The effects of COVID-19 on Airbnb

Lajos BOROS[1], Gábor DUDÁS[2] and Tamás KOVALCSIK[1]

Abstract

COVID-19 pandemic starting at the end of 2019, hit hard tourism and hospitality industries throughout the world. As a part of the processes, the most popular P2P accommodation service, the Airbnb also faced a rapid drop in bookings. This study explores and compares the effects of the first wave of the pandemic on the Airbnb markets of 15 cities. The analysis is based on the data retrieved from Insideairbnb.com. Booking trends are compared between 2019 and 2020 and a day-to-day analysis of occupancy rates during the first months of 2020 is also performed. Special attention was paid to the effects of pandemic on different price categories of listings. The results show that the evolution of local pandemic situation had the most significant impact on bookings and occupancy rates in the investigated cities. The characteristics of local markets and the pandemic and economic situation of sending countries had also great influence on the bookings and cancellations. In addition, in some cases the cancellations did not affect the reservations made for the later periods, meaning that tourists hoped for a quick recovery. The effect on price categories was also different from one location to another. The study provides empirical insights to the effects of the disease on P2P accommodations. Furthermore, the future of short-term rentals is also discussed briefly.

Keywords: Airbnb, tourism crisis, geography of pandemic, COVID-19, P2P accommodation, sharing economy

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Introduction

Infectious diseases have always posed threats for societies and economic activities (Jennings, L.C. *et al.* 2008; Strielkowski, W. 2020), but due to the increasing interconnectivity of our contemporary globalised world, diseases can spread even more rapidly to distant regions than before (Browne, A. *et al.* 2016; Semenza, J.C. and Ebi, K.L. 2019; Hall, C.M. *et al.* 2020; Wilson, M.E. and Chen, L.H. 2020). Furthermore, information flows are also increasingly globalised, thus, people receive up-to-date reports on the spreading and consequences of the diseases or other disruptive events. Growing public awareness and perceived risk affects consumer decisions in tourism and hospitality industry (Page, S. *et al.* 2012; Otoo, F.E. and Kim, S.S. 2018; Huang, D. *et al.* 2019; Kim, J. *et al.* 2020).

The COVID-19 (coronavirus) pandemic that appeared at the end of 2019 had a devastating effect on almost all aspects of social and economic life. Tourism, as a fragile and volatile sector (Çakar, K. 2018) was no exception; as a matter of fact, it was among the most seriously affected sectors (Higgins-Desbiolles, F. 2020; UNWTO, 2020). Due to the closing down of borders, fear from the virus and the lockdown measures applied by local and national authorities (Ren, X. 2020), international and domestic tourist flows decreased dramatically. Consequently, tourism sector experienced its largest downfall ever (Gössling, S. *et al.* 2020; Stankov, U. *et al.* 2020).

As a part of these processes, one of the most important online accommodation platforms, Airbnb was also hit hard by the pandemic. Airbnb guests cancelled their reservations or did not make new ones after the pandemic

[1] Department of Economic and Social Geography, University of Szeged, H-6722 Szeged, Egyetem u. 2. Hungary. E-mails: borosl@geo.u-szeged.hu (corresponding editor), kovalcsik.tamas@geo.u-szeged.hu
[2] Institute for Regional Studies, Centre for Economic and Regional Studies, Eötvös Loránd Research Network, H-5600 Békéscsaba, Szabó Dezső u. 42. Hungary. E-mail: dudasgabor5@gmail.com

had started to spread (Dolnicar, S. and Zare, S. 2020). As a result, occupancy rates stagnated or decreased. The aim of this paper is to present the effects of the pandemic on the Airbnb markets, including the analysis of booking trends in 15 cities, the comparison of data from 2019 and 2020 and a more detailed analysis of occupancy rates in 2020. Furthermore, the effects on different price categories are also analysed in relation to each city.

Literature review

Airbnb – characteristics and conflicts

Several researches focus on the development and the conflicts of Airbnb in the last years. The key topics are the following: the motivations of guests, the strategies of hosts, characteristics of Airbnb supply and the effects of P2P accommodation on the destinations, regulatory aspects and taxation, the effects of Airbnb on tourism and hospitality sector and Airbnb itself as a company (Dann, D. et al. 2019; Guttentag, D. 2019). Several studies analyse the effects on housing markets, highlighting that due to the emergence of short-term rentals, entire apartments are withdrawn from local housing and rental markets leading to inflating rents and real estate prices (Ke, Q. 2017; Robertson, D. et al. 2020). As a consequence, low-income residents are excluded from tourist areas, and those who remained also developed negative perceptions (Stergiou, D.P. and Farmaki, A. 2019). In relation to the above-mentioned processes, Airbnb is often related to gentrification (Dudás, G. et al. 2017; Wachsmuth, D. and Weisler, A. 2018; Robertson, D. et al. 2020). Several analyses emphasise that despite the "sharing" rhetoric, professional, business-like use is widespread: single hosts operate multiple listings (Boros, L. et al. 2018; Ferreri, M. and Sanyal, R. 2018. Adamiak, C. 2019; Robertson, D. et al. 2020). Airbnb can contribute to the transformation of city centres as well: since it can appear in already existing buildings, it intensifies crowding and tourism gentrification (Gutiérrez, J. et al. 2017).

The effects of Airbnb on traditional accommodation services is also often analysed: studies have found that Airbnb influences occupancy rates and hotel prices (Hong Choi, K. et al. 2015; Zervas, G. et al. 2017; Ginindza, S. and Tichaawa, T.M. 2019) or employment in tourism (Fang, B. et al. 2016). However, these effects are not uniform: the type of hotels (e.g. ownership) and location matter (Dogru, T. et al. 2020). Guttentag, G. (2015) described Airbnb as a disruptive innovation in the accommodation sector. Taxation, for example, is a key issue in this regard (Vinogradov, E. et al. 2020). Since the booking of accommodation happens through Airbnb, both guests and hosts tend to avoid taxes. This creates a competitive advantage for Airbnb as opposed to hotels. Furthermore, hotels must comply with the legal framework regarding the accommodation sector, while Airbnb listings are usually out of the scope of the regulations, which is also a competitive advantage for P2P accommodations (Boros, L. et al. 2018). In addition to the taxation issue, the regulatory aspect of P2P accommodations is also a widely discussed topic. Several studies highlighted that existing regulatory frameworks are not suitable for the management of Airbnb and its effects on the housing market or tourism sector (Edelman, B.G. and Geradin, D. 2015; Guttentag, G. 2017). Reacting to this problem, many cities introduced restrictive measures for Airbnb, e.g. maximizing the number of rental days, requiring the registration of hosts, or creating new administrative frameworks (Hajibaba, H. and Dolnicar, S. 2017).

The relation between P2P accommodation and traditional tourism services has a particular aspect in the post-socialist region, where tourism development is fragmented and not embedded in wider economic or urban development (Gunter, U. and Önder, I. 2018; Ključnikov, A. et al. 2018; Smith, M. et al. 2018; Smith, M.K. et al. 2018; Belotti, S. 2019; Gyódi, K. 2019; Rátz, T. et al. 2020). Due to the characteristics of post-socialist housing markets (e.g. ownership structures, processes of privatisation, regulatory frameworks) (see

e.g. ENYEDI, G. and KOVÁCS, Z. 2006; FÖLDI, Zs. 2006; SÝKORA, L. and BOUZAROVSKI, S. 2012; GRIME, K. *et al.* 2019; KORCELLI-OLEJNICZAK, E. and TAMMARU, T. 2020; KOVÁCS, Z. 2020) the emergence of Airbnb contributed to the increase of socio-economic inequalities in post-socialist inner-cities. At the same time, the rise of Airbnb has also clearly contributed to the development of tourism in these cities, providing relatively cheap accommodation in city centres and nearby locations. According to recent research findings (e.g. BOROS, L. *et al.* 2018; KLJUČNIKOV, A. *et al.* 2018) the share of multi-hosts (hosts managing more than one listing) in these cities is higher than the European average. At the same time, short-term rentals are regulated moderately or not at all in post-socialist cities. Therefore, the effects of COVID-19 pandemic on the hospitality industry of post-socialist cities deserve special attention.

Previous research has also revealed that the most important motivations for using P2P accommodations are the lower costs compared to hotels and the value for price (GUTTENTAG, D. 2015; MAO, Z. and LYU, J. 2017; So, K.K.F. *et al.* 2018; PUNG, J.M. *et al.* 2019), but other factors have their significance as well. TRAN, T.H. and FILIMONAU, V. (2020) identify four types of motivational factors: economic benefits, social benefits, functional attributes and experiences. On the other hand, lack of trust and perceived risk are both identified as de-motivational factors when considering listings on Airbnb (MAO, Z. and LYU, J. 2017; MAHADEVAN, R. 2018; MAO, Z.E. *et al.* 2020). At the same time, certain kinds and levels of risks can have a positive effect on consumer behaviour in P2P accommodation services due to the perceived advantages (e.g. price, authenticity or location) and the risk-seeking attitude of travellers (ARUAN, D.T.H. and FELICIA, F. 2019; YI, J. *et al.* 2020). However, previous studies could only analyse the role of perceived risk on micro level: on the scale of host and guest and usually focused on certain markets. COVID-19 represents a more general and unprecedented risk. Since Airbnb is a major force shaping today's tour-ism and due to the magnitude of the local effects of P2P accommodations, it is important to understand how COVID-19 has affected local Airbnb markets. The future of Airbnb is related to the future of tourism and hospitality industry and the future of our cities.

Diseases, risks and tourism and hospitality

As it was mentioned in the Introduction, tourism is a fragile sector, often severely affected by crises, natural or human-made disasters or disease outbreaks (ÇAKAR, K. 2018; REDDY, M.V. *et al.* 2020). Thus, the consequences of these unfavourable events and post-crisis management aspects are often on the agenda. In the last two decades several major disruptions have affected international tourism, such as terrorist attacks (e.g. in New York, 2001; in Bali, 2002), the global economic crisis in 2008–2009, the eruption of the volcano Eyjafjallajokull in 2010 or the 2004 tsunami in South Asia (HALL, C.M. 2010; LIM, J. and WON, D. 2020). The most important disease outbreaks that had effects on tourism and hospitality industry were the bovine spongiform encephalopathy ("mad cow disease") in 2002–2003, the Severe Acute Respiratory Syndrome (SARS-CoV) in 2003, the avian flu in 2004, swine flu in 2009 (H1N1), Middle East respiratory syndrome-related coronavirus in 2012 (MERS-CoV) and the Ebola outbreak in 2014. All of them have been analysed and discussed intensely in the academic literature, focusing on the effects of the diseases, presenting post-crisis management perspectives and highlighting the importance of precaution (SHARPLEY, R. and CRAVEN, B. 2001; BAXTER, E. and BOWEN, D. 2004; HENDERSON, J.C. and NG, A. 2004; GU, H. and WALL, G. 2006; MCALEER, M. *et al.* 2010; WU, E.H.C. *et al.* 2010; RASSY, D. and SMITH, R.D. 2013). However, despite the calls for proactive crisis management, most of the national governments failed to elaborate effective plans for disease-related tourism management and communication (JAMAL, T. and BUDKE, C. 2020).

Many authors concluded that the outbreaks usually caused decline in tourist arrivals, due the fact that tourists were concerned about their health and safety (Kuo, H.-I. *et al.* 2009; Mao, C.-K. *et al.* 2010; Lee, C.-K. *et al.* 2012; Joo, H. *et al.* 2019) and to non-pharmaceutical interventions (such as surveillance, border control and quarantine) (Lee, C.-K. *et al.* 2012; Ho, L.-L. *et al.* 2017; Ryu, S. *et al.* 2020). However, the effects can vary depending on the type of tourism (Shi, W. and Li, K.X. 2017). Furthermore, it is also important to point out that tourism is not only affected by diseases but is also connected with their spread. The greater mobility of people and the accessibility and affordability of air travel contribute to the rapid spread of infectious diseases (Davis, X.M. *et al.* 2013; Omrani, A.S. and Shalhoub, S. 2015; Findlater, A. and Bogoch, I.I. 2018).

As previous works on crises and tourism demonstrated, the perception of risk has a significant role in tourist decisions (Reisinger, Y. and Mavondo, F. 2005; Law, R. 2006; Tang, C.F. and Tan, E.C. 2016; Novelli, M. *et al.* 2018), although the awareness of individuals varies depending on their experiences and knowledge (Widmar, N.J.O. *et al.* 2017; Nelson, E.J. *et al.* 2019). If travellers are concerned about their health and safety, it affects tourist flows negatively. Several studies confirmed that negative effects tend to appear quickly, while the recovery could take longer time (Lean, H. and Smyth, R. 2009). Lim, J. and Won, D. (2020) investigated the recovery of tourism in Taiwan after the outbreak of SARS. Their research showed that the tourist arrivals from different markets recovered at a different rate, because the risks were perceived differently among travellers from Hong Kong, the United States or Japan. The perceptions were affected by local experiences regarding the virus or the trust in health organisations. Consequently, in the case of Japan recovery of tourist flows took longer.

Since travel decisions are strongly related to perceptions of risks, the role of communication is crucial in shaping fear and concern among potential consumers – as it was highlighted by several case studies (e.g. Faulkner, B. 2001; Baxter, E. and Bowen, D. 2004; Kuo, H.-I. *et al.* 2009; Sparke, M. and Anguelov, D. 2012; Fisher, J.J. *et al.* 2018; Maphanga, P.M. and Henama, U.S. 2019; Jamal, T. and Budke, C. 2020). Disease outbreaks influence consumer behaviour negatively – even if a virus does not infect humans (such as the case of avian flu demonstrates – Kim, J. *et al.* 2020). Alarmist voices in media strengthen the perception of risk, causing panic and leading to more severe consequences in tourism (Monterrubio, J.C. 2010), affecting destination image (Hugo, N. and Miller, H. 2017).

Communication is also important during the recovery: destinations and hotels have to convey messages about safety – focusing on revenue-generating markets. National tourism agencies play a crucial role in coordinating and supporting these activities – see the example of Tourism Authority of Thailand after the 2004 tsunami. In addition to the marketing efforts, price has also a significant role during recovery: hotels can offer discounts or special packages to attract guests (Henderson, J.C. 2005). On the other hand, cost reduction (e.g. lower labour costs, stricter financial control, reduced level of services etc.) is also an often used strategy (Campiranon, K. and Scott, N. 2014). Collaboration between various actors of tourism (e.g. between hotels, airlines, travel agencies etc.) may also contribute to cost reduction through the economies of scale, help the formation of shared visions of future, increase the influence of stakeholders on future policies, and strengthen the relations between actors (Howes, M. *et al.* 2015; Jiang, Y. and Ritchie, B.W. 2017). So far, the effects of diseases on Airbnb have been rarely analysed, due to the fact that since the emergence of this accommodation platform, there have been only a few disease outbreaks that affected tourism markets, and only with limited effect. According to Hu, M.R. and Lee, A.D. (2020) the lockdown in Wuhan, the local appearance of COVID-19 and the introduction of local restrictions all had negative

effects on Airbnb bookings – but the importance of these factors varied from one region to another. The geographical distance of disease hotspots and the local mobility levels also influenced the number of cancellations. As their analysis on London shows, the pandemic affected the structure of demand as well: due to the lower level of host-guest contact, entire homes had a competitive advantage against private rooms. Although COVID-19 pandemic caused severe crisis in tourism industry, reducing spending power and tourist demand, the first negative effects of the disease outbreak were mainly caused by the perceived risks (Rivera, M.A. 2020). This is mainly because economic problems started later than the reports on the disease outbreak had started to dominate public and political discourses.

Based on the above-mentioned risk and pandemic related context, the main questions of this research are the following: How has the pandemic hit the analysed cities; what were the main differences among them? Which factors did influence the magnitude of the decrease in bookings and cancellations the most? How were different price categories affected by the pandemic?

COVID-19: characteristics of the disease and a brief timeline of the pandemic

The first confirmed case of COVID-19 was reported in Wuhan, China on 1 December 2019 – although according to several reports there had been earlier cases of the disease. The new disease (as pneumonia of unknown cause) was reported on 31 December 2019 to the World Health Organization (WHO) Country Office in China. Several researches reported that the coronavirus appeared in Europe in the last quarter of 2019, however, the public was not aware of the danger at that time. The impact of the disease started to manifest in tourism when the disease had become a global pandemic and various non-pharmaceutical interventions were applied by national governments or global

organisations (travel bans, border closures, state of emergency etc.). As a result of these measures, the threat posed by coronavirus became more evident for travellers, thus, it had a larger role in their decisions.

The name COVID-19 for the disease was announced on 11 February 2020. The WHO declared the outbreak as public health emergency of global concern on 30 January 2020. It was the sixth time that an emergency of this scale had been identified (Kamel Boulos, M.N. and Geraghty, E.M. 2020; Zheng, Y. *et al.* 2020). On 11 March 2020, the outbreak was classified as pandemic by the WHO (2020). The virus rapidly spread outside China during January (according to the epidemiological reports); the first infected person outside China was reported in Thailand on 13 January, while the first European case was reported in France on 24 January (Worldometer, 2020). The first COVID-19 related deaths in the countries concerned in our research were reported during February. National governments reacted by introducing travel restrictions and declaring states of emergency – although the timing and the exact nature of measures varied. For example, Brazil did not declare a national state of emergency, only certain cities did so. On the other hand, most of the European countries announced state of emergency almost at the same time – in the middle of March. These actions were coincided with or were followed by travel restrictions and borders closures – to slow down or prevent the spread of the disease (*Figure 1*).

Data and methods

The data used in this analysis was retrieved from the database of insideairbnb.com (Insideairbnb, 2020). This webpage provides free data on offers and bookings of local Airbnb markets. The dataset contains information on the actual price (on the day of the data collection) and availability (stored in a Boolean variable: true-false) of all listings for the next 12 months. The data is updated monthly, thus, can be used for longitudinal
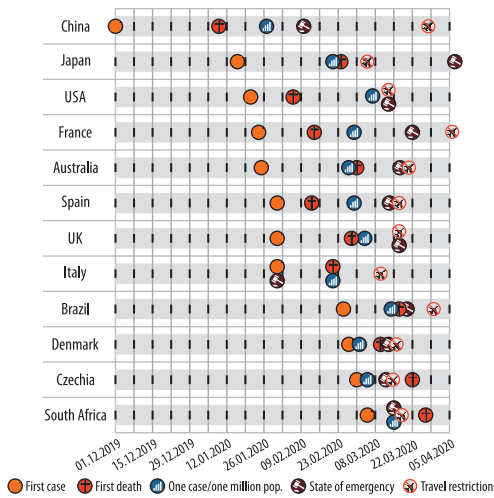
Fig. 1. The timeline of the spread of COVID-19 and measures and restrictions taken by different countries. *Source*: Edited by the authors.

analyses; analysing booking trends, prices and comparing them between various cities. The dataset has its limitations though: it does not contain data from all Airbnb listings worldwide, but only for selected cities. Furthermore, the timeframe of the data available in different locations can differ; in some cases (e.g. Tokyo), the earliest available data is from the middle of 2019, thus, it is not always possible to make a year-to-year comparison between the data from 2019 and 2020. Furthermore, the data collections in various cities do not cover exactly the same time periods *(Table 1)*.

Last but not least, although the dataset contains availability and price data for each and all listings for the next 365 days, a large part of those listings becomes unavailable after three months (i.e. the value of the availability variable is 'false' for all days from the 4th month to the 12th). Our assumption is that most of them are not withdrawn from the market but are usually offered only for the next three months. As a result, a significant share of local Airbnb markets is not represented in the data for the above-mentioned period. Thus,

the analysis is always based on the data for a three months' period starting from the day of the data collection (i.e. in our analysis the overlap between consecutive data collections is two months – due to the reliability of data, only these months can be compared).

To answer our research questions, we have analysed the changes in booking rates in 15 cities (London, New York, Paris, Sydney, Los Angeles, Beijing, Rio de Janeiro, Copenhagen, Rome, Cape Town, Madrid, Barcelona, Prague, Tokyo and Milan). The choice of cities was based on their tourism importance within Airbnb and because the aim was to represent various parts of the world and to provide a more comprehensive analysis of the early effects of coronavirus. Thus, the 9 largest local Airbnb markets (based on the number of listings) were selected. Madrid, Barcelona and Milan were added to the analysis because of the severity of the pandemic in these cities. Furthermore, in order to provide a more comprehensive overview, the trends of Cape Town (the largest African market) and Prague (the largest post-socialist market) were also analysed. In addition, the selection of Prague was also motivated by the fact that most of the post-socialist countries had lower infection ratio compared to Western Europe (Kouřil, P. and Ferenčuhová, S. 2020). Due to the limitations of data availability various cities had to be excluded from the analysis or could only partly be analysed. In addition, since the pandemic hit Asian countries first, the timeframe of the data collection is different in the case-study cities. In the cases of Tokyo and Beijing data from November to February were used, while in other cases the timeframe was from December to March *(Table 2)*.

During our research, we used the data on availability and prices to analyse the changes in booking rates and to compare cancellations and new bookings among various price categories (price quartiles) for all cities. Four datasets were analysed in all cases: every month from December 2019 to March 2020. This timeframe covers the time when the world was not yet aware of the dangers of COVID-19 and the time when the virus

Table 1. Dates of the data collections

City	Year	Date-1 P-I*	Date-2 P-I – P-II**	Date-3 P-II – P-III***	Date-4 P-III****
Barcelona	2019	10.12.2018	14.01.2019	06.02.2019	08.03.2019
	2020	10.12.2019	10.01.2020	16.02.2020	16.03.2020
Madrid	2019	10.12.2018	14.01.2019	06.02.2019	08.03.2019
	2020	10.12.2019	10.01.2020	18.02.2020	17.03.2020
Rio de Janeiro	2019	14.12.2018	18.01.2019	11.02.2019	13.03.2019
	2020	23.12.2019	21.01.2020	25.02.2020	18.03.2020
London	2019	07.12.2018	13.01.2019	05.02.2019	07.03.2019
	2020	09.12.2019	09.01.2020	16.02.2020	15.03.2020
New York	2019	06.12.2018	09.01.2019	01.02.2019	06.03.2019
	2020	04.12.2019	03.01.2020	12.02.2020	13.03.2020
Paris	2019	07.12.2018	13.01.2019	05.02.2019	11.03.2019
	2020	10.12.2019	09.01.2020	16.02.2020	15.03.2020
Sydney	2019	07.12.2018	13.01.2019	04.02.2019	07.03.2019
	2020	08.12.2019	07.01.2020	15.02.2020	16.03.2020
Los Angeles	2019	06.12.2018	11.01.2019	03.02.2019	06.03.2019
	2020	05.12.2019	04.01.2020	13.02.2020	03.03.2020
Beijing	2019	15.11.2018	14.12.2018	18.01.2019	11.02.2019
	2020	24.11.2019	26.12.2019	21.01.2020	26.02.2020
Rome	2019	11.12.2018	16.01.2019	07.02.2019	08.03.2019
	2020	12.12.2019	12.01.2020	19.02.2020	30.03.2020
Milan	2019	11.12.2018	16.01.2019	07.02.2019	08.03.2019
	2020	11.12.2019	12.01.2020	18.02.2020	30.03.2020
Copenhagen	2019	18.12.2018	28.01.2019	17.02.2019	26.03.2019
	2020	31.12.2019	29.01.2020	28.02.2020	22.03.2020
Prague	2019	21.12.2018	29.01.2019	18.02.2019	28.03.2019
	2020	31.12.2019	30.01.2020	29.02.2020	22.03.2020
Cape Town	2019	15.12.2018	22.01.2019	12.02.2019	18.03.2019
	2020	28.12.2019	26.01.2020	27.02.2020	21.03.2020
Tokyo	2020	28.11.2019	30.12.2019	28.01.2020	29.02.2020

*Beginning of the booking phase of the Period I. **End of the booking phase of the Period I, and beginning of the booking phase of the Period II. ***End of the booking phase of the Period II, and beginning of the booking phase of the Period III. ****End of the booking phase of the Period III.

started to spread globally, severely affecting tourism flows and accommodation bookings. Since most of the travel restrictions were introduced during March, the analysed processes were influenced by the market trends without the governmental interventions. We compiled a timeline of the spreading of COVID-19 and national and local policy responses. According to several reports and analyses, the virus appeared earlier than the first confirmed cases indicate, but this is irrelevant for our analysis, the responses from governments, tourists or airlines were affected by the 'official' data and the measures tak-

en by various actors within and outside the tourism sector (e.g. airlines, travel agencies).

Comparing of reservation numbers for the same days between two consecutive months, it is possible to determine change in occupancy rates of Airbnb listings. Growth is interpreted as net gain, while decrease is interpreted as net loss of reservations. If we have two data collections, one from 10 December 2019, the other from 10 January 2020 (i.e. booking phase), we can calculate and compare occupancy numbers for the days between 10 January and 10 March (i.e. travel phase). As we mentioned earlier, the

Table 2. List of the case-study cities and justification of their selection

Ranking	City	Number of		Justification of selection
		listings	active listing	
1	London	87,571	58,261	
2	Paris	66,414	35,097	
3	New York	51,097	32,706	
4	Sydney	40,434	22,821	
5	Beijing	39,732	35,393	Top Airbnb market
6	Los Angeles	38,851	31,575	
7	Rio de Janeiro	36,461	27,842	
8	Rome	31,450	28,803	
9	Copenhagen	28,418	10,997	
..				
13	Cape Town	24,591	20,357	Top African Airbnb market
..				
17	Madrid	21,845	17,899	Severely hit by COVID-19
..				
19	Barcelona	20,981	18,210	Severely hit by COVID-19
20	Milan	20,280	15,959	
..				
24	Tokyo	15,551	14,827	Top Asian Airbnb market*
25	Prague	14,560	11,631	Top post-socialist Airbnb market

*Outside of China. *Source*: Edited by the authors based on data from InsideAirbnb, 2020.

reliability of data drops significantly after the third month of the travel phases. As the first step of the analysis, a year-to-year comparison of bookings was made to understand the dynamics of local Airbnb markets. In the next phase of research, in order to gain a more detailed understanding of the temporal changes, a day-to-day comparison of booking numbers was made; and changes in the number of bookings for each day of the travel phase were calculated. Finally, to understand how various price categories were affected by the pandemic, the changes of bookings in the price quartiles of cities were compared.

Results

As the first step of the analysis, the changes in the number of bookings between 2019 and 2020 were compared. *Figure 2* shows the average net gain/loss in reservations per day for each travel phase. These numbers were calculated by dividing the total number of

new reservations made during the preceding booking phase by the number of days within the travel phase. Each period shown in *Figure 2* consists of a booking and a travel phase (see *Table 1*).

Compared to the previous year, all the analysed cities show a decrease in the number of new bookings between February and March 2020 – the largest one was experienced in Rome. Although the most affected region was Lombardy (ca. 600 km from Rome), the decrease in Milan was lower. Paris and Prague also suffered significant drops. Spain was hit severely by COVID-19 which is reflected in the number of bookings as well: the number of cancellations exceeds the number of new bookings for Barcelona and Madrid in the third period of 2020, when the pandemic situation started to evolve in the country. It means that the number of bookings from March to May dropped significantly.

In the first half of February, Airbnb bookings in Beijing were suspended until May (Reuters, 2020), thus, the last analysed pe-
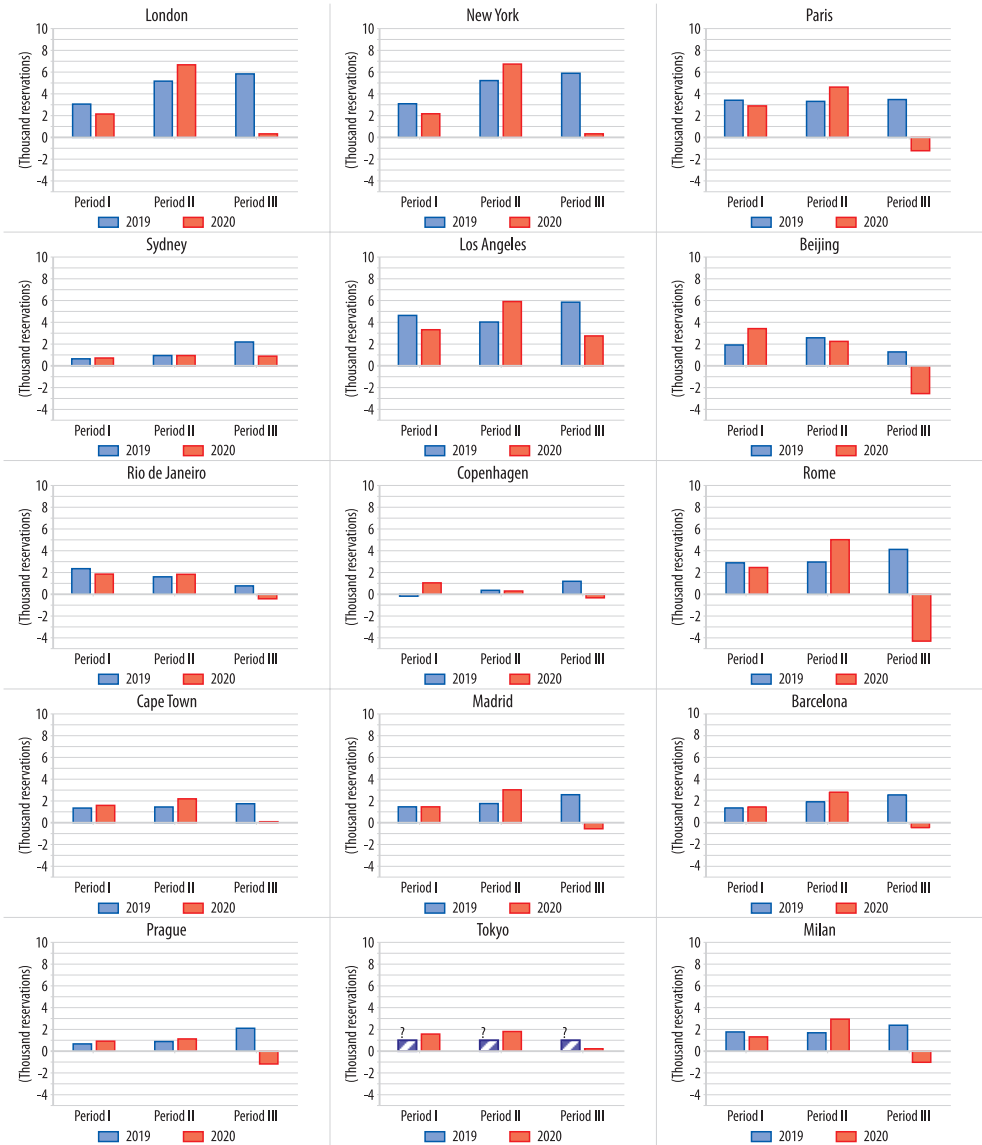
Fig. 2. Changes in daily average reservations, comparison of 2019 and 2020. *Source*: Edited by the authors.

riod from 2020 shows the largest drop in the number of bookings – but this is due to administrative reasons. The processes in London and New York are quite similar – the reason could be that as global cities they are both deeply embedded into global flows of people and information. In Los Angeles,

the number of bookings decreased, but the number of new bookings in Period III almost matched the level of Period I. Additionally, Los Angeles showed the largest number of new bookings in Period III. Although the first confirmed cases in the United States were reported in January, Los Angeles remained

slightly affected until the middle of March. Our assumption is that in this case, traveller choices were affected mostly by the local situation, and the spreading of virus in other states had a lower significance. The restrictions for travellers from the Schengen Zone were introduced on 13 March, and so they did not affect the booking trends analysed in this research.

Since December, January and February are summer months on the Southern Hemisphere, the peak tourism season falls to this period. Christmas season also strengthens tourism in this period so the significance of "last minute" bookings is lower in Sydney, Rio de Janeiro and Cape Town than in the other investigated cities – i.e. travellers book their accommodations well before the travel date. Thus, the number of new reservations and the decrease in the third period are also lower in the cities of the Southern Hemisphere. In addition, the pandemic has appeared later in Cape Town and Rio de Janeiro compared to the other analysed cities. The year-to-year comparison was not possible in the case of Tokyo due to the missing data for 2019 – but compared to the first two periods in 2020 there were almost no new reservations in the third.

When analysing the effects of various events and milestones on *Figure 1*, the results show that the global events (e.g. declaration of public health emergency of global concern) had little effect on booking and cancellation trends. Instead, the local pandemic situation had more significant role in these processes; the change in the number of bookings correlates with the time elapsed from the date when the rate of fatalities exceeded the one person/million value. With time the drop in booking numbers was larger. There were two exceptions: Rio de Janeiro and Sydney. In both cases, local conditions and processes may explain this deviation. In Rio de Janeiro, the low level of COVID-19 testings and political attitudes towards the disease decreased the official numbers of infections and fatalities. While Australian bookings might have been affected by extensive wildfires.

It is important to note that other factors than COVID-19 also had their impacts on tourism and Airbnb reservations. The possible effects of Australian wildfires were already mentioned. In addition, China is the most important source of international visitors in Australia; the evolving pandemic situation in China could also affect the number of reservations. This was particularly the case after Australia had introduced a travel ban for visitors from China on 1 February 2020 (Champer Champ, 2020).

In the second step of the research, the aim was to provide a more detailed picture of the processes presented above. Thus, a day-to-day analysis was made for the occupancy rates for four data collection dates. The lines on *Figure 3* show the percentage of booked listing at the time when these data collections were made for each consecutive day. The areas between lines present direction and the extent within the change. If the lines representing a later data collection time decreases below the one representing the earlier data, then a net loss in occupancy is experienced. As we mentioned earlier, Airbnb bookings were suspended in Beijing in the first half of February 2020.

The graphs on *Figure 3* confirm the abovementioned statements – but they also reveal some peculiarities. The differing trend lines highlight the differences in booking strategies. For example, in the case of Rio de Janeiro, the steepness of the trend lines shows that most bookings are made just before the travel. In the cases of Madrid and Barcelona a net loss in occupancy can be seen from the middle of March. At the same time, this negative trend seems to have a lower effect towards the end of Period III; travellers booked accommodation for May during the third booking phase (the beginning of March). It shows that some tourists trusted that the pandemic situation would disappear by May – confirming the role of risk perception in travel plans. In Rome the bookings disappeared for the whole Period III – showing a different perception of risk in that case. In Paris and Prague, the cancellation ratio was high, but similarly to Madrid and Barcelona guests did not cancel their bookings for the end of April.
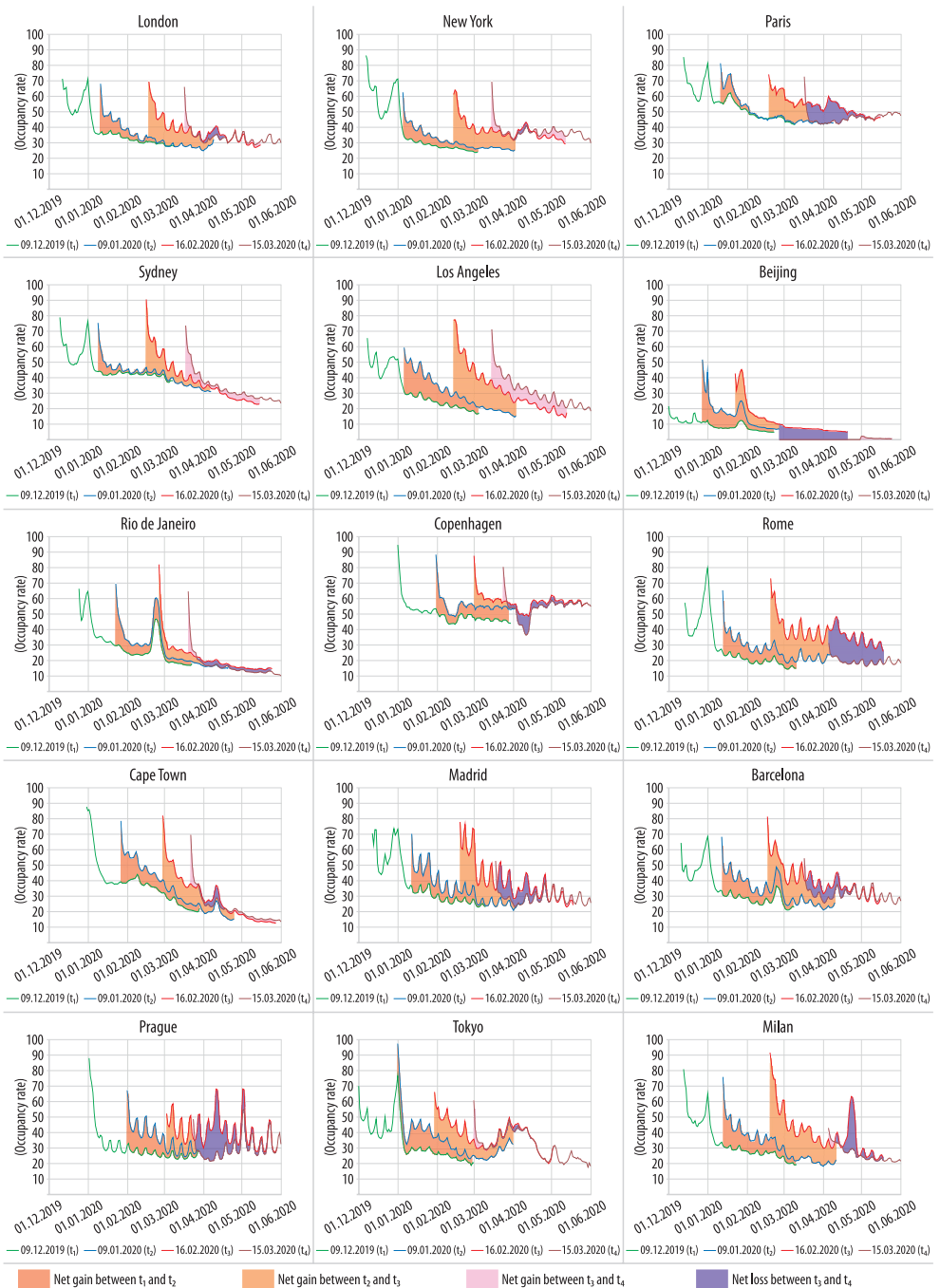
Fig. 3. Day-to-day changes of the Airbnb occupancy ratio between December 2019 and March 2020.
Source: Edited by the authors.

The trend lines of London and New York show similar patterns here as well; the net loss in bookings appears at the beginning of April and the rate of relapse lower compared to Rome, where the most drastic decrease in occupancies was experienced. In Milan the magnitude of net loss is connected to the cancellation of the Design Week event. Copenhagen had net loss during almost the whole Period III, but the occupancy rate remained relatively high compared to the other investigated cities. Only two cities had no net loss in Period III: Sydney and Los Angeles. However, Sydney had two weeks at the beginning of April with only a minimal growth in occupancy rate. At the same time, the trend lines are quite similar for Los Angeles in each period. It confirms our previous findings; the effect of COVID-19 was minimal on the local Airbnb market during the analysed period. Tokyo shows the largest drop when comparing the maximum occupancies between data collections.

Compared to the peak occupancy of the holiday season, the maximum rates dropped more than 30 per cent for the next two phases. The possible explanations are two-fold; on the one hand, the drop is a "normal" process, since occupancy is usually higher during Christmas and New Year. On the other hand, China is one of the most important sources of tourists for Japan. In 2019 almost one-third of the tourists in Japan arrived from China. Losing one of the key sources of international tourism hit hard the Japanese Airbnb market as well. The number of new reservations in Cape Town also decreased significantly, but the length of net loss period is relatively short and new reservations were already made for May. This could be related to local circumstances: South Africa was where COVID-19 appeared the latest among the countries concerned.

During the third step of the analysis, the effects of coronavirus on different price categories of Airbnb were analysed. For the sake of that the daily average number of net gain/loss in each period for the price quartiles was calculated. Results show how the overall gain or loss occurred among the price quartiles (the first quartile consists of the most expensive listings, while the fourth the cheapest ones) during 2020 *(Figure 4)*. Data for Beijing shows the cancellation of all previously booked listings since all bookings were suspended to Period III.

According to the reservation data, the Airbnb markets of all analysed cities were affected by the pandemic – but this effect showed different patterns. In Milan, Rome, Prague, Rio de Janeiro, Copenhagen all price categories had net loss. In the cases of Rome, Barcelona, Rio de Janeiro, London and New York the more expensive listings were more affected, however, it does not always mean net loss. Unlike the previous parts of the analysis, London and New York shows distinct differences here. While in the case of New York, there was a slight increase in all quartiles, in London a net loss was experienced above the median price. In Paris, Los Angeles, Copenhagen, Madrid, Prague and Milan the second and third quartiles suffered the largest decrease, while in Tokyo listings below the median price were the most affected. The rise of occupancy rate in Cape Town at the end of Period III was related to the cheapest price category. Due to the specific situation of Australia (i.e. wildfires) Sydney does not seem to fit into the above described categories.

Discussion and conclusions

The aim of this paper was to analyse the effects of COVID-19 on the Airbnb markets of different cities. To this end, the paper focused on three interrelated research questions. The first one referred to similarities and differences between various tourist locations regarding the effects of COVID-19. As data showed, COVID-19 pandemic had serious effects on the analysed local Airbnb markets, although the characteristics of the changes varied from city to city – thus, there is no uniform model of changes. Differences are determined by several factors, e.g.:

– the characteristics of local tourism markets (i.e. seasonality, price level, key source countries of tourists);
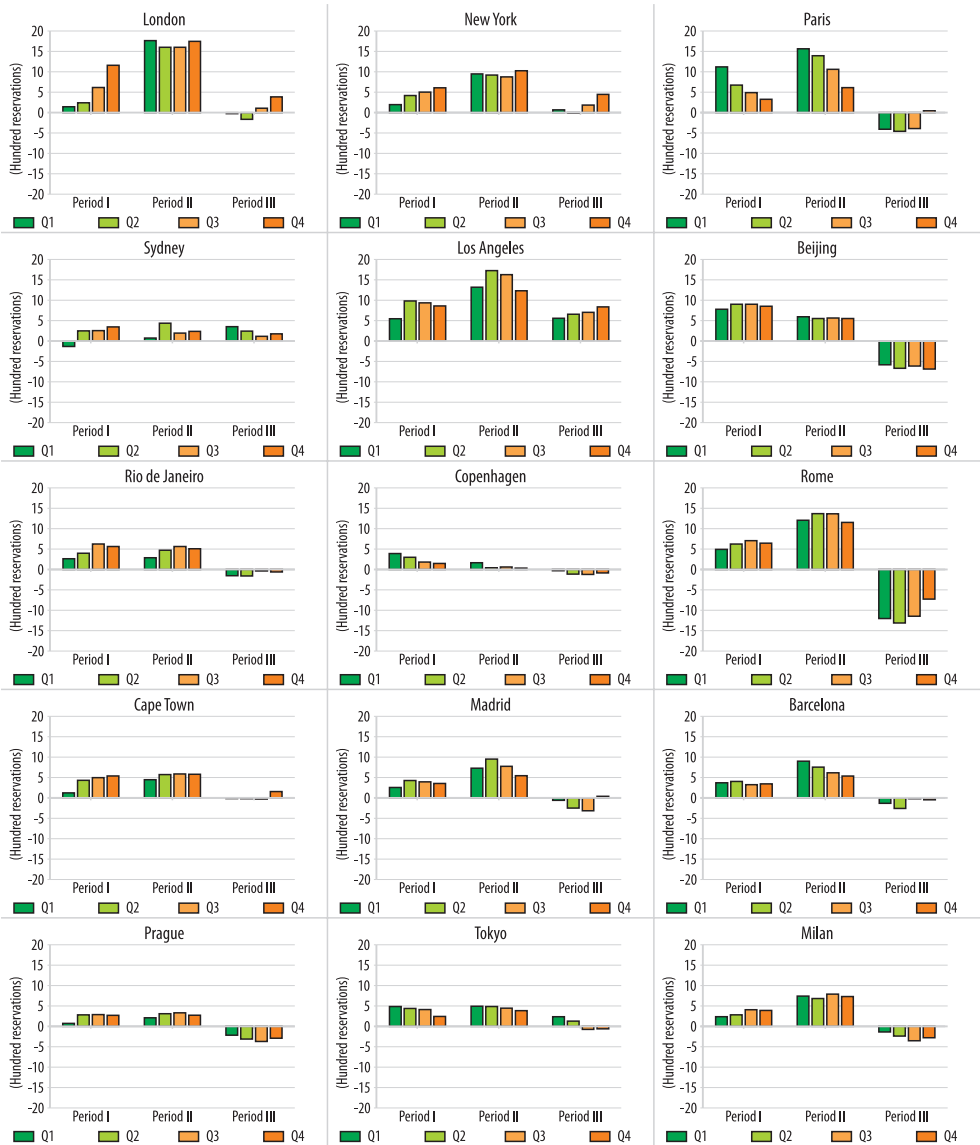
Fig. 4. Daily average reservations by quartiles between December 2019 and March 2020. *Source*: Edited by the authors.

– the time of the emergence of pandemic situation locally;
– government reactions and policies.

In some cases, the reservations made for a later date were not cancelled – as the case of Prague demonstrates. While its reasons are unknown due to the limitations of the analysed data, the relatively low infection ratio might have had an effect on this.

Based on our research findings it is difficult to provide comprehensive answers to the second and third research questions. The second

question focused on the underlying factors of Airbnb cancellations. As the data showed, guests reacted to the pandemic quickly; they cancelled their reservations and did not make new ones – well before the travel restrictions. The declaration of global health emergency had little effect on booking trends. Instead, as the link between the change of occupancy rates and time of one case per million milestone shows, the local emergence of the disease contributed more to the perception of risk. To answer the third research question, it can be stated that the different price categories were affected differently – it was also related to the characteristics of local tourism markets. Thus, the local characteristics had significant role in shaping several aspects of booking trends.

The pandemic raises questions regarding the future of Airbnb – in a wider sense regarding the future of cities and tourism as well (Rubino, I. *et al.* 2020). According to several analyses, the pandemic can provide an opportunity for a transformation in tourism industry, moving towards a more sustainable future (Brouder, P. 2020; Gössling, S. *et al.* 2020; Hall, C.M. *et al.* 2020; Niewiadomski, P. 2020; Stankov, U. *et al.* 2020). Furthermore, as several studies highlighted (Ke, Q. 2017; Dolnicar, S. and Zare, S. 2020), in many cases the hosts did not share their idle capacities – instead, they managed multiple accommodations. These enterprise-like hosts can suffer significant losses during the crisis, they can go bankrupt or decide to leave the market or to decrease their portfolio (Farmaki, A. *et al.* 2020). In addition, future policies can also affect the future of Airbnb. The effect of Airbnb on hotel industry and local communities was a highly debated issue in many localities. When the revival of tourism starts, local and national governments may support 'traditional' hotel companies due to their stronger lobbying power, role in employment and contribution to tax incomes. This support can be manifested in financial support or regulatory changes that would offer a significant advantage to hotels over P2P accommodations. This can lead to the decline of 'capitalist' multi-hosts (Dolnicar, S. and Zare, S. 2020).

The eventual shrinkage of local Airbnb offers would have effects on real estate and rental markets; the apartments withdrawn from the Airbnb market can become available for long-term rent or the owners can try to sell them. Thus, the price and the quantity of available flats (both for rent and for sale) can be affected by these changes. These processes can have a special relevance in post-socialist cities; where multi-hosts have a more prominent role compared to Western European cities. The regulation framework can be strengthened – as the attempts in Prague and Budapest demonstrate (Expats 2020; 24.hu 2020). If the regulations become stricter, it can change the tourism sector of these cities as well, e.g. by affecting the perceived value for money for tourists.

The length of the crisis and its effect on employment, incomes etc. will all influence how market processes and governmental policies evolve in the future. For example, tax breaks, stimulus packages and other governmental measures can provide help for certain actors in tourism and hospitality, influencing market processes (Dube, K. *et al.* 2020). Since the end of the pandemic and the subsequent economic crisis are not predictable (e.g. the consequences of the second wave of the disease – Oskam, J. 2020), it is too early to propose management recommendations. As the pandemic has caused an economic crisis, the recovery of tourism will take a longer time compared to the earlier disease-induced crises in tourism and hospitality. The experiences of previous pandemics (SARS-CoV and MERS-CoV in particular) provide insights into the possible effects and the possible directions of crisis relief. But COVID-19 caused distractions on an unprecedented scale – which means utilising past experiences has its limitations. Unlike in the case of previous diseases, the chance for a quick recovery of short-term rentals is extremely low because the length of the pandemic and the economic crisis.

Obviously, our study has certain limitations; it only focuses on certain cities and the timeframe of the analysis is limited too. We used publicly available data from Insideairbnb,

which has its own limitations regarding the content, the scope and timeframe of the datasets. The analysis only shows the changes in booking trends; the perceptions and motivations beyond the decisions are unknown.

Future research could focus on the motivations of tourists, e.g. on why they cancel (or do not cancel) their bookings? Questions related to trust and perceived risks can provide further useful insights regarding the demand side of Airbnb. The markets trends on a longer term should also be analysed: questions of how long the decrease will be and how the structure of Airbnb supply will change. As we mentioned above, the policies towards Airbnb can also change – influencing P2P accommodation markets significantly. Thus, processes within various regulatory frameworks could also be compared. Last, but not least, the severity, the length and the effects of the second wave of the pandemic (and the related reactions of various actors) can vary from one location to another, causing unforeseeable processes. These should be also analysed in future researches.

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