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Price determinants of Airbnb listing prices in Lake Balaton Touristic Region, Hungary

Gábor Dudás [1]*, Tamás Kovalcsik [2], György Vida [3],
Lajos Boros [4] and Gyula Nagy [5]

[1] Centre for Economic and Regional Studies, 5600 Békéscsaba, Szabó Dezső utca 42, Hungary. Email: dudasgabor5@gmail.com
[2] Department of Economic and Social Geography, University of Szeged, Hungary. Email: kovalcsik.tamas@geo.u-szeged.hu
[3] Department of Economic and Social Geography, University of Szeged, Hungary. Email: vidagy@geo.u-szeged.hu
[4] Department of Economic and Social Geography, University of Szeged, Hungary. Email: borosl@geo.u-szeged.hu
[5] Department of Economic and Social Geography, University of Szeged, Hungary. Email: geo.nagy.gyula@gmail.com

* Corresponding author

Abstract
The aim of the paper was to investigate the impact of different accommodation attributes on Airbnb listing prices in a touristic area. The study applied hedonic price modeling utilizing a sample of 2417 Airbnb accommodation rental offers in the Lake Balaton Touristic Region in Hungary. Our results revealed that property-related attributes significantly influence Airbnb prices although the magnitude of these effects is very diverse and complex. The OLS findings showed that the provision of air conditioning, free internet, and free parking are the main determinants of Airbnb price in the sample area, while the number of available photos and the presence of a kitchen does not significantly influence the price. The quantile regression results further demonstrated that capacity, the provision of breakfast, and TV leads to higher prices among the higher-priced accommodations, while the number of bedrooms and bathrooms, smoking, and free parking influence more the prices of lower-end accommodations.

Keywords: sharing economy, Airbnb, peer-to-peer accommodation rental, hedonic price regression, quantile regression

Introduction

Every night, tens of thousands of people decide not to stay in traditional accommodations like hotels but use the services of peer-to-peer (P2P) accommodation sharing platforms that allow ordinary people to rent residences to tourists. For more than a decade now, P2P accommodation sharing emerged as a major trend shaping the global tourism and hospitality industry (Guttentag & Smith, 2017; Magno *et al.*, 2018), disrupting the way the tourism sector is running (Bakker *et al.*, 2018; Guttentag, 2015) and led to the complete restructuring of markets and the appearance of new travel forms (Forno & Garibaldi, 2015; Önder *et al.*, 2018). The rise of the phenomenon is remarkable, as the share of P2P accommodation in 2018 make up about 7% of the global accommodation supply, and the projected annual growth rate for the P2P accommodation economy is expected to be 31% between 2013 and 2025 (Bakker *et al.*, 2018). However, P2P accommodation rental has not necessarily created entirely new demand, as people informally renting out their residences to tourists has existed for a long time (Guttentag *et al.*, 2018; Magno *et al.*, 2018). But the development of Internet platforms and mobile technologies have brought many new ways of sharing and revolutionized this practice by facilitating older forms of P2P accommodation sharing on a larger scale (Gutiérrez *et al.*, 2017), or at least increased and made this new type of supply more visible (Önder *et al.*, 2018).

Since its inception in 2008, Airbnb has experienced rapid growth and from a small start-up it has become the most important global player among P2P accommodation platforms with nearly 5 million listings and more than 300 million guest arrivals in 81 000 cities in 191 countries (Airbnb, 2018). The essence and rapid success of Airbnb lies on the effective mix of several key factors, including affordable prices and economic advantages (Tussyadiah, 2015), authenticity and unique consumer experience (Guttentag, 2015; Magno *et al.*, 2018; Tussyadiah & Pesonen, 2016; Wang *et al.*, 2016), sustainability (Midgett *et al.*, 2017), flexible supply (Li & Srinivasan, 2018), perceived attractiveness and responsiveness of the host (Ert *et al.*, 2016; Gunter & Önder, 2018), and the accommodation's ratings (Tussyadiah & Zach, 2017). Above all these advantages, price and lower cost are frequently reported as one of the most important factors facilitating the rapid diffusion of P2P accommodation sharing phenomenon (Pizam, 2014; Tussyadiah & Pesonen, 2016). As long known, price is one of the main determinants of hotel choice in tourism and hospitality industry (Lockyer, 2005), therefore, hotel room pricing is a well-researched topic (Gibbs *et al.*, 2017). As the popularity of and demand for P2P accommodations has increased, pricing became a relevant issue in the sharing economy based accommodation sector as well, and understanding Airbnb prices became crucial both from practical and theoretical perspectives. Nevertheless, it has to be noted that as P2P rentals are privately owned apartments or houses and the vast majority of them are managed by non-professional hosts, thus, the price determining attributes and mechanism may differ from those determining hotel room price (Önder *et al.*, 2018; Wang & Nicolau, 2017), even though they share many common features (e.g. site and property attributes, amenities). Therefore, we think it is important to examine the impact of these accommodation attributes – which are also relevant to the traditional hotel industry – on price in the sharing economy based accommodation sector. P2P accommodation rental in its present form is relatively new, but the number of studies investigating the price determining factors and the underlying pricing strategies of this phenomenon is growing rapidly (Gibbs *et al.*, 2017; Hrobath *et al.*, 2017; Li *et al.*, 2016a; Wang & Nicolau, 2017). The majority of these studies focus mainly on larger cities, however, the importance of Airbnb is rising in popular coastal resorts and holiday destinations and regions as well (Adamiak, 2018). These regions differ in several characteristics from larger cities – e.g. the spatial patterns of supply, population distribution, the spatiality and other features of the real estate market and the housing stock, etc. Thus, the impact of P2P accommodations can be different in these regions than in large cities, but this issue is largely unexplored in the existing body of literature. Therefore, the main aim of this study

is to shed light on the determining factors of Airbnb accommodation prices in a touristic region. For this purpose, the Lake Balaton Touristic Region in Hungary was selected for a case study.

The remainder of the paper is organized as follows: the next section reviews the related work on Airbnb and focuses on previous researches considering hedonic price theory and quantile regression. Then, the paper describes and presents the applied data and study methodology. Afterwards, the paper presents our empirical findings and finally, we conclude the paper, and discuss its limitations and present the directions for future work.

Literature review
The sharing economy and Airbnb
The sharing of goods, spaces, services, and skills among individuals is not a completely new phenomenon, but the scope of these activities was very limited in the past due to the difficulty of matching supply and demand and the lack of trust between strangers (Ranjbari *et al.*, 2018). In the last decade, the mix of many factors such as the proliferation of the Internet and mobile technologies, globalization, urbanization, the global economic crisis, and shifts in general attitudes towards consumption and sustainability had come to cover these gaps and fostered the advent of the sharing economy (Bardhi & Eckhardt, 2012; Mody *et al.*, 2017; Möhlmann, 2015; Ranjbari *et al.*, 2018). Under the "tent" of the sharing economy, these technological innovations, economic and social changes are transforming the way people produce, consume, travel, and communicate among many other activities (Alizadeh *et al.*, 2018; Quattrone *et al.*, 2016; Van der Borg *et al.*, 2017) and expand traditional trading and consumption practices (Sung *et al.*, 2018).

The phenomenon of the sharing economy appeared in the early 2000s (Sung *et al.*, 2018), however, given its exponential growth, in recent days, it is estimated that 72% of Americans (Pew Research Center, 2016) and 70% of Europeans (OCU, 2016) are involved in sharing economy activities (Murillo *et al.*, 2017). Furthermore, it has tremendous market potential as the revenue generated by the key sharing economy sectors are estimated to increase from $15 billion today to roughly $335 billion by 2025 (PWC, 2015ab). Services covered by the sharing economy range from transportation (e.g. Uber, Lyft) to accommodation (e.g. Airbnb, HomeAway) to finance (e.g. Kickstarter, Prosper) (Dudás *et al.*, 2017b; Hamari *et al.*, 2016; Quattrone *et al.*, 2016). P2P marketplaces associated with the sharing economy operate particularly within the field of travel and tourism and the most popular and important player in the hospitality sector is the home sharing platform Airbnb (Boros *et al.,* 2018; Dann *et al.*, 2019; Dudás *et al.,* 2017a; Guttentag, 2015; Wang & Jeong, 2018). Airbnb, by providing access to millions of spaces from apartments and villas to castles, igloos, treehouses, or boats has recorded more than 400 million guest arrivals (Airbnb, 2018) since its launch in 2008, without owning a single room. By mid-2018, it was estimated to worth more than $38bn (Forbes, 2018) meaning that it is valued more than the world's largest hotel chains such as the Hilton Hotels & Resorts, Marriott, or Hyatt (Akbar & Tracogna, 2018; Statista, 2018). Given the exponential growth of Airbnb and its disruptive potential (Guttentag, 2015), it has received considerable scholarly attention and researchers have begun to examine a variety of issues related to Airbnb. Several studies put focus on challenges and potential threats to Airbnb's future growth (Guttentag, 2015; Meleo *et al.*, 2016), while other address regulatory and tax issues (Guttentag, 2017; Hajibaba & Dolnicar, 2017; Jefferson-Jones, 2015; Kaplan & Nadler, 2015) indicating that new regulatory frameworks should be established to enable Airbnb to operate legally (Edelman & Gerardin, 2015). More recently, many scholars have turned their attention to the impact of Airbnb on housing market and rental prices (Delgado-Medrano & Lyon, 2016; Lee, 2016; Samaan, 2015; Wachsmuth & Weisler, 2018) highlighting that due to the diffusion of Airbnb, entire homes and apartments are disappearing from the local housing market and this process may drive up the rents in several cities (Ke, 2017) and exclude

residents from tourist areas (Dogru *et al.*, 2017; Oskam & Boswijk, 2016). Moreover, there have been many reports on the effects of Airbnb on the tourism industry (Fang *et al.*, 2016; Gutiérrez *et al.*, 2017; Van der Borg *et al.*, 2017) including Airbnb's impact on hotel prices (Aznar *et al.*, 2017; Choi *et al.*, 2015; Neeser *et al.*, 2015; Xie & Kwok, 2017; Zervas *et al.*, 2017), on hotel sales (Blal *et al.*, 2018), on hotel occupancy rates (Ginindza & Tichaawa, 2017), and on tourism industry employment (Fang *et al.*, 2016). Furthermore, there were recent studies set up to explore prices and pricing decisions on Airbnb (Edelman & Luca, 2014; Kakar *et al.*, 2016; Teubner *et al.*, 2017). However, given the Airbnb is primarily an urban phenomenon, empirical papers focus mainly on large cities (Gibbs *et al.*, 2017; Wang & Nicolau, 2017) and investigations on holiday destinations is lacking. In the following section, the paper reviews the relevant studies focusing on hotel price determinants and reveal recent findings conducted for Airbnb pricing determinants.

Pricing issues in the Tourism and Hospitality industry / hedonic price regression
Pricing is a relevant issue in the tourism and hospitality literature (Hung *et al.*, 2010), however, the price consumers are willing to pay for an accommodation largely depends on the attributes an accommodation can offer (Castro & Ferreira, 2015). Wang and Nicolau (2017) categorize these factors into five categories: site-specific characteristics, quality signalling factors, hotel amenities and services, property characteristics, and external factors. The effects of these attributes on price attracted significant scholarly attention by hospitality and tourism researchers in recent years, and many studies have investigated the pricing strategies in the traditional hospitality industry (Becerra *et al.*, 2013; Castro & Ferreira, 2018; Chen & Rothschild, 2010; Espinet *et al.*, 2003; Hung *et al.*, 2010; Lee, 2016; Masiero *et al.*, 2015; Schamel, 2012; Thrane, 2007; Yang *et al.*, 2016; Zhang *et al.*, 2011b).

A widely applied method for assessing the importance of these attributes is hedonic price modeling, which is credited to Rosen (1974) and is based on the idea that different price for a product or service can be viewed as composites of attributes and characteristics. Thus, the hedonic function can reveal how marketable product features will be reflected in the products market prices, in other words, it can outline, for example, how room/accommodation prices will change when characteristics of room/accommodation change (Schamel, 2012; Teubner *et al.*, 2016; Zhang *et al.*, 2011b). A number of recent contributions employ hedonic models, for example, Espinet, Saez, Coenders and Fluvia (2003) examined how attributes of holiday hotels in a sun-and-beach segment influence room prices and found that hotel size, distance to the beach, and the availability of free parking space have significant effect on price. Thrane (2007) applied the same approach in the city of Oslo and also showed evidence that the presence of attributes such as free parking, location, or a mini-bar are the main determinants of room rates in capital cities. Likewise, Zhang, Ye and Law (2011b) used regression models to analyse how room attributes and hotel class influence room rates in New York City hotels and revealed that hotel location and room quality are the important determinants of room prices. Chen and Rothschild (2010) analysed the impact of a variety of attributes on hotel room rates in Taipei and the empirical findings showed that hotel location, the availability of LED TV, and the presence of conference facilities have significant effects on both weekday and weekend prices. Furthermore, Schamel (2012) estimated the willingness to pay for different hotel characteristics and found that the important determining factors of hotel room prices are popularity ratings, hotel star ratings, weeks of advance booking, and certain other hotel characteristics such as express check-out, room service, and Internet access. Hung, Shang and Wang (2010), in addition, applied OLS regression supplemented with quantile regression to provide a more complex characterization of price determinants in Taiwanese hotels. The OLS results showed that number of rooms, age of hotel, and number of housekeeping staff per person are the major determining attributes of hotel room rates, while the quantile regression further refined these results and demonstrated that hotel age and market conditions are only significant in the high-priced hotel

category. In another study, Zhang, Zhang, Lu, Cheng and Zhang (2011a) applied geographically weighted regression and examined how site and situation attributes can affect room prices in Beijing and found that star rating, hotel age, and location have the greatest influence on hotel room rates. Across these findings, the most commonly reported factors determining hotel room price are related to physical characteristics of the offerings (Gibbs *et al.*, 2017), in addition, location and amenities – especially parking – are highlighted as further significant influencing factors.

However, while hotel room price has an important role in the traditional hospitality industry (Zhang *et al.*, 2017), it has also a vital role in the room pricing decision of the sharing economy based accommodation rental, since price (and the possibility to save money) is one of the main influencers on the guest's accommodation selection decisions and on hosts' profits as well (Tussyadiah & Pesonen, 2016; Zhang *et al.*, 2017). Nevertheless, given the difference between traditional and sharing economy based accommodation products some of the price determinants of the traditional hospitability industry are unsuited for the sharing economy, therefore, new price indicators such as host characteristics (e.g. Superhost status, profile picture), special amenities, and diversified accommodation characteristics were identified to bridge this gap (Wang & Nicolau, 2017).

As highlighted above, a significant number of studies have investigated the price determinants of hotels, but only a limited number of papers have explored what factors affect the prices of sharing economy based accommodation rentals, especially Airbnb. For example, Gutt and Herrmann (2015) examined how star ratings and rating visibility affect listing prices on the Airbnb platform and reported that rating star visibility significantly increases prices by an average of 2,69 Euro. Kakar, Franco, Voelz and Wu (2016) examined the effect of host information (e.g. race, gender, sexual orientation, etc.) on Airbnb price in San Francisco and found that Hispanic and Asian host charge lower prices (on average 9.6% and 9.3%) than their white counterparts, while Ert, Fleischer and Magen (2016) reported that a trustworthy photo of the host may be associated with higher listing price and the higher probability of being chosen. Li, Pan, Yang and Guo (2016b) analysed that how the distance to the nearest landmark, the impact of a facility, and the popularity of the nearest landmark affect Airbnb prices and proved positive effects. Hrobath, Leisch and Dolnicar (2017) identified the drivers of price on entire properties in Vienna and found that location is the primary driver of prices and properties with more amenities charge higher prices. Teubner, Hawlitschek and Dann (2017) quantified the price effects of reputation features using a large scale dataset from 86 German cities and found that indexes such as hosts' ranking scores and duration of membership are associated with economic value. Similarly, Gibbs, Guttentag, Gretzel, Morton and Goodwill (2017) examined the impact of a variety of attributes on the rates of Airbnb by using the listings information in five Canadian areas reporting that physical characteristics, location, and host characteristics significantly affect prices. Likewise, Wang and Nicolau (2017) in their study investigated Airbnb rental offers in 33 cities by using OLS and quantile regression through the analysis of 25 explanatory variables and highlighted the relationship between these attributes and accommodation price.

In summary, the number of studies on pricing issues of sharing economy based accommodation rentals is growing rapidly, however, these focus primarily on large cities, therefore Airbnb's impact on larger touristic regions remains unclear. The remaining part of the paper aims to bridge this gap.

Methodology and data
Study area
The area selected for this study was the Lake Balaton Touristic Region in Hungary. We choose this holiday destination area for several reasons. First, Lake Balaton is the greatest lake in Central Europe,

and the oldest and most established tourist destination in Hungary (Puczkó & Rátz, 2000; Törzsök *et al.,* 2017). In 2017, the region hosted more than 2.4 million tourists and the number of overnight stays totaled 8 million (33% of them international stays), with an average stay of 3.2 nights (CSO, 2019), generating a huge demand for accommodation services. Thus, behind the Hungarian capital Budapest, Lake Balaton is the second most visited tourist area in Hungary (Domonkos *et al.,* 2016). Second, the phenomenon of locals renting out their homes or rooms for tourist exists in the region for decades and it became a widespread practice. This long-standing tradition is represented in the capacity of accommodation supply as well, namely, in 2018, 615 commercial accommodation establishments offered more than 94 thousand bed places, while more than 19 000 private accommodation establishments (short-term rentals) offered more than 108 thousand bed places in the region (CSO, 2019). These numbers may also highlight, that unlike large cities, P2P accommodation rental in this region can be built on existing stocks of holiday homes, and create an extensive capacity for the supply side of sharing economy based accommodation rental and may scale it dramatically and raise it to a new level. As a result, Airbnb became a major actor in the hospitality industry in the region and can provide an appropriate study area and an important benchmark for other Airbnb studies.

Data and variables
The region – according to Hungarian law [1] – consists of 180 settlements and the study was based on Airbnb listings from this area. The database was compiled by applying web-scraping technology to gather publicly available information directly from the Airbnb website. Web-scraping is an innovative and more frequently applied data collecting method (Gibbs *et al.,* 2017; Gunter & Önder, 2018; Horn & Merante, 2017; Smith *et al.,* 2018) and its essence lies in that a web-crawler (computer program) visits the selected website and based on specified parameters saves the information displayed on the site into a database for further analysis (Gyódi, 2017; Olmedilla *et al.,* 2016). The data was collected for July 2018 and Table 1 presents a brief description of the sample and the variables reporting a total of 2417 listings of the region. Descriptive statistics of the sample highlight that the average rental price for the sampled Airbnb listings is $89.49, however, offers cover a wide spectrum of different listing prices within the region indicated by the high standard deviation values. The predominant room types are entire homes or apartments accounting for the largest proportion (86%), followed by private rooms (14%) and shared rooms represent only a marginal share (less than 1%). The main characteristics of the Airbnb inventory in the region are the follows: 94% have a kitchen; 70% offer free wireless internet access and 88% have a TV; only 7% offer breakfast and 30% are equipped with air conditioning; smoking is not allowed in 67% of the accommodations.

Data analysis
The hedonic pricing method, widely credited to Rosen (1974), is based on the idea that different price for a product or service can be viewed as composites of attributes and characteristics. Thus, the hedonic function can reveal how marketable product features will be reflected in the products market prices, in other words, it can outline, for example, how room/accommodation prices will change when characteristics of room/accommodation change (Schamel, 2012; Teubner *et al.,* 2016; Zhang *et al.,* 2011b). To assess the accommodation attributes' economic value and quantify the individual impact of certain features on Airbnb accommodation price, we conducted hedonic price regression supplemented with quantile regression (QR) analysis to reveal the nexuses between a dependent variable and a set of predictor variables. As a dependent variable price per person per night (in a logarithmic form) was selected, while the independent variables are described in Table1. Hedonic price regression was based

Table 1. *Brief description of the variable list (n=2417)*

Variable name	Description of variable/attribute	Mean/ proportion	Standard deviation
PRICE	Listed price per night (In US dollars)	89.49	83.91
LnPRICE	Price, logged	4.25	0.67
DISTANCE	Distance between the location of the Airbnb accommodation and the lakeside (in km)	2.26	3.96
ENTIRE HOME/APT	Entire home/apartment (Dummy variable)	0.86	0.35
PRIVATE ROOM	Private room (Dummy variable)	0.14	0.35
SHARED ROOM	Shared room (Dummy variable)	0.005	0.07
CAPACITY	The number of people that can be accommodated	5.55	2.94
BEDROOMS	The number of bedrooms	2.32	1.43
BED NUMBER	The number of beds	4.35	3.17
BATHROOMS	The number of bathrooms	1.53	1.05
KITCHEN	Kitchen is available (Dummy variable)	0.94	0.25
BREAKFAST	Offer breakfast (Dummy variable)	0.07	0.25
INTERNET	Free wireless internet access (Dummy variable)	0.70	0.46
TV	Offer a TV (Dummy variable)	0.88	0.33
AIR CONDITIONING	Offer Air Conditioning (Dummy variable)	0.30	0.46
FREE PARKING	Offer free parking (Dummy variable)	0.84	0.37
POOL	Offer a pool (Dummy variable)	0.19	0.39
PHOTOS	Number of photos about the accommodation	17.53	11.35
SMOKING	Smoking is not allowed (Dummy variable)	0.67	0.47

on the conditional mean of the dependent variable, estimating the average response of the independent variable to changes in the explanatory variables (Wang & Nicolau, 2017). In doing so, the following equation representing the general hedonic model was formulated:

$$\ln(P_i) = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i \qquad (1)$$

where $\ln(P_i)$ is the embodiment of the natural logarithmic transformation of the price per person per night linked with booking i, α is a constant term, the coefficients β_k are the implicit prices for Airbnb attributes linked with the k-th independent variable x_{ki} representing the associated Airbnb characteristics, while ε is Normal error (Hung *et al.,* 2010; Masiero *et al.,* 2015; Schamel, 2012). Many authors suggest that multicollinearity may be a problematic issue in hedonic models (Andersson, 2010; Yang *et al.,* 2016). Thus, to address this issue, we calculated the Variance Inflation Factor (VIF) to detect the seriousness of multicollinearity. According to Kennedy (2018), multicollinearity is a serious problem if the VIF value is above ten. In this study, all the VIF values were below the commonly used threshold point of 10 – the highest VIF value was 4.49 – indicating that multicollinearity is not a problematic issue in the present study. Moreover, we have to keep in mind, when assessing the effect of a dummy independent variable on a log-dependent variable in a log-linear hedonic pricing regression that we have to transform the coefficient by (e^β-1), where β is the coefficient and e is the base of natural logarithm (Gibbs *et al.,* 2017; Halvorsen & Palmquist, 1980), and this gives the estimated effect of the dummy variables in percentage terms.

However, the hedonic pricing model may give an incomplete description of the conditional distribution (Hung *et al.,* 2010; Mosteller & Tukey, 1977) as it only considers the average relationship between price and the other explanatory variables. Therefore, to move beyond the analysis of the conditional mean of the dependent variable and provide information about the higher and lower tail behaviour of the distribution, quantile regression was also applied. In addition to hedonic price regression, QR measures the effects of individual explanatory variables on the whole distribution of the dependent variable and may reveal the hidden price-response patterns (Wang & Nicolau, 2017) and further increases the interpretability of the results (Masiero *et al.,* 2015). According to Koenker (2005), quantile regression was specified as follows:

Presuming that Y is a real value random variable with a cumulative distribution function $F_Y(y) = P(Y \leq y)$, the τth quantile of Y can be given by

$$Q_Y(\tau) = \inf\{y:F_Y(y) \geq \tau\} \tag{2}$$
where $0 < \tau < 1$.

Results and discussion

Table 2 reports the results of the OLS including the effects of the independent variables (in percent) on price and presents the estimated coefficients at the 10th, 25th, 50th, 75th, and 90th quantiles of the quantile regression analysis. All the selected dependent variables of the general OLS analysis have a significant effect on Airbnb price except 'kitchen' and 'photo', while the quantile regression results are showing us mixed and more complex and sophisticated results.

Looking first at the variable distance, it is outlined, that consistent with previous studies (Gibbs *et al.,* 2017; Wang & Nicolau, 2017) location of the Airbnb rental has significant negative effect on price, indicating that with each additional kilometer the accommodation is located away from the lakeside, the price decreases with 2.55%. The pattern of the quantile parameters signifies that the negative effect of distance is greater for lower-priced rentals (Table 3).

The OLS regression estimates that the room type entire home/apt has a noteworthy significant positive impact on price associated with an increase of 17.87%, indicating that an entire home leads to higher prices. Moreover, the numbers of the quantile regression provide richer information reflecting a decreasing pattern, thus, highlighting that the influence of this attribute is higher in the lower-priced accommodations and lower for the higher-priced accommodations, while at the 90th quantile it has an insignificant effect on accommodation price.

The attributes related to the size of the rentals – such as capacity, bedroom number, bed count, and bathroom number – have mixed effects on price. From the OLS results capacity and bedroom number signifies sizeable positive influence, while somewhat unexpectedly, bed number and bathroom number are negatively related to rental price, which is inconsistent with previous findings. More specifically, capacity – which embodies the number of people that can be accommodated – exhibit that each increase in capacity (person) may result in a price increase of 10.8% and each additional bedroom can give rise to Airbnb price by 8.69%. In other words, the accommodation is more expensive if it accommodates more people and has more bedrooms. Although this result was foreseeable, quantile estimates highlight the positive impact of capacity on price is consistently stronger for the higher priced-listings, while in contrast, bedroom number affects lower-priced hotels much more. Furthermore, the OLS regression for

Table 2. *Estimated results of OLS and quantile regression*

Variable	OLS	Diff (%)	0.1	0.25	0.5	0.75	0.9
DISTANCE	-0.026***	-2.555	-0.0336***	-0.0254***	-0.0193***	-0.0244***	-0.0184***
ENTIRE HOME/APT	0.164***	17.869	0.24812***	0.1592**	0.1522***	0.0996*	-0.0145
CAPACITY	0.096***	10.076	0.0346*	0.0901***	0.1041***	0.1273***	0.1416***
BEDROOMS	0.083***	8.692	0.1353***	0.0777***	0.0679***	0.0727***	0.0534*
BED NUMBER	-0.034***	-3.313	-0.0169	-0.0285***	-0.0208***	-0.0271***	-0.0425***
BATHROOMS	-0.056**	-5.424	-0.1371***	-0.1077***	-0.0386**	-0.0235	0.0173
KITCHEN	-0.050	-4.841	-0.0718	-0.0282	-0.0938*	-0.0861	-0.0802
BREAKFAST	0.127*	13.550	0.0943	0.106	0.1117**	0.1728**	0.2024**
INTERNET	0.171***	18.666	0.1189*	0.1706***	0.1429***	0.1625***	0.1557***
TV	-0.151***	-14.047	0.0992	-0.0353	-0.1553***	-0.2035***	-0.2305***
AIR CONDITIONING	0.317***	37.367	0.2892***	0.2779***	0.3373***	0.3489***	0.3425***
FREE PARKING	-0.206***	-18.599	-0.3041***	-0.2228***	-0.1989***	-0.1577***	-0.1074*
POOL	0.137***	14.661	0.1176*	0.1268**	0.1194***	0.2012***	0.1274**
PHOTOS	0.001	0.108	-0.0029	-0.0029*	-0.0015	0.0025*	0.0049**
SMOKING	-0.156***	-14.403	-0.3066***	-0.3008***	-0.1522***	-0.0510	-0.1308

Notes: * denotes p < 0,05, ** denotes p < 0,01, *** denotes p < 0,001

Table 3. *Significant differences among quantiles (p-values)*

Variable	0.1, 0.25	0.25, 0.5	0.5, 0.75	0.75, 0.9
DISTANCE	0.086	0.016	0.183	0.077
ENTIRE HOME/APT	0.198	0.895	0.282	0.019
CAPACITY	0.005	0.339	0.066	0.198
BEDROOMS	0.105	0.685	0.834	0.486
BED NUMBER	0.321	0.473	0.600	0.118
BATHROOMS	0.346	0.013	0.658	0.077
KITCHEN	0.624	0.348	0.876	0.892
BREAKFAST	0.910	0.942	0.478	0.774
INTERNET	0.201	0.393	0.554	0.874
TV	0.216	0.003	0.245	0.589
AIR CONDITIONING	0.832	0.020	0.730	0.223
FREE PARKING	0.061	0.349	0.276	0.235
POOL	0.870	0.863	0.064	0.010
PHOTOS	0.992	0.055	0.505	0.203
SMOKING	0.883	0.000	0.000	0.478

the number of beds and the number of bathrooms gives significant negative coefficients indicating that an additional bed results in a price decrease of 3.31%, while each additional bathroom is associated with a price decrease of 5.42%. The results of the quantile regression further indicate that bed number does not significantly influence accommodation price in the 10th quantile and the 25th 50th and 75th quantile parameters take higher values than the 90th. The quantile estimates for bathroom number illustrate that coefficients of the 75th and 90th quantile are insignificant, while those for 10th, 25th and 50th are significant, outlining that the provision of bathrooms leads to lower the prices at the lower-end accommodations (10th and 25th quantile).

Considering the variable kitchen, no significant effect on price can be outlined according to the results of both the OLS and the QR analysis, except the 50th quantile where the price is negatively influenced. The reason that the provision of kitchen is not significant might be that most of the accommodations (94%) are equipped with a kitchen, therefore, it is considered to be a basic service that is not reflected in the price of the accommodation.

The provision of breakfast has a positive and significant impact on price and host may charge 13.55% more, if the accommodation provides this service. However, when quantile regression is evaluated at the lower-priced accommodations (10th and 25th quantile), the provision of breakfast does not significantly influence price, but it is significant for the 50th, 75th, and 90th quantile. This is inconsistent with previous findings (Wang & Nicolau, 2017), but during the interpretation of the results we have to note, that only 7% of the listings offer breakfast, so this minority group may charge higher prices in accommodations, which are priced above average, presumably for please their guest and make the rental more appealing by offering breakfast as an extra amenity.

The provision of air conditioning has the largest positive and significant influence on price in the sample. The rates for apartments equipped with air conditioning are priced 37.37% higher than those without this amenity. The quantile coefficients indicate a mixed pattern highlighting that the influence of this attribute is lower for the lower-priced accommodations and higher for the higher-priced accommodations reaching its top in the 75th quantile. These findings support that in a holiday destination air conditioning is the comfort function (being the most important in the summer) in an accommodation for which people usually have to pay the most.

Regarding the free wireless internet access, the OLS estimated a significant and positive influence on the listed price associated with a price increase of 18.67% in those rooms which have such access. In addition, the coefficients of the quantile estimates highlight different magnitudes as we move up the conditional distribution signifying that accommodations in the lowest-priced quantile do not charge as much for free internet as their higher-priced (50th, 75th, and 90th quantile) competitors, however, the 25th quantile listings increase the price most in order to have free internet access.

Between the amenities that were considered, the provision of TV and free parking have a significant negative effect on price. The OLS regression stresses that rates for accommodations equipped with a TV are about 14.08% less than those without such appliances. However, quantile estimates signify that the effect of this variable is not significant for the 10th and 25th quantile, while coefficients of the other three quantile highlight that the presence of a TV is less important among the higher-priced listings. The amenity free parking has also a significant negative impact on prices with decreasing values in the quantile coefficients. The OLS result highlight the presence of a free parking spot is associated with a price decrease of 18.6% while the quantile estimates outline that the negative effect is higher for the lower-priced accommodations and lower for the higher priced ones. These results are inconsistent with

previous findings on hotel price determinants (Espinet *et al.*, 2003; Thrane, 2007) and Airbnb price determinants (Wang & Nicolau, 2017) showing that the provision of this attribute in a touristic region may have a quite different effect than the same variable for a hotel or an Airbnb accommodation in a city region.

The provision of pool is associated with significant price increase of 14.66% while quantile coefficients are relatively constant except the 75th quantile where positive impact of this amenity is the highest.
The number of available photos about the accommodation does not significantly influence listing price according to the results of the OLS, however quantile estimates coefficients vary over the conditional distribution signifying that the 10th and 50th quantile are insignificant, the 25th quantile is significant but negatively affect accommodation price, while the 75th and 90th quantile are significant with positive impact on price, although the degree of this effect is very low.

Finally, the attribute smoking has also a significant negative effect, thus in those apartments where smoking is allowed host charge 14.40% less than in those where smoking is not permitted. The quantile estimates highlight that the negative effect is stronger at the lower-tail apartments, however, the coefficients for the 75th and 90th quantile are insignificant. The results are consistent with previous findings (Wang & Nicolau, 2017) and strengthen the assumption that hosts are trying to make their (smoking)homes more attractive by lowering their prices.

Conclusions
In the present article, we have investigated whether and how accommodation attributes are associated with Airbnb accommodation prices in a touristic region and quantified these effects by applying OLS and quantile regression analysis. In line with previous studies, the findings confirm that property-related attributes significantly influence Airbnb prices in a touristic region as well, although the magnitude of these effects is very diverse and complex.

The OLS results showed that the provision of air conditioning, free internet, and free parking are the main determinants of Airbnb price in the sample area, while the number of available photos and the presence of a kitchen does not significantly influence the price. The quantile regression results further demonstrated that capacity, the provision of breakfast and TV leads to higher prices among the higher-priced accommodations, while the number of bedrooms and bathrooms, smoking, and free parking influence more the prices of lower-end accommodations.

Findings consistent with previous studies
Our results also illustrate that several factors have similar effects with previous findings. The attributes related to the size of the rentals such as capacity and bedroom number are associated with higher rental prices in various cities (Cai *et al.,* 2019; Chen & Xie, 2017; Gibbs *et al.,* 2018; Kakar *et al.*, 2016; Wang & Nicolau, 2017) and according to our results the listings in the Lake Balaton Tourism Region are no exception. As expected, entire homes also account for significant price increase. As most previous studies indicated, location greatly matters both in the case of hotels (Espinet *et al.,* 2003; Thrane, 2007; Zhang *et al.,* 2011a) and Airbnb rentals (Gibbs *et al.,* 2018; Perez-Sanchez *et al.,* 2018; Wang & Nicolau, 2017; Zhang *et al.,* 2017) as well, and so is the case in the Lake Balaton Region. The smoking allowance is negatively related to Airbnb price in the study area, which is also in line with previous findings (Kennedy *et al.,* 2018; Wang & Nicolau, 2017), emphasizing that hosts are trying to lower their prices to make their (smoking)homes more attractive.

Findings different from previous studies
Surprisingly, in contrast with previous studies, the number of beds and the number of bathrooms have negative influence on price challenging the findings found for Airbnb listings located in major cities (Cai *et al.,* 2019; Chen & Xie, 2017; Gibbs *et al.,* 2018; Wang & Nicolau, 2017). These two factors may indicate that listings in the Lake Balaton Tourism Region have different inner characteristics than the listings in large cities, thus, host take them differently into consideration during their price setting. It was also inconsistent with previous research (Gibbs *et al.,* 2018; Perez-Sanchez *et al.,* 2018), that the number of photos does not have a significant effect on price in general as in – only in the 75th and 90th quantile can be a very low positive impact outlined –, although pictures are perceived as important in building trust (Ert *et al.,* 2016; Teubner *et al.,* 2017) and may be a good indicator of professionalism (Gibbs *et al.,* 2018). The next finding inconsistent with previous findings lies in the effect of free parking. Both hotel research (Espinet *et al.,* 2003; Thrane, 2007) and Airbnb research (Cai *et al.,* 2019; Gibbs *et al.,* 2018; Wang & Nicolau, 2017) states, that free parking is associated with higher prices in various cities. However, our results highlight, that in a touristic region due to different spatial and settlement structure, free parking may have a significantly different effect on Airbnb rental prices than in large cities.

Limitations and directions for future research
Nevertheless, this study contributes to the existing literature on the price determinants of sharing economy based accommodation rentals. Practically, the analysis may offer potential implications for stakeholders of the traditional accommodation industry such as managers, decision makers, accommodation suppliers to analyse and evaluate their market situation and strategies and improve their services. Moreover, the present paper may provide hosts with insights how to set up their pricing strategies to increase their revenues, and may help Airbnb employees to design tools and guides that can offer hints and tips for hosts for ideal price setting.

We acknowledge that like any piece of research, this study has certain limitations that need to be highlighted. First, it is temporally limited as only one time period is considered (July 2018), therefore seasonal differences are missing from the analysis, which needs to be addressed in future studies. Second, the research is geographically limited as the study focused on an exclusive sample area, namely, the Lake Balaton Touristic Region, Hungary. Therefore, variations between cities or even regions have not been fully explored, nevertheless, the study provides insight into that certain accommodation attributes how may affect Airbnb price in a touristic region. Another limitation is that the research scrutinizes the accommodation attributes affecting accommodation price and the social, economic, and psychological factors determining the host price-setting strategies are not considered.
In conclusion, the present research provides relevant insights, however, it underscores the need for further research. Specifically, future research should expand the time-period and research scope focusing on the difference in price-determinant nexuses between regions and various city-types. It would be also important to conduct an analysis to reveal the price-setting differences between professional and non-professional hosts.

Endnotes
[1]: The list of settlements is set out in the T/18783 Bill of 2017 Urban Planning Plan for Hungary and certain priority areas (http://www.parlament.hu/irom40/18783/HTMLT18783.pdf)

Acknowledgments

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