significant spatial variation at the 0.001 level in the positive effect of **Online_Rep** on the breakfast price. Thus, hotels use vertical differentiation and online reputation to fix higher breakfast prices with different degrees of intensity depending on the location and search customer less price sensitive. On the other hand, local coefficients of **H_Diff** range from negative to positive values with a significant spatial variability at the 0.001 level, so **H3** is also confirmed. Thus, differentiation in breakfast services can be used to attain competitive advantage by offering differentiated breakfast services at a lower price or to capture less price sensitive customers depending on location. Similarly, hypothesis **H4** is also supported since local coefficients of **N_Hotels** show a significant spatial oscillation at the 0.001 level that encompasses both negative and positive values and hence the confrontation agglomeration versus competition is also linked to geographical location and can show different patterns depending on the hotel environment. Thus, except for control variables, all independent variables show significant spatial variability in the local coefficients at the 0.001 level which, together with the significance of the local model over the global one confirmed by both the F1 and F tests, show the relevance of accounting for spatial autocorrelation and spatial heterogeneity to avoid biased estimates of the proposed model.

4.2 Analysis by destination: hot spot analysis

Due to the spatial varying effect of explanatory variables, to illustrate how hotels fix breakfast price in different locations, we considered four global cities, Madrid, Paris, Rome, and London. Previous studies in hospitality research have considered global cities as empirical settings since they are more attractive destinations for international tourists, and they play a relevant role in the tourism industry (Woo and Mun 2020). Table 4 provides the summary descriptive statistics of local coefficients by variable and city.

Table 4 shows that Madrid is a destination where there is an agglomeration effect (positive competition effect) while in the other three destinations, there is a negative competition effect which has the greatest intensity in London and shows how the confrontation between agglomeration and competition is subject to the geographical location of the hotel as established by hypothesis **H4.** Additionally, in accordance with **H3**, hoteliers in Madrid use differentiation as a promotional tool and offer differentiated breakfast services at a lower price while in the rest of the destinations, hotels set higher prices by offering differentiated services seeking less price sensitive consumers, where London is the destination with the greatest price premium. Similarly, as established by hypothesis **H1**, the price premium associated with vertical dif-

Table 4 Summary descriptive statistics for chosen global cities

	Category						Online_Rep					
	Min	0.25	Median	Mean	0.75	Max	Min	0.25	Median	Mean	0.75	Max
Madrid	4.316	4.353	4.360	4.359	4.368	4.401	1.618	1.631	1.633	1.635	1.637	1.663
Paris	6.387	6.450	6.480	6.474	6.495	6.539	0.791	0.792	0.792	0.792	0.793	0.794
Rome	3.840	3.841	3.841	3.841	3.841	3.841	0.498	0.499	0.499	0.499	0.499	0.500
London	9.331	9.531	9.571	9.570	9.606	9.813	0.723	0.738	0.739	0.739	0.741	0.752
	H_Diff						N_Hotels					
Madrid	− 0.888	− 0.877	− 0.872	− 0.867	− 0.864	− 0.817	0.0132	0.0133	0.0134	0.0134	0.0134	0.0135
Paris	1.063	1.082	1.091	1.089	1.095	1.109	− 0.027	− 0.026	− 0.026	− 0.026	− 0.025	− 0.024
Rome	0.713	0.718	0.718	0.718	0.719	0.722	− 0.008	− 0.008	− 0.008	− 0.008	− 0.008	− 0.008
London	1.394	1.418	1.423	1.423	1.427	1.449	− 0.060	− 0.055	− 0.054	− 0.054	− 0.052	− 0.048

ferentiation is linked to spatial location and in Madrid, higher quality is offered with a lower price premium than in Paris or London and one which is only higher than that in Rome. In accordance with hypothesis **H2**, all destinations set price premiums for breakfast services according to online reputation, the intensity of which varies spatially, with Madrid being the destination with the greatest effect.

Finally, to fully explore the four destinations considered, a Hot Spot analysis was performed on each destination. Figures 2, 3, 4 and 5 show the local clusters and outliers by city and variable. Regarding Madrid, in accordance with hypothesis **H1-4**, Fig. 2 shows that the effects associated with **Category**, **Online_Rep**, **H_Diff** and **N_Hotels** respectively vary spatially even within the same destination and we can observe a trade-off between vertical and horizontal differentiation. In those areas where there is a significant concentration of hotels that apply a higher price premium for the quality offered (HH **Category** clusters), there are also concentrated areas of hotels that offer differentiated breakfast services at a lower price (LL **H_Diff** cluster) and vice versa. Near the HH **Category** cluster (or LL **H_Diff** cluster) there is a group of LH **Category** outliers (or HL **H_Diff** outliers) that employ the opposite strategy, offering better quality at a lower price and differentiated breakfast services at a higher price than neighbouring hotels. Similarly, there is also a trade-off between the online reputation clusters and the agglomeration effect clusters, so that the price premium associated with online reputation could compensate for a lower benefit associated with hotel agglomeration and vice versa. An LH **N_Hotels** outlier exists near to an HH **N_Hotels** cluster where a lower profit from agglomeration than neighbouring hotels is compensated with a higher price premium associated with online reputation.

In the case of Paris, Fig. 3 also shows the varying effect of all the independent variables as established by hypotheses **H1-4**. Additionally, Fig. 3 shows a trade-off between the negative effect of competition and vertical and horizontal differentiation, so in areas where the adverse effects of competition is greater (LL **N_Hotels** clusters) hotels offer higher quality and differentiated services at a higher price (HH cluster of **Category** and **H_Diff**), so hoteliers in Paris use both differentiations as a screening tool in search of less price sensitive customers and to reduce the pressure of competition. Unlike Madrid, there are no significant outliers associated with the trade-off observed between the competition and the two types of differentiation. Concerning online reputation, a big HH cluster is in the South and a big LL cluster is in the North along with a group of HL outliers. Thus, in the south-central area of Paris, hotels suffer less from the negative effect of competition on breakfast prices and can also obtain higher price premiums associated with a better online reputation.

In the case of Rome, there is also a trade-off between the negative effect of competition and vertical differentiation (Fig. 4) located both in the northwest (LL **N_Hotels** and HH **Category** cluster) and in the southeast (HH **N_Hotels** and LL **Category** cluster), however this trade-off is partial since there is both an HH **Category** cluster in the northeast and an LL **Category** cluster in the south without any significant relationship pattern regarding competition and there is even an LL **Category** and an LL **N_Hotels** cluster in the west. The local coefficients associated with the effect of **Online_Rep** and **H_Diff** do not show a significant spatial pattern in most cases but there is a partial trade-off between both effects located in the west and southeast. Thus, in the west, hoteliers only use horizontal differentiation to combat a stronger

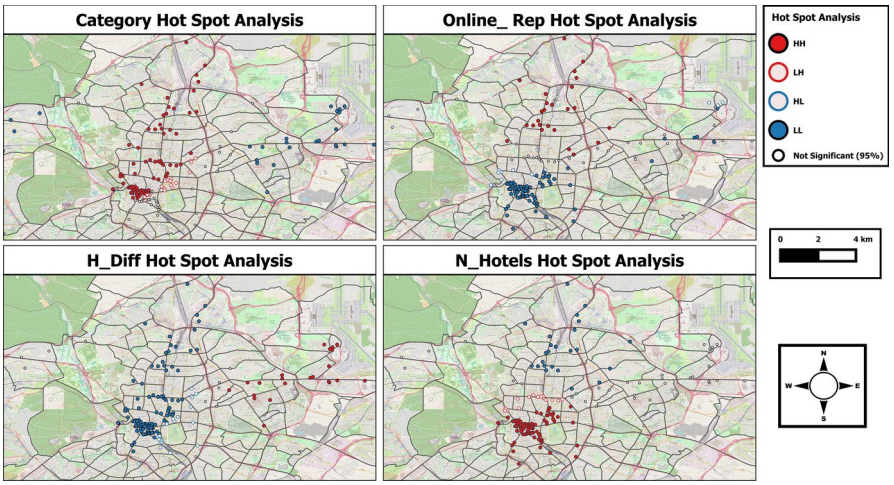

Fig. 2 Hot Spot Analysis for explanatory variables in Madrid.
Source: Own elaboration by using QGIS and OpenStreetMap® and Contributors

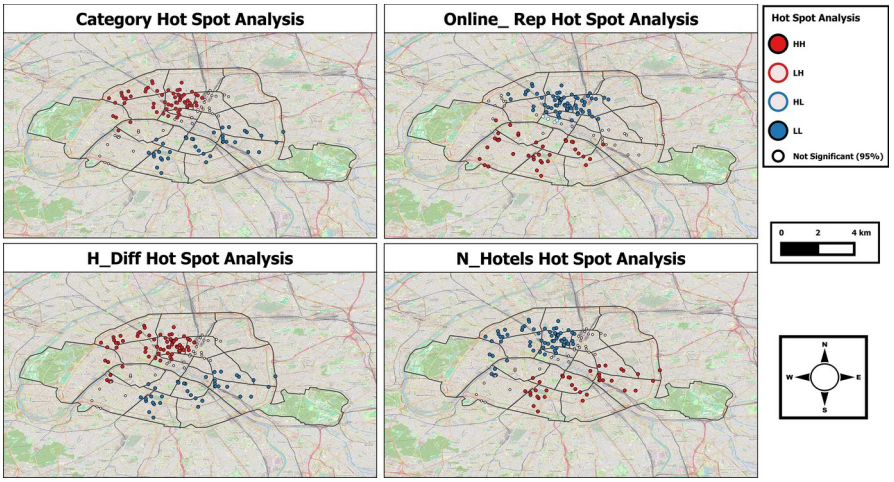

Fig. 3 Hot Spot Analysis for explanatory variables in Paris.
Source: Own elaboration by using QGIS and OpenStreetMap® and Contributors

negative effect from competition and in the southeast, similarly to Paris, hotels bear less pressure from competition but attain higher price premiums from a better online reputation.

Finally, in accordance with hypotheses **H1-4**, Fig. 5 again shows local spatial variation for all explanatory variables and show that the case of London is very similar to Paris, but this time the trade-off with the negative competition effect also incorporates online reputation. In the east, hotels use vertical and horizontal differentiation strategies along with online reputation to combat stronger hotel competition. On the other hand, in the west, hoteliers face a lower level of competition and hence the price

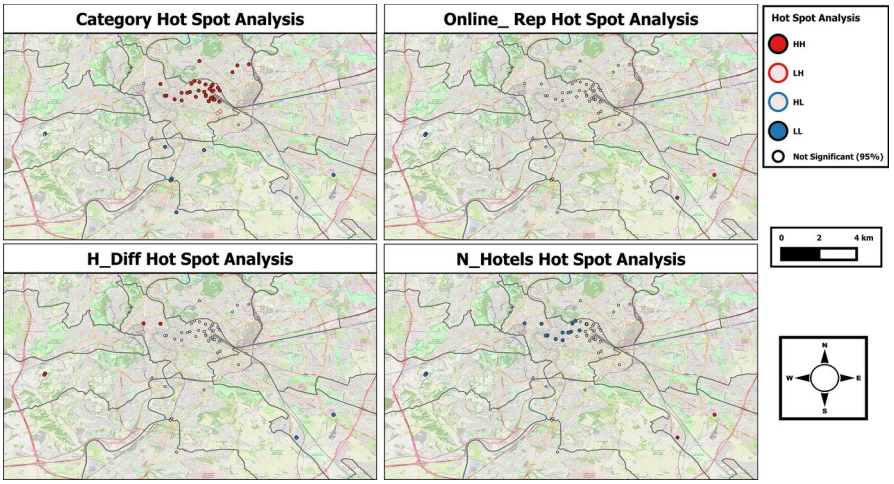

Fig. 4 Hot Spot Analysis for explanatory variables in Rome.
Source: Own elaboration by using QGIS and OpenStreetMap® and Contributors

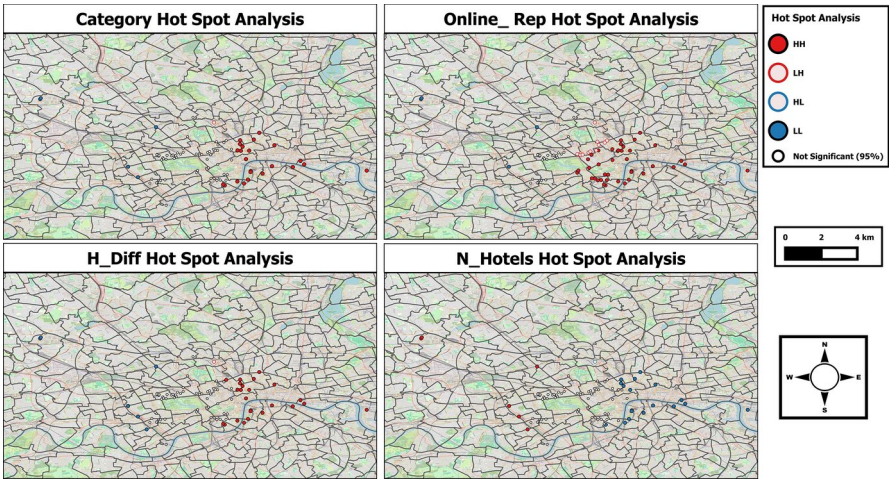

Fig. 5 Hot Spot Analysis for explanatory variables in London.
Source: Own elaboration by using QGIS and OpenStreetMap® and Contributors

premiums associated with higher quality, better online reputation and more differentiated service are lower. Additionally, there are LH **Online_Rep** outliers located near the HH **Online_Rep** cluster.

5 Discussion

The main objective of this work is to extend the understanding of hotel add-on pricing research, a recent and scantly researched area that is mainly focused on the consumer-based approach (Liu et al. 2020; Nicolau and Sellers 2012). To this end, based on a sample that includes several countries and destinations, our study assumes a supply-based approach but unlike the few previous studies is not limited to the fee add-ons versus free add-ons dichotomy (Lin 2017; Liu et al. 2020; Nicolau and Sellers 2012) a narrow and simplified approach that has limited the analysis of the role played by both the competitive environment and the horizontal differentiation strategy regarding the design of the hotel add-on pricing policy.

First, our study in accordance with Lin (2017) confirms the positive effect of vertical differentiation on the add-on pricing policy, such that a higher-category hotel can set a higher breakfast price. This finding is in line with results from previous studies on hotel pricing (Abrate et al. 2011, 2012; Abrate and Viglia 2016; Becerra et al. 2013; Kim et al. 2020a; Latinopoulos 2018; Lee 2015; Zhang et al. 2011a, b) that generally establish a higher hotel room price (core product) for higher category hotels but unlike most of them (Abrate et al. 2011, 2012; Abrate and Viglia 2016; Becerra et al. 2013; Lee 2015; Sánchez-Pérez et al. 2020; Silva 2015; Zhang et al. 2011a) and only in accordance with Kim et al. (2020a); Latinopoulos (2018); Zhang et al. (2011b), our findings establish that the intensity of the positive effect of the category is not static and varies spatially according to the location of the hotel.

Second, our work also supports the hypothesis about a non-static positive effect of online reputation on breakfast price, so a better online reputation allows hotels to attain a price premium for breakfast services, which is in line with previous studies on hotel pricing that establish price premiums for the core product (hotel room) (Abrate and Viglia 2016; Sánchez-Pérez et al. 2020; Öğüt and Onur Taş 2012; Zhang et al. 2011a) and especially with those that establish non-static hotel price premiums (Kim et al. 2020a; Latinopoulos 2018).

Third, in contrast to previous studies on hotel add-ons that postulate the horizontal differentiation based on free service as a promotional tool (Liu et al. 2020; Nicolau and Sellers 2012), our study, through a service-based horizontal differentiation approach, confirms the hypothesis that the effect of horizontal differentiation on breakfast prices varies spatially and can have a positive and negative effect in the same destination. Thus, contrary to previous studies on hotel pricing that postulate a spatially static effect of horizontal differentiation on the price of the core product within the same destination or country (Becerra et al. 2013; Sánchez-Pérez et al. 2020; Silva 2015), our study supports Illescas et al.'s (2023) findings, showing that a positive and negative effect of horizontal differentiation on hotel price policy can coexist within the same destination depending on the hotel location.

Additionally, regarding the effect that the competitive environment can play with respect to hotel add-ons, contrary to Liu et al. (2020) who establish a negative effect of competitors on the perceived value by the consumer in relation to the breakfast service, our results show that depending on the hotel location, there can be both a positive effect of agglomeration and a negative effect of competition on breakfast price. Thus, contrary to several hospitality studies on the confrontation between agglomeration and competition that postulate a static effect of the competitive environment (Becerra et al. 2013; Kalnins 2016; Kim et al. 2020b; Lee 2015; Lee and Jang 2015; Sánchez-Pérez et al. 2020; Urtasun and Gutiérrez 2017), our findings show that the imbalance between both effects with respect to breakfast price is linked to the geographic location as occurs with the price of the core product, in line with Illescas et al. (2023).

Finally, on the one hand, in accordance with previous studies (Becerra et al. 2013; Lee 2015), our results show that when hotels are faced with a negative effect of the competitive environment, hoteliers can use both vertical (in the cases of Paris, Rome and London) and horizontal differentiation (in the cases of Paris and London) as screening tools to escape pressure from competitors and set higher prices, in our case for breakfast service, which is in line with Liu et al. (2020) who postulate that the use of horizontal differentiation as a positive determinant can be negatively affected by the competitive environment. On the other hand, when faced with an agglomeration effect (in the case of Madrid), hoteliers use horizontal differentiation to counterbalance for price premiums associated with vertical differentiation.

6 Conclusions

Nowadays, given the current broad hotel offer that can provide similar services (Liu et al. 2020), hotels should consider strategies to differentiate themselves and attract customers through valuable product bundled services (Liu et al. 2020; Nicolau and Sellers 2012). Given the multicomponent nature of the hotel product, the setting of the appropriate price for hotel add-on services is a challenge for hotel managers with regard to simultaneously maximizing their profit and attracting customers. Our work, to the best of our knowledge, provides the first contribution in hotel research that tries to analyze the determining factors for setting the price of relevant hotel add-ons such as breakfast due to its influence on the perceived value (Liu et al. 2020; Nicolau and Sellers 2012), hotel choice (Leite-Pereira et al. 2019) and satisfaction (Sthapit 2019). Following similar approaches in hotel room pricing research (Kim et al. 2020a, b; Latinopoulos 2018; Zhang et al. 2011b), our findings are based on a geographically weighted regression model that allow us to consider non-static effects providing a new approach in hotel add-on studies and show how location can condition the influence of vertical and horizontal hotel strategies, online reputation and competitive environment on the price of breakfast. Our findings show that concerning breakfast price, hoteliers use vertical differentiation and online reputation as customer screening tools with varying intensity depending on the hotel location. On the contrary, depending on the geographic location, horizontal differentiation can play a stimulus or a screening role. Finally, the imbalance between agglomeration and competition

also applies to breakfast price and is linked to the hotel location. Additionally, the Hot Spot analysis allows us to identify different submarkets in the same destinations.

6.1 Theoretical implications

Some theoretical contributions can be derived from the findings of our study. First, based on agglomeration and Industrial Organization theories (McCann and Folta 2008; Shaked and Sutton 1982), our work extends the results on a central issue in hotel pricing research, the agglomeration versus competition confrontation (Becerra et al. 2013; Lee 2015; Sánchez-Pérez et al. 2020; Illescas et al. 2023) and shows that this confrontation is linked to hotel location and is not limited only to the setting of the room price but also occurs when setting the price of extra services.

Second, based on Signalling Theory and the information asymmetry approach (Manes and Tchetchik 2018; Spence 1978), our study confirms the role as a screening tool for seeking less price-sensitive customers that vertical differentiation, based on hotel category, plays in the pricing policy for add-ons (Lin 2017). However, our work shows that this role is not limited to only the fee or free dichotomy since greater vertical differentiation also allows hotels to set higher breakfast prices and links the intensity of this strategy to the hotel location due to the positive spatial varying effect of vertical differentiation on breakfast price. Additionally, our study expands previous studies on hotel pricing (Abrate et al. 2011, 2012; Abrate and Viglia 2016; Becerra et al. 2013; Kim et al. 2020a; Latinopoulos 2018; Lee 2015; Zhang et al. 2011a, b) and shows that a higher vertical differentiation also allows hotels to set higher prices for complementary services such as breakfast and not only for the core product (hotel room).

Third, unlike previous studies on hotel add-on pricing that have overlooked the role of online reputation in hotel add-on pricing strategy (Lin 2017; Liu et al. 2020; Nicolau and Sellers 2012), drawing on expectations theory (Rust and Oliver 1994) and prospect theory (Kahneman and Tversky 1979), our work has confirmed that regarding breakfast service, hotel managers use online reputation, with a greater or lesser extent depending on location, as a screening tool to search for less price-sensitive customers. Thus, our findings expand upon the benefits attained by hotels through online reputation and show that a better online reputation not only allows hotels to set a price premium for the core service (Öğüt and Onur Taş 2012) but also allows price premiums to be assigned for extra services.

Additionally, regarding horizontal differentiation, our work through the proposed breakfast service differentiation index adopts a more enriching approach by measuring the differentiation of the breakfast service with respect to the standard offer of competitors and allows us to get round the fee or free debate (Liu et al. 2020; Nicolau and Sellers 2012). Our findings support the premise that hoteliers can use differentiation as a stimulus or screening tool depending on hotel location and link the role of horizontal differentiation to the imbalance between agglomeration and competition, so that in destinations where there is a competition effect, a trade-off exists between the negative effects of competition and the strategies of horizontal differentiation and vertical differentiation (and sometimes even together with online reputation, e.g. London). On the other hand, in destinations where an agglomeration effect appears

(Madrid), there is a trade-off between horizontal and vertical differentiation so hotels fix higher prices for higher quality but lower prices for more differentiated services so horizontal differentiation plays a positive role in attaining more customers by increasing its perceived value among travellers (Liu et al. 2020) which allows high category hotels to compensate for the price premium relating to quality.

Finally, our proposal is based on a GWR model, a technique that has recently begun to be used in hotel room pricing studies (Illescas et al. 2023; Kim et al. 2020a; Latinopoulos 2018) and that takes into account spatial autocorrelation and assumes a non-stationary relationship between the explanatory variables and the dependent variable. Thus, we have been able to incorporate hotel location into the estimation of the model, a research gap that has recently been claimed in the literature on hotel add-ons (Liu et al. 2020) given that the hotel industry is one which is location-sensitive (Nicholls and Kim 2022), overcoming the limitations of previous studies.

6.2 Managerial implications

From the managerial point of view, our work provides tools that can help hotel managers to appropriately design their pricing policy for an extra service such as breakfast and highlights the usefulness that spatial analysis can play in this task through suitable techniques such as GWR. When setting the price of extra services, managers must consider location, vertical and horizontal differentiation strategies, online reputation and the competitive environment. Thus, hotels must always set price premiums associated with both their category and their online reputation, while the offer of different breakfast services must be subject to a pricing policy based on their competitive environment so that if there is an effect of competition the hotel must set price premiums for differentiated breakfast services. Faced with an agglomeration effect, hoteliers can offer differentiated breakfast services as a promotional tactic; this being more suitable for higher category hotels since the value perceived by the consumer is not affected by lower category hotels that apply the same incentive (Liu et al. 2020). Finally, through the Hot Spot analysis, destination management organizations can properly identify different submarkets within the same destination, a key aspect in the promotion of tourist destinations (Tkaczynski et al. 2010).

6.3 Limitations and future research

Our study presents some limitations that may foster future research lines. First, the conclusions derived from the empirical study are related to breakfast services so future research should analyze if the conclusion can be generalized to other add-ons such as Wi-Fi or parking. Second, our study has not considered the cost that the hotel has to assume when providing the breakfast service, which can clearly influence its pricing policy, nor has it tried to find out if the cost of this service is incorporated into the room price. Third, our study has not considered certain relevant variables within the hotel environment, such as number of restaurants, cafes or shopping malls that may condition the pricing policy of the breakfast service. Additionally, our study has not considered variables which represent the peer-to-peer market with which each hotel has to compete (Huarng and Yu 2019). Finally, the collected sample encom-

passes data from the hotel industry during the year 2021 and it would be recommendable to update the research with more recent data.

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