The Economic Research Guardian – Vol. 11(2)2021
Semi-annual Online Journal, www.ecrg.ro
ISSN: 2247-8531, ISSN-L: 2247-8531
Econ Res Guard 11(2): 252-266

The End of the Sharing Economy? Impact of COVID-19 on Airbnb in Germany

Jennifer Gossen
Zeppelin University of Friedrichshafen, Friedrichshafen, Germany
E-mail: j.gossen@zeppelin-university.net

Fabian Reck
Zeppelin University of Friedrichshafen, Friedrichshafen, Germany
E-mail: fabian.reck@zu.de

Abstract
This paper analyzes the effect the COVID-19 pandemic is having on the sharing economy. We focus on hosts' behavior in the German shared housing market and examine hosts' adaption to the pandemic state. Using monthly data from January 2019 until December 2020 for the city of Berlin, we conduct a probit model regression analysis and investigate the influence of several Airbnb-listing-specific factors and unemployment on the probability of renting the Airbnb accommodation. Through this big data analysis, we find that hosts switch from short-term to long-term options and rent relatively more entire apartments than shared ones during the COVID-19 pandemic compared to the pre-pandemic state.

Keywords: Sharing Economy, COVID-19, Peer-to-Peer Accommodation, Big Data

JEL classification: E24, L83

Received: 16 September 2021; Received in revised form: 27 November 2021; Accepted: 09 December 2021

1. Introduction

As humankind has been continually confronted with pandemics in history, the spread of the coronavirus disease (COVID-19) is not an entirely new difficulty. For instance, the Spanish Flu caused over 50 million mortalities worldwide and led to rising poverty and unemployment (Taubenberger & Morens, 2006; Karlsson & Nilsson & Pichler, 2014). Diverse studies investigating the impact of diseases and pandemics, on the hospitality industry (Alan & So & Sin, 2006; Chen & Jang & Kim, 2007; Chien & Law, 2003; Kim & Chun & Lee, 2005; Wu & Law & Jiang, 2010). Worldwide, 57 million tourist arrivals have been lost during epidemic outbreaks from 1980 to 2019. The loss of tourism spending reached US$ 95 billion for the same period (Škare, Soriano & Porada-Rochón, 2021).

During the COVID-19 pandemic, travel restrictions, and border closures led to a decrease in domestic and international tourist flows (Gössling et al., 2020). Furthermore, the United Nations World Tourism Organization declared tourism one of the hardest-hit industries during the spread of SARS-CoV-2, concerning both travel demand and travel supply (United Nations World

Tourism Organization, 2020). Therefore, concerns about the future of the tourism and hospitality sector have arisen worldwide.

Numerous studies analyze the vast impact of the COVID-19 pandemic on the tourism industry. Using data from 1995 to 2019 in 185 countries Škare et al. (2021) estimated the impact of COVID-19 on the worldwide tourism sector. The researchers proved that the effects of COVID-19 are more destructive, and the industry's recovery is likely to last longer than the expected average recovery period of ten months. Farmaki et al. (2020b), on the contrary, argue that characteristics of the travel industry will return to pre-pandemic levels once the situation is under authorities' control. Ying et al. (2020) postulate that the effect of the spread of SARS-CoV-2 will be a long-term addition to tourists' risk perception. Jayawardena et al. (2008) argue that risk assessment, planning, and contingency plans will be relevant for the recovery of the entire tourism sector.

Regarding the future of peer-to-peer renting alert have been raised due to the high vulnerability of the sector to pandemic outbreaks. Fidrmuc et al. (2021) show that the home sharing sector was hit hard by the COVID-19 pandemic. Their research describes the overall negative impact but does not specify how the industry might adapt, or has already adapted. A more profound examination of how COVID-19 influences the shared housing sector has been presented by Gossen (2021) and Fidrmuc (2021), which both analyze the effect of COVID-19 on *Airbn*b. Our research is based on these two papers. Therefore, we are asking: Does the COVID-19 pandemic lead *Airbnb* hosts to exit the market, switch from short term to long-term options, and rent rather whole apartments than shared ones?
For our analysis we focus on the shared housing market of Berlin. The monthly data covers the period from January 2019 to December 2020. Our estimation strategy is a probit model.

The remainder of this study is organized as follows: Chapter 2 deals with the existing literature. Chapter 3 describes the data and explains the econometric model. Chapter 4 shows the results. Chapter 5 discusses limitations to our research, summarizes and concludes.

2. Literature review

2.1. The sharing economy during the COVID-19 pandemic

The sharing economy is an extensively discussed topic in research, and its core idea became a predominant business model in the digital economy (Kraus & Roig-Tierno & Bouncken, 2019; Richter et al., 2017). Cheng (2016) defines the sharing economy as "peer-to-peer sharing of access to underutilized goods and services, which prioritizes utilization and accessibility over ownership". Home sharing, i.e. peer-to-peer accommodation, is based on digital platforms that allow individuals to rent their underutilized properties for a short period (Belk, 2014).

While the sharing economy has enormous potential to meet consumer's demand and create new income sources, it can also disrupt whole industries. For example, Reichle et al. (2021) show that home-sharing has significantly contributed to a rise in rents and house prices in European cities. Regarding COVID-19, Batool et al. (2020) empirically analyze the impact the pandemic had on five sectors of the sharing economy using Google Trend Data from 2019 and 2020. They found that transportation and accommodation experienced a negative influence. In comparison, COVID-19 and its related lockdown positively impacted freelance work, online deliveries, and streaming services.

With the expanding importance of the sharing economy, peer-to-peer accommodation has developed to disrupt the traditional hospitality industry (Sigala, 2017; PwC, 2015). The advantage of peer-to-peer accommodations for guests is the provision of comparatively cheap housing options (Stors and Kagermeier, 2015; Tussyadiah, 2016) that offer a more authentic alternative compared to hotels (Mody & Hanks & Dogru, 2019; Mody & Suess & Lehto, 2019; Paulauskaite & Powell & Coca-Stefaniak & Morrison, 2017). At the same time, hosts can profit from an additional source of income (Farmaki and Kaniadakis, 2020a; Guttentag, 2015) and practice entrepreneurship (Zhang & Bufquin & Lu, 2019). Another vital distinction between hotels and peer-to-peer accommodations is that the latter offers a "home away from home" (Liang & Choi & Joppe, 2018: 43) and social interaction between the local host and the renter (Moon & Miao & Hanks & Line, 2019) as well as social gratification for hosts (Lampinen & Cheshire, 2016). However, the spread of SARS-CoV-2 brought the risk of contagion when either sharing an apartment or socially connecting to the hosts (Batool et al., 2020; Farmaki & Stergiou, 2019). Consequently, threats exist to the sharing economy caused by the ongoing pandemic (Conger & Griffith, 2020).

2.2. Impact of COVID-19 on Airbnb and Peer-to-Peer renting

As peer-to-peer accommodation is growing in importance within the hospitality sector, much research has been done in a short time about the impact of COVID-19 on *Airbnb* or peer-to-peer accommodation in general.

Overall quantitative changes
Chen & Cheng & Edwards & Xu (2020) measured the financial losses of *Airbnb* hosts in Greater Sydney and found by comparing August 2020 to January 2020 that hosts underwent an income loss of about 89.5% on average.
Shen & Wilkoff (2020) have affirmed that, in general, the number of active listings on *Airbnb* dropped by 25% during the pandemic, and hosts who kept their listings active lost 22% of their income, while occupancy rates declined by 20%. At the same time, properties perceived as clean experienced an income increase of 17.5% and an expansion in occupancy rates by 16.5%. For their analysis the authors used data from Austin, Texas.
Boros & Dudas & Kovalcsik (2020) likewise found evidence for a reduction in occupancy rates during the spread of SARS-CoV-2 using data from 15 cities. Moreover, they examine the effects on underlying motives in detail and find that "the local pandemic situation had the most significant impact on bookings and occupancy rates" (Boros & Dudás & Kovalcsik, 2020: 363). Furthermore, local market characteristics and the pandemic status in travelers' home countries played a significant role in bookings and cancellations.
Jang & Kim & Kim & Sam (2021) studied the change of *Airbnb* performance during the ongoing pandemic in Florida depending on the purpose of the trip and the perceived thread by COVID-19. In two experimental studies they were able to show that *Airbnb* hosts experienced different losses in urban and rural areas and that the perceived threat by COVID-19 is lower for business tourists than for leisure tourists.

Hu and Lee (2020) similarly examined the determinants for global *Airbnb* booking activities. They found that local lockdowns lead to a decrease of 57.8% in booking activities globally. Moreover, they show that a doubling of cases leads to a 4.16% decrease in bookings. The authors could also prove that the sensitivity of bookings decreases with an increasing geographic distance to Wuhan and increases with "government stringency of lockdown policies" and "human mobility" within an area. Diverging from previous studies, their data shows no significant changes in the number of active listings on the supply side but instead lower prices per night together with dynamic pricing strategies. Focusing on the demand side, they discover a reduction in travel flows influenced by lockdowns and the spreading of SARS-CoV-2 in tourists' home countries or towns.

Hosts' behavior towards losses rooting in the spread of SARS-CoV-2

Financial motives showed to be the primary decisive reason for hosting (e.g., Guttentag, 2015), as around a third of the participants admitted in a survey that income from hosting was their first source of income (Farmaki et al., 2020a). COVID-19 led to hosts struggling financially due to a sharp decrease in bookings (Farmaki et al., 2020a; Johnson & Davis, 2020). Being informal employees of *Airbnb* (Sundararajan, 2014), hosts are not eligible for unemployment benefits and other worker-related governmental programs (Chen et al., 2020). Hence, *Airbnb* as a platform could transfer their risk to *Airbnb* hosts, who experienced losses around 6.5 times greater than the platform itself (Chen et al., 2020; Friedman, 2014). The hosts' income loss further influences potential mortgage payments and other debts and increases the variance of hosts' income (Chen et al., 2020).

Farmaki et al. (2020b) used a qualitative approach and conducted a semi-structured interview with hosts of peer-to-peer accommodation to examine perceived short-term impacts of the pandemic, how the hosts dealt with the challenges, and the perceived long-term impacts of the pandemic. Concerning short-term impacts, all hosts experienced a direct negative impact by governmental intervention to minimize the spread of SARS-CoV-2. They further described an increase in cancellations and a decrease in bookings. As peer-to-peer renting is the first source of income for some hosts, their economic situation experienced a severely negative impact. The effects were even worse for professional hosts as they had to continue paying cleaners and other staff. Hosts described lowering prices to stimulate demand, target domestic tourists, minimize human contact through self-check-in, and improve cleaning.

This paper wants to analyze the switch from short-term to long-term renting, as well as renting of entire properties instead of shared apartments. Furthermore, this paper aims to investigate the factors that determine the probability of an *Airbnb* listing being active before and during the COVID-19 pandemic.

3. Methodology

3.1. Sample definition

The platform *Inside Airbnb* provides big data on *Airbnb* listings for Berlin (*Inside Airbnb*, 2021). The unemployment rate is taken from the Federal Statistical Office (Statistisches Bundesamt, 2021). The Mitteldeutscher Rundfunk (MDR) and the German Foreign Office provide data about lockdowns and travel restrictions implemented during the COVID-19 pandemic (Mitteldeutscher Rundfunk, 2021; Auswärtiges Amt, 2021).

The cleaned monthly panel data for Berlin consists of 326,226 observations and covers the period from 2019 to 2020. In total there are 19,897 *Airbnb* listings. In the COVID-19 phase 123 hosts entered the market while 5,016 hosts left the market.

We subdivide the researched period into two major phases: The pre-pandemic phase begins on January 1st, 2019, and ends on December 31st, 2019. The COVID-19 phase begins at the 4th of January 2020 - the World Health Organization (2020) tweeted that there was a cluster of pneumonia cases in Wuhan, Hubei province, People's Republic of China - and ends on December 31st, 2020. This means we have almost the same amount of time in both phases.

3.2. Variables

Overview Inside Airbnb

The platform *Inside Airbnb* provides data on numerous characteristics of *Airbnb* listings such as price per night, room type with the characteristic entire home/apartment or private room, the minimum number of nights for a booking, date of the last review, number of monthly reviews - which is a moving average -, number of overall reviews, number of days available for booking within one year, and numerous other factors.

The dependent variable *airbnb* is binary and takes the expression 1 if a listing *i* is active on *Airbnb* at time *t* and 0 when the opposite is the case. In addition, the dichotomous variable takes the value 0 if the last review of an *Airbnb* listing was at the most twelve months ago. The categorical variable *entire* is based on the room type, taking on the value 1 if the whole apartment is rented and 0 if otherwise. The categorical variable *long* differentiates between short-term and long-term rentals to determine a possible change in trend. All *Airbnb* listings that require a minimum of 60 nights per booking are labeled as long-term options. Long term options take the value 1, short term options take the value 0. A host's *income* from an *Airbnb* accommodation is measured on a ratio scale and derived from the components of price per night, required minimum number of nights per booking, and moving average number of reviews per month which serves as a proxy variable for the number of bookings per month (*Airbnb*, 2021). For our estimations, we use the variable *host_income_diff* which represents the differences in a host's income between the respective time periods. Lockdowns are periods with massive restrictions, for instance, in the form of curfews and closures. The categorical variable *lockdown* takes on the value 1 if a lockdown in the sense of the above definition is detected on at least 15 days of the respective month. This determination is based on the reporting of the MDR. In this sense, the variable *lockdown* takes on the value 1 for April, October, November, and December 2020 for Berlin. Travel restrictions are existing in the case of complete closure of the German borders on at least 15 days of the respective month, or in the case of a ban on tourist entry on at least 15 days of the respective month. The categorical variable *travel_restrictions* takes on the value 1 if such are in operation is executed by the government. The former applies to March, April, and May 2020, while the latter case occurs for November and December 2020. The German Foreign Office and MDR reporting provide the basis for defining this variable (Auswärtiges Amt, 2021; Mitteldeutscher Rundfunk, 2021).

As a control variable for business cycles, we choose the rate of unemployment which was collected monthly at the national level. The source of this data is the Federal Statistical Office, with its publicly accessible GENESIS-Online database (Statistisches Bundesamt, 2021).

3.3. Descriptive statistics

Besides listing-specific data, pandemic-related factors such as *lockdown* and *travel_restrictions* as well as the macroeconomic factor *unemployment* are assigned to every *Airbnb* listing in all 24 time points. In addition, the binary variable *airbnb* describes if an *Airbnb* listing is active or not at the respective time. The large values of the standard deviation indicate that the selected sample is heterogeneous concerning the time dimension. Table 1 summarizes descriptive statistics for the pre-pandemic period with 195,360 observations. Table 2, in contrast, provides descriptive statistics with 130,866 observations for the COVID-19 phase.

Table 1 – Summary Statistics of Pre-Pandemic Phase

	n	mean	sd	min	max
airbnb	195,360	0.652	0.476	0	1
availability_365	195,360	72.062	112.417	0	365
entire	195,360	0.499	0.500	0	1
host_income	195,360	158.865	451.620	0	15,891.600
host_income_diff	195,360	0.795	160.880	-9,699	13,737.800
lockdown	195,360	0	0	0	0
long	195,360	0.029	0.168	0	1
minimum_nights	195,360	4.682	8.594	1	62
monthly_reviews	195,360	0.979	1.424	0.010	30
number_of_reviews	195,360	26.592	47.651	1	626
price	195,360	51.842	26.164	0	137.000
travel_restrictions	195,360	0	0	0	0
unemployment	195,360	5.004	0.170	4.800	5.300

Source: Own Estimation based on data from Auswärtiges Amt (2021); *Inside Airbnb* (2021); Mitteldeutscher Rundfunk (2021); Statistisches Bundesamt (2021); and World Health Organization (2021) and visualized with Stargazer Package for R Studio (Hlavac, 2018).

Table 2 – Summary Statistics of COVID-19 Phase

	n	mean	sd	min	max
airbnb	130,866	0.504	0.500	0	1
availability_365	130,866	75.222	119.938	0	365
entire	130,866	0.524	0.499	0	1
host_income	130,866	145.844	477.555	0	23,889.600
host_income_diff	130,866	-3.409	217.013	-22,337.280	22,265.280
lockdown	130,866	0.327	0.469	0	1
long	130,866	0.032	0.177	0	1.000
minimum_nights	130,866	4.997	9.019	1	62
monthly_reviews	130,866	0.836	1.289	0.010	30
number_of_reviews	130,866	35.051	59.687	1	950
price	130,866	52.687	26.671	0	137.000
travel_restrictions	130,866	0.456	0.498	0	1
unemployment	130,866	5.807	0.425	5.100	6.400

Source: Own Estimation based on data from Auswärtiges Amt (2021); *Inside Airbnb* (2021); Mitteldeutscher Rundfunk (2021); Statistisches Bundesamt (2021); and World Health Organization (2021) and visualized with Stargazer Package for R Studio (Hlavac, 2018).

3.4. Economic model

The research work at hand uses a binary response model, i.e. a probit model, to explain the effects of the independent variables x_j on the response probability P ($airbnb = 1 | x_j$), corresponding to an active listing if *airbnb* takes on the value 1 and an inactive listing if *airbnb* takes on the value 0.

The probit model used in this paper contains listing-specific, pandemic-related, and a macroeconomic factor:

$$airbnb_{it} = \phi(\beta_0 + \beta_1 host\_income\_diff_{it} + \beta_2 entire_{it} + \beta_3 price_{it} + \beta_4 long_{it} + \beta_5 number\_of\_reviews_{it} + \beta_6 lockdown_{it} + \beta_7 travel\_restrictions_{it} + \beta_8 unemployment_{it} + \pi_i + \delta_t + \varepsilon_{it}) \quad (1)$$

Where *airbnb* is the dependent variable taking on the value 0 if an *Airbnb* listing *i* is inactive at time *t* or the last review has been written at least 12 months ago. The difference of host's income between period *t* and *t-1* is captured by the variable *host_income_diff*. Furthermore, *entire* is a categorical variable taking on the value 1 if the entire apartment is subleased and 0 if only a private room is subleased. The variable *price* is the price per night; *long* is a categorical variable taking on the value 1 if the minimum stay is at least 60 days and 0 if otherwise; *number_of_reviews* is a variable indicating the total number of reviews and being a proxy variable for the length of this listing being active on *Airbnb*. Factors concerning the COVID-19 pandemic are captured by the variables *lockdown*, which is a categorical variable taking on the value 1 if there is a lockdown and 0 if otherwise; and *travel_restrictions*, which is a categorical variable taking on the value 1 if there are travel restrictions and 0 if otherwise. Macroeconomic changes are included with the variable *unemployment*, referring to the unemployment rate to control for business cycle effects; π_i is a random effects listing-specific error term; δ_t is a fixed effects time-specific error term. Finally, the error term, ε_{it}, represents all disturbances.

4. Empirical analysis

4.1. Descriptive analysis

Before conducting a paired two-sample t-test for means, the average of the respective variables during the pre-pandemic phase as well as the COVID-19 phase is calculated for each host in our data set. Consequently, means in Table 3 differ from the respective variables' means in Table 1 and Table 2. Furthermore, the variables *host_income*, *entire* and *long* were rounded to two decimal places in advance. Additionally, observations that only have data for the pre-pandemic phase but not for the COVID-19 phase have been excluded from the descriptive analysis. Table 3 shows the results of our paired two sample t-tests for means. First, we conclude that host's income is significantly lower in the COVID-19 phase compared to the pre-pandemic phase. Second, we show that more entire accommodations are rented during the COVID 19 phase. Third, we provide evidence for a statistically significant higher number of long-term rentals in the COVID-19 phase.

Table 3 – Results of Paired Two Sample t-tests for Means

Paired Two Sample t-Test for Means		
Hypothesized Mean Difference: 0		
host_income by phase	pre-pandemic phase	COVID-19 phase
Mean	162.552	145.375
Observations	13,715	13,715
t statistic, p value	7.144 [0.000]	
entire by phase	pre-pandemic phase	COVID-19 phase
Mean	0.509	0.513
Observations	14,758	14,758
t statistic, p value	-5.27623 [0.001]	
long by phase	pre-pandemic phase	COVID-19 phase
Mean	0.02988	0.03152
Observations	14,758	14,758
t statistic, p value	-2.60263 [0.001]	

Source: Own Estimation based on data from *Inside Airbnb* (2021) and World Health Organization (2020).

4.2. Results and data evaluation

Table 4 shows the average marginal effects on the dependent variable *airbnb*. We first show the partial effects of the analyzed variables. Thus, specifications (1) to (8) include only one variable to show its individual effect, whereas the preferred model specification (9) shows the partial marginal effects of several variables simultaneously. We estimate the panel probit model using maximum likelihood with clustered standard errors and we report average marginal effects.

Table 4 – Model Specifications for *Airbnb* Listings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
host_income_diff	0.000***								
	(0.000)								
entire		0.048***							0.048***
		(0.007)							(0.007)
price			0.003***						
			(0.000)						
long				0.092***					0.074***
				(0.024)					(0.024)
number_of_reviews					0.011***				
					(0.001)				
lockdown						-0.129***			-0.071***
						(0.003)			(0.002)
travel_restrictions							-0.118***		
							(0.002)		
unemployment								-0.109***	-0.089***
								(0.003)	(0.002)
Observations	283,632	283,632	283,632	283,632	283,632	283,632	283,632	283,632	283,632
Pseudo R^2	0.000	0.002	0.023	0.000	0.217	0.006	0.006	0.009	0.009

Significance Levels: Standard errors are in parentheses. * p<0.10; ** p<0.05; *** p<0.01.
Source: Own Estimation used maxLik Package for R Studio (Henningsen & Toomet, 2011) based on data from Auswärtiges Amt (2021); *Inside Airbnb* (2021); Mitteldeutscher Rundfunk (2021); Statistisches Bundesamt (2021); and World Health Organization (2021).

Our results show that marginal effects for listing-specific explanatory variables are statistically significant but close to zero: *Host_income_diff, entire, price*, *long,* and *number_of_reviews* have a statistically significant positive marginal effect on the probability of an *Airbnb* listing being active. *Lockdown* and *travel_restrictions* influence the probability of an *Airbnb* listing being active significantly negatively, showing that the measurements against the spread of SARS-CoV-2 taken by the government significantly influenced the shared housing market. Moreover, the marginal effect of *unemployment* is negatively correlated with an *Airbnb* accommodation being active.

Our preferred model specification (9) in Table 4 shows the marginal effects of the variables *entire*, *long*, *lockdown*, and *unemployment* simultaneously on the probability of an active *Airbnb* listing. Also in this specification *entire* and *long* have a positive and statistically significant effect on the probability of an *Airbnb* listing being active. This means that renting out whole apartments or houses, and renting long term increases the probability of an Airbnb listing to remain in the market. On the other hand, as expected, *lockdown* has a statistically significant influence and decreases the probability of an active *Airbnb* listing, whereas *unemployment* does so too.

4.3. Robustness analysis

The following section aims at testing the robustness of our model. To account for differences between the influence of a lockdown in Germany and solely travel restrictions, we run two regressions using the variable *lockdown* and secondly, the variable *travel_restriction*. Moreover, we test for the quality of *Airbnb Listing by differentiating between accommodations with a low number of reviews and accommodations with a high number of reviews. Finally,* we subdivide our original panel data set into data for the pre-pandemic phase and data for the COVID-19 phase to examine if the effects of the variables *long* and *entire* change when only considering the COVID-19 phase.

Table 5 – Specifications with the Variable *lockdown* versus *travel_restrictions*, *low number of reviews* versus *high number of reviews,* and the *pre-pandemic phase* versus *COVID-19 phase*

	(1) *with lockdown*	(2) *with travel-restriction*	(3) *low number of reviews*	(4) *high number of reviews*	(5) *pre-pandemic phase*	(6) *COVID-19 phase*
entire	0.047***	0.047***	0.014*	0.039***	0.036***	0.126***
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
long	0.073***	0.073***	0.258***	-0.119***	-0.022	-0.013*
	(0.024)	(0.024)	(0.033)	(0.033)	(0.018)	(0.021)
lockdown	-0.130***		-0.119***	-0.057***		-0.047***
	(0.003)		(0.003)	(0.002)		(0.002)
travel_restrictions		-0.119***				
		(0.002)				
unemployment			-0.156***	-0.057***		
			(0.004)	(0.003)		
Observations	283,632	283,632	147,439	136,193	195,360	283,632
Pseudo R^2	0.007	0.008	0.041	0.021	0.001	0.013

Significance Levels: Standard errors are in parentheses. * p<0.10; ** p<0.05; *** p<0.01.
Source: Own Estimation used maxLik Package for R Studio (Henningsen & Toomet, 2011) based on data from Auswärtiges Amt (2021); *Inside Air*bnb (2021); Mitteldeutscher Rundfunk (2021); Statistisches Bundesamt (2021); and World Health Organization (2021).

Results in Table 5 in specification (1) and (2) show that the marginal effects of *long* and *entire* remain positive and statistically significant for both specifications, the one with *lockdown* and the one with *travel_restriction*. We observe that *lockdown* has a slightly more negative effect on the probability of an *Airbnb* listing being active than *travel_restrictions*. Nevertheless, because of almost identical effects it is irrelevant which of the two variables is used in our preferred specification (9) in Table 4.

Results in Table 5 in specification (3) and (4) show the results when controlling for the quality of *Airbnb listings*. The results indicate that the coefficient of the variable entire is positive and statistically significant at the 10% level for *Airbnb* listings with a low number of reviews, and positive and statistically significant at the 1% level for *Airbnb* listings with a high number of reviews. The coefficient of the variable long is positive and statistically significant at the 1% level for *Airbnb* listings with a low number of reviews, whereas it is negative and statistically significant at the 1% level for *Airbnb* listings with a high number of reviews. The latter result is counter intuitive. For both subsamples, the estimates of *unemployment* and *lockdown* remain negative and statistically significant on a significance level of 1%.

Results in Table 5 in specification (5) and (6) show the results when differentiating between the pre-pandemic phase and the COVID-19 phase. The results show a statistically significant positive marginal effect for the variable *entire*, mainly insignificant marginal effects for the variable *long*, and statistically significant negative effects for the variable *lockdown*. However, between the pre-pandemic phase and the COVID-19 phase, the marginal effect of the variable *entire* increases. Therefore, renting an entire apartment in the COVID-19 phase increases the probability of an active *Airbnb* listing by a higher value than in the pre-pandemic phase.

5. Discussion and conclusion

Our Big Data analysis using a probit model supports the assumption that the Sharing Economy experiences a structural change during the spreading of SARS-CoV-2. Our key findings are that host who rented entire apartments and long-term options had a higher probability to stay in the market. Moreover, it could be shown that the lockdowns and travel restrictions harmed the sharing economy. Finally, the business cycle, proxied with the *unemployment rat*e, also influenced the sharing economy.

Nevertheless, this does not mean the end of the sharing economy. Our results could help future policies better adapt to the sharing economy by providing insight into the behavior of its participants. However, more future research is needed as it is unclear how SARS-CoV-2 mutates, which policies for social distancing will be in place in the future, and if the structural change we found is long-term and sustainable.

As with all research, our work is not free from limitations. First of all, the COVID-19 pandemic is a very recent phenomenon, and we are still in the middle of its occurrence. As a result, only vague assumptions about further developments can be made. Moreover, the *Airbnb* platform and hosts are shaped by the media and thus short-term events. The actuality of the subject means that the research field offers much potential, and current studies are usually not yet peer-reviewed, so their quality must be viewed critically. In addition, a comparison with other pandemics is problematic, as the last global pandemic on a comparable scale was the Spanish Flu in 1918. At that time, tourist travel was much less pronounced, and the sharing economy was non-existent. Also, no comparable relevant data can be found for economic changes during the Spanish Flu.
In terms of data selection, this paper is limited to the geographic area of Germany and covers only the city of Berlin. Thus, it remains unclear whether the effects examined would also be confirmed in more rural areas, or instead exclusively arise in urban areas. In addition, our research only compares the years 2019 and 2020. Adding other pre-pandemic phases could have minimized cyclical fluctuations and thus provided more reliable results.

Future research should consider and minimize the limitations of this paper. For example, the data set could be extended to the entire European region and thus compare countries affected differently by the pandemic. In this course, the influence of the 7-day incidence rate or media coverage would also be of interest.

References

Alan C.B, So S, Sin L (2006). Crisis management and recovery: how restaurants in Hong Kong responded to SARS. *International Journal of Hospitality Management*. 25(1): 3–11.

Airbnb (2021). What are Airbnb service fees?
https://www.airbnb.com.au/help/article/1857/what-are-airbnb-service-fees (accessed in July 28, 2021).

Auswärtiges Amt (2021). Informationen zu Einreisebeschränkungen, Test- und Quarantänepflichten in Deutschland. https://www.auswaertiges-amt.de/de/quarantaene-einreise/2371468 (accessed in July 28, 2021).

Batool M, Ghulam H, Hayat M. A, Naeem M. Z, Ejaz A, Imran Z. A, Spulbar C, Birau R, Gorun T. H (2020). How COVID-19 has shaken the sharing economy? An analysis using Google trends data. *Economic Research-Ekonomska Istraživanja*: 1-13.

Boros L, Dudás G, Kovalcsik T (2020). The effects of COVID-19 on airbnb. *Hungarian Geographical Bulletin*. 69 (4): 363–381.

Chen G, Cheng M, Edwards D, Xu L (2020). COVID-19 pandemic exposes the vulnerability of the sharing economy: a novel accounting framework. *Journal of Sustainable Tourism*. 1-18.

Chen M.H, Jang S.S, Kim WG (2007). The impact of the SARS outbreak on Taiwanese hotel stock performance: an event-study approach. *International Journal of Hospitality Management*. 26(1): 200–212.

Cheng M, (2016). Sharing economy: A review and agenda for future research. *International Journal of Hospitality Management*. 57: 60-70.

Chien G C, Law R (2003). The impact of the Severe Acute Respiratory Syndrome on hotels: a case study of Hong Kong. *International Journal of Hospitality Management*. 22 (3): 327–332.

Conger K, Griffith E (2020). The results are in for the sharing economy. They are ugly. The New York Times. https://www.nytimes.com/2020/05/07/technology/the-results-are-in-for-the-sharing-economy-they-are-ugly.html (accessed in July 28, 2021).

Farmaki A, Kaniadakis A (2020a). Power dynamics in peer-to-peer accommodation: insights from Airbnb hosts. *International Journal of Hospitality Management*. 89 (102571).

Farmaki A, Miguel C, Drotarova M H, Aleksić A, Časni A Č, Efthymiadou F (2020b). Impacts of Covid-19 on peer-to-peer accommodation platforms: Host perceptions and responses. *International Journal of Hospitality Management*. 91(102663).

Farmaki A, Stergiou D.P (2019). Escaping loneliness through Airbnb host-guest interactions. *Tourism Management*. 74: 331–333.

Fidrmuc E (2021). Are sharing economy services affected by Covid-19? - A long term analysis based on Big Data. *International Student Research Conference*. Zeppelin University Friedrichshafen.

Fidrmuc J, Horky F, Reichle P, Reck F (2021). Sharing Economy und die Pandemiekriese. *ifo Schnelldienst*. 74(3): 20-24.

Friedman G (2014). Workers without employers: shadow corporations and the rise of the gig economy. *Review of Keynesian Economics*. 2(2): 171-188.

Gossen J (2021). The end of the Sharing Economy? A quantitative analysis of the impacts of COVID-19 on the Sharing Economy in the case of Airbnb. *International Student Research Conference*. Zeppelin University Friedrichshafen

Guttentag D (2015). Airbnb: Disruptive innovation and the rise of an informal tourism accommodation sector. *Current Issues in Tourism*. 18(12): 1192-1217.

Henningsen A, Toomet O (2011). maxLik: A package for maximum likelihood estimation in R. *Computational Statistics*. 26(3): 443-458.

Hlavac M (2018). stargazer: Well-Formatted Regression and Summary Statistics Tables. R package version 5.2.2. https://CRAN.R-project.org/package=stargazer

Hu M, Lee A D (2020). Airbnb, COVID-19 Risk and Lockdowns: Local and Global Evidence. *Coronavirus & Infectious Disease Research eJournal*.

Inside Airbnb. Get the Data. http://insideairbnb.com/get-the-data.html (accessed in July 28, 2021).

Jang S, Kim J, Kim J, Kim S (2021). Spatial and experimental analysis of peer-to-peer accommodation consumption during COVID-19. *Journal of Destination Marketing and Management*. 20 (100563).

Jayawardena C, Tew P J, Lu Z, Tolomiczenko G, Gellatly J (2008). SARS: lessons in strategic planning for hoteliers and destination marketers. *International Journal of Contemporary Hospitality Management*. 20(3): 332–346.

Johnson C, Davis J (2020). *Airbnb* Hosts Struggle with Loss of Reservations, Income Due to Pandemic. NBC Owned Television Stations.
https://www.nbclosangeles.com/news/local/airbnb-hosts-struggle-with-loss-of-reservations-income-due-to-pandemic/2357744/ (accessed in July 28, 2021).

Karlsson M, Nilsson T, Pichler S (2014). The impact of the 1918 Spanish flu epidemic on economic performance in Sweden: An investigation into the consequences of an extraordinary mortality shock. *Journal of Health Economics*. 36(1): 1–19.

Kim S.S, Chun H, Lee H (2005). The effects of SARS on the Korean hotel industry and measures to overcome the crisis: A case study of six Korean five-star hotels. *Asia Pacific Journal of Tourism Research*. 10(4): 369–377.

Kraus S, Roig-Tierno N, Bouncken R.B (2019). Digital innovation and venturing: an introduction into the digitalization of entrepreneurship. *Review of Managerial Science*. 13(3): 519-528.

Lampinen A, Cheshire C (2016). Hosting via *Airbnb*: Motivations and financial assurances in monetized network hospitality. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. 1669–1680.

Liang L J, Choi H C, Joppe M (2018). Exploring the relationship between satisfaction, trust and switching intention, repurchase intention in the context of Airbnb. *International Journal of Hospitality Management*. 69: 41–48.

Mitteldeutscher Rundfunk (2021). Die Chronik der Corona-Krise. https://www.mdr.de/nachrichten/jahresrueckblick/corona-chronik-chronologie-coronavirus-102.html (accessed in July 28, 2021).

Mody M, Hanks L, Dogru T (2019). Parallel pathways to brand loyalty: mapping the consequences of authentic consumption experiences for hotels and Airbnb. *Tourism Management.* 74: 65–80.

Mody M, Suess C Lehto X (2019). Going back to its roots: Can hospitableness provide hotels competitive advantage over the sharing economy? *International Journal of Hospitality Management*. 76: 286–298.

Moon H, Miao L, Hanks L, Line N D (2019). Peer-to-peer interactions: perspectives of Airbnb guests and hosts. *International Journal of Hospitality Management*. 77: 405–414.

Paulauskaite D, Powell R, Coca-Stefaniak J A, Morrison A M (2017). Living like a local: authentic tourism experiences and the sharing economy. *International Journal of Tourism Research*. 19(6): 619–628.

PricewaterhouseCoopers GmbH (2015). The Sharing Economy. Consumer Intelligence Series. https://www.pwc.com/us/en/technology/publications/assets/pwc-consumer-intelligence-series-the-sharing-economy.pdf (accessed in July 28, 2021).

Reichle P, Fidrmuc J, Reck F (2021). The Sharing Economy and its Effects on Housing Markets in Selected European Cities, *mimeo, Zeppelin University Friedrichshafen*.

Richter C, Kraus S, Brem A, Durst S, Giselbrecht C (2017). Digital entrepreneurship: Innovative business models for the sharing economy. *Creativity and Innovation Management*. 26 (3): 300-310.

Shen L, Wilkoff S (2020). Cleanliness is Next to Income: The Impact of COVID-19 on Short-Term Rentals. *Available at SSRN 3740321*

Škare M, Soriano D R, Porada-Rochón M (2021). Impact of COVID-19 on the travel and tourism industry. *Technological Forecasting & Social Change.* 163: 120469.

Statistisches Bundesamt (2021). Konjunkturindikatoren. Arbeitslosenquote Deutschland. https://www.destatis.de/DE/Themen/Wirtschaft/Konjunkturindikatoren/Arbeitsmarkt/arb210a.html (accessed in July 28, 2021).

Sundararajan A (27.11.2014). What *Airbnb* Gets About Culture That Uber Doesn't. Harvard Business School Publishing. https://hbr.org/2014/11/what-*airbnb*-gets-about-culture-that-uber-doesnt (accessed in July 28, 2021).

Taubenberger J K, Morens D M (2006). 1918 Influenza: The Mother of All Pandemics. *Emerging Infectious Diseases*. 12 (1): 15–22.

United Nations World Tourism Organization (2020). Tbilisi Declaration. Actions For A Sustainable Recovery Of Tourism. https://webunwto.s3.eu-west-1.amazonaws.com/s3fs-public/2020-09/Tbilisi-Declaration-WEB.pdf (accessed in July 28, 2021).

Westdeutscher Rundfunk Köln (2021). Lockdown und Shutdown – angemessene Begriffe? https://www1.wdr.de/nachrichten/lockdown-shutdown-begriffe-bedeutung-100.html (accessed in July 28, 2021).

World Health Organization (2020). Timeline of WHO's response to COVID-19. https://www.who.int/news-room/detail/29-06-2020-covidtimeline (accessed in July 28, 2021).

Wu E H, Law R, Jiang B (2010). The impact of infectious diseases on hotel occupancy rate based on independent component analysis. *International Journal of Hospitality Management*. 29(4): 751–753.

Ying T, Wang K, Liu X, Wen J, Goh E (2020). Rethinking game consumption in tourism: A case of the 2019 novel coronavirus pneumonia outbreak in China. *Tourism Recreation Research*. 46: 304 - 309.

Zhang T, Bufquin D, Lu C (2019). A qualitative investigation of microentrepreneurship in the sharing economy. *International Journal of Hospitality Management*. 79: 148–157.