



THE IMPACT OF COVID-19 ON THE EUROPEAN SHORT-TERM RENTAL MARKET

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The diffusion of COVID-19 and related containment measures practically halted tourism flows, which in many countries generate more than 10% of GDP. By exploiting Airbnb data covering the main touristic destinations in Europe, we investigate how the exposure to COVID-19 and the stringency of containment measures affected the market of short-term rentals over the spring and summer months of 2020. We find that the epidemic reduced dramatically both the supply of apartments available for rents and the consumers' demand, up to 9 months ahead. Prices fell as well, even at long time horizons, but with a delay.

The spread of the COVID-19 epidemic worldwide has led many governments to adopt drastic containment measures. Social distancing, limits to mobility, and the forced closure of many productive sectors, together with difficult public health conditions, determined a dramatic drop in GDP in the first half of 2020.

In this note, we describe the impact of the epidemic on the market of short-term rentals. We use microdata collected by InsideAirbnb.com, which analyzes publicly available information about Airbnb listings for several cities worldwide. Our sample includes listings in 19 major European cities located in 15 different countries, from early 2018 until September 2020. Importantly, we can analyze the impact of COVID-19 on supply, demand (captured by booking and cancellation rates) and prices of short-term rentals. Moreover, the data are forward-looking, as we can look at agents' decisions up to 9 months ahead the observation date. Therefore, we can assess whether the spread of the epidemic influenced only short-term decisions or, instead, led agents to review their plans also several months ahead.

Although carried out on a specific market segment, our analysis provides insights on the impact of COVID-19 at a more general level. The results likely extend to the whole tourism sector, considering that: i) Airbnb is the largest peer-to-peer platform of short-term rentals and in recent years has become

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an important player even compared to the traditional hotel industry; ii) accommodation is strictly connected to other activities in the same sector, such as, in particular, restaurants and the cultural and recreational industry. The tourism sector is particularly interesting, as it was the hardest hit by the pandemic and related containment measures. Moreover, tourism is an important driver of the overall economy, especially in some countries like Italy and Spain¹, where its share on GDP, taking into account both direct and indirect effects, is estimated at 13.2 and 14.6%, respectively.²

We report that the outbreak of the epidemic had a dramatic negative impact on market activity, on all dimensions. The supply of houses for rental decreased and customers reacted to the shock by canceling existing bookings and drastically reducing new bookings across all time horizons. Prices behave somewhat differently, as they started to decrease later in the year, probably reflecting owners' assessment that demand would have been rather inelastic. Therefore, although becoming smaller at longer time-horizons, the effects of COVID-19 are quite persistent and, in some cases, they remain significant up to 9 months ahead. Moreover, the reduction in prices suggests that demand shortages may overcome supply shortfalls. Preliminary econometric estimates (not covered in this note) confirm these results.

1. The data

Our sample includes Airbnb listings for 19 major European cities located in 15 different countries.³ These cities are the capital of their country or major destination of tourist flows. We retrieve web-scraped data on listings from InsideAirbnb.com, an independent project collecting data from the Airbnb website to study the implications of short-term rentals on the housing market. For each city, we have snapshots of listings collected monthly between April 2018 and September 2020, although they may not refer to the same day of the month. A snapshot is the collection of all listings in a city published on www.airbnb.com on a given day, and from each of them, we keep in our sample only listings of entire apartments, excluding shared or private rooms that may be differently affected by the ongoing epidemic due to social distancing measures.

All information in our dataset is public and displayed on the Airbnb site. We observe many details for each listing (for example, information about the host, physical characteristics of the house, location, rental policy), including the calendar availability for the following 365 days, the guests' reviews, and the price per night of the accommodation. We mostly use the information on calendar availability, which allows us to estimate the number of bookings and cancellations and occupancy rates.⁴ We can infer the evolution of the occupancy rates also through guests' reviews, although we cannot use them to compare the occupancy rate across cities. Finally, calendar data allow observing prices and estimating hedonic indexes over different time horizons.

The analysis of these data requires some caution. Airbnb is an online marketplace that allows homeowners (hosts) to offer rental services to other people (guests). Differently from the standard hotel and accommodation industry, a prominent share of suppliers consists of non-professional operators.⁵ Those hosts may not rent the house regularly and may not update the calendar frequently;

¹ See MacDonald *et al.* (2020).

² World Travel and Tourism Council, 2017.

³ The cities are Amsterdam, Athens, Barcelona, Berlin, Brussels, Copenhagen, Dublin, Florence, Geneva, Lisbon, London, Madrid, Milan, Oslo, Paris, Rome, Stockholm, Venice and Vienna.

⁴ For each day in the calendar, we can only observe if a house is available for booking or not. An apartment cannot be available for booking because it was already booked or because the host does not accept reservations for that particular day.

⁵ Recently, intermediaries have emerged who specialize in taking empty houses over from owners and managing short-term rentals on the Airbnb marketplace.

thus, calendar data can be the same in two different snapshots, and we cannot infer activity in the time-lapse. Furthermore, some hosts deliberately limit the time horizon for which they accept bookings (for example, giving the possibility to book only up to 90 days ahead). In this case, the house appears unavailable beyond this time horizon.

To limit these issues and identify hosts that are more active in the market, we make the following choices. First, from each snapshot, we keep only listings with an updated calendar compared to the previous observation. We consider the calendar updated if at least one of the following conditions is satisfied: (i) there is a change in the availabilities compared to the previous snapshot; (ii) the host has changed its prices. Second, if the calendar dates for a listing are all unavailable from a specific date onwards, we assume they are not bookable; hence, we include these listings in our analysis only for the period in which they are bookable.

Using these criteria, we select the most active listings and hosts on the market. In this work, we are interested in quantifying the effects of the COVID-19 epidemic on the supply and demand for short rentals promptly. Considering listings with outdated calendars, or more generally host not very active on the market, would have led to underestimating the effects of the shock.⁶

2. The evolution of the epidemic and containment measures

The first COVID-19 case was reported in China, in the Hubei region, on January 9, 2020.⁷ In Europe, the first COVID-19 cases were identified at the end of January; however, the disease remained mostly undetected until the end of February, when infection clusters in Northern Italy became apparent. In Italy the epidemic gained momentum at a fast pace, prompting the Italian authorities to impose a nationwide lockdown since March 10. In March and April the epidemic spread in all European countries, albeit with different timings and intensities. Beside Italy, the hardest and earlier hit countries were Spain, Austria and Belgium, where the positivity rate (the ratio between the number of infections and the number of tests) reached its peak already in late March. On the other side of the spectrum, in Germany, Portugal and Greece the positivity rate never exceeded 10% during the first wave (Figure 1).

Regarding the policy actions adopted to fight the virus, Italy, Spain and Austria enforced a strict lockdown already in March (Figure 1). Other countries adopted different approaches: the UK government, for instance, imposed shutdown orders only when the strategy of achieving herd immunity appeared to be too costly in terms of human lives. Sweden was the only European country that relied on mild mitigation policies, notwithstanding relatively high levels of contagion.

In May, the epidemiological situation improved and containment measures were eased; since June, people were allowed to travel also outside their country of residence, although with some restrictions. However, some European countries, like Spain, experienced a new surge in COVID-19 cases already in early July. In France, the UK, the Netherlands and Belgium the contagion quickly spread in August and September, while in Italy and Germany the diffusion of the infection remained modest until the beginning of October.⁸ Despite rising infection rates, until September - the end of our sample period

⁶ We do not believe that these are universal criteria to adopt in all circumstances, as they may not be necessary for other analyses. After all, Airbnb aims to allow people (not professionals) to share their house with other people in return for a fee, and the calendar may be outdated because bookings are very low in some periods of the year.

⁷ Several studies have then proved that the coronavirus was already diffused; however, here we are interested in the official communication and the spread of news to the public.

⁸ See Borin *et al.* (2020) for a detailed analysis of worldwide evolution of the pandemic since the summer.

- governments avoided a new tightening, hoping to keep the evolution of the epidemic under control while preserving economic activities.

3. The effects of the epidemic on short-term rental markets

Difficult health conditions and containment measures adopted by governments led to a collapse in the mobility of people between cities and between countries. Consequently, levels of activity in the accommodation sector, and thus also in the short-term rental market, collapsed. The epidemic led to a gradual decrease in the number of houses on the market. Customers reacted to the shock by canceling existing bookings and drastically reducing new bookings across all time horizons. Therefore, the accommodation facilities' occupancy rates dropped, and owners progressively reduced the required prices, even on longer time horizons.

For each variable, we take into account the possibility that the effects of the epidemic may have been heterogeneous at different time horizons (denoted by h), going from 1 month ahead up to 9 months ahead. Then, we compute for each city the y-o-y monthly variations and show how the 10th, 50th and 90th percentiles of the distribution of these variations have changed over time.

The supply of short-term rentals. Before the COVID-19 outbreak, the market for short-term rentals was expanding in most of the cities in our sample. In January and February, the number of listings was decreasing significantly only in Dublin and Amsterdam, due to pre-existing downward trends. The y-o-y median growth rate of available accommodations across cities was about 10%. In Vienna, Athens and Brussels, growth rates were close to 20%.

This positive trend was interrupted in March (Figure 2). Initially, the supply contracted in particular in Italian cities, which were the first to be affected by the epidemic. The growth rate turned negative, from 9% to -14% in Rome and from 17% to -9% in Milan. Subsequently, the worsening affected all the other cities; in May the growth rate of the number of listings was negative everywhere.

The drop in supply was quite strong between March and May, but in most cities the decline continued even afterward. Between May and September, the offer was about a quarter lower than the corresponding period in 2019. In Dublin and Amsterdam, the offer roughly halved.

The sharp drop in supply observed in the spring can be mostly explained by governments' restrictive measures, which reduced the number of hosts actively operating in the market. Despite the improvement in health conditions and the loosening of containment measures, the downward trend persisted also in the summer months, probably due to the uncertainty regarding the evolution of the epidemic, the travel restrictions in many countries and the unfavorable perspectives for the tourism sector. Many owners may have in fact preferred to rent their homes in the long-term rental segment, waiting for a return to normality. Moreover, the epidemic led to a worsening of the average quality of the apartments on the market, as can be deduced from the analysis of price trends (see below).

Cancellations and new bookings. The effects of the epidemic on current and future demand are visible. First, we estimated the share of booking cancellations over different time horizons.⁹

In March, the share of one-month-ahead bookings that were canceled increased markedly in all cities (Figure 3). The median increase compared to March 2019 was about 40 percentage points. In some cities, the increase in the cancellation rate exceeded 60 points.¹⁰ The one-month-ahead cancellation rate was much higher compared to normal times, even in the following months, although the gap gradually narrowed.

⁹ We estimate the share of cancellations instead of the absolute number to smooth out the strong seasonal pattern on these statistics. Technical details about the estimation of all indicators discussed in this note are in the Appendix.

¹⁰ In normal times, the one-month-ahead cancellation rate varies between 2% and 10%.

Initially, the impact on cancellations was higher in the Italian touristic cities. In Rome, Venice and Florence the one-month-ahead cancellation rate was about 70% in March. The worsening was more limited in the capitals of Northern European countries. Except for March, the impact was also lower in Milan, although Lombardy was the first Italian region hit by the epidemic and the most affected one. That could be due to the stronger business orientation of Milan, which plausibly makes the hosts' activity relatively less dependent on the dynamics of tourism flows compared to the other cities under scrutiny.¹¹ We observe a similar pattern for London, although the pandemic severely hit the UK.

The sharp increase in the share of pre-existing bookings that were cancelled in March and April is plausibly due to the mobility restrictions imposed by the governments.¹² However, travelers also canceled many reservations up to 3 months ahead, at a rate significantly higher than in normal times. Cancellation rates converge to those prevailing in normal times from the six-months ahead horizon.

The number of estimated new bookings also fell sharply since March (Figure 4). In April, the booking rate's median gap across cities compared to a year earlier reached -23 percentage points. Venice recorded the worst performance: the ratio of new bookings over previously available accommodations one-month-ahead fell to 6%, about 40 points lower than in 2019. All the main tourist destination cities were hardly hit also in terms of cancellations, mostly because many bookings for the summer months are usually made in spring.

Differently from cancellations, booking rates decreased significantly even at longer horizons (beyond 6 months). This indicates that customers significantly revised their travel plans since the pandemic outbreak without waiting for the crisis's possible resolution. The fact that cancellations were instead limited to a shorter horizon may be explained by cancellation policies' flexibility: in March and April, some guests may have decided to wait before cancelling their reservations for the summer months as they could do it without incurring in immediate penalties.

Occupancy. Because of the joint occurrence of more cancellations and fewer new bookings, the vacancy rate – measured as the share of listings available for booking – skyrocketed in all cities (Figure 5). The impact is visible up to six months ahead. In the aftermath of the COVID-19 outbreak, the vacancy rate's median increase was about 40 percentage points for one month ahead reservations and 20 percentage points over a three-month horizon. As expected, the largest increase occurred in the main touristic destinations. The vacancy rate somewhat decreased during summer, although remaining far larger than in 2019 (the median variation was about 20 percentage points for one-month ahead reservations). In Barcelona, during the summer months, the vacancy rate was 40 percentage points larger than in 2019.

The insights derived from the vacancy rate are consistent with those coming from the average monthly number of reviews per apartment, which is a proxy of the occupancy rate.¹³ This indicator decreased markedly during the lockdown, reaching a median y-o-y reduction of about 60% in April

¹¹ According to Istat data, in 2018 the percentage of nights spent by foreigners in the province of Milan was almost half of the average share in the provinces of Rome, Venice and Florence.

¹² Formally, Airbnb remained active throughout the lockdown period because the short-term rentals offered through the platform could provide accommodation also for health workers. In Italy, for instance, Airbnb rentals are not formally considered as a part of the accommodation sector but can be run as a private rental activity. In practice, however, the majority of Airbnb services target the tourism sector (Guttentag *et al.*, 2017), which was forcefully shutdown.

¹³ The vacancy rate measures perspective bookings observed at given date. In this case, the reference month refers to the date of web scraping. This indicator can be noisy, because data are not downloaded always in the same day of the month. At the opposite, the indicator based on the reviews refers to all the reviews observed in a given month. For this reason, reviews-based indicator can be more effective in measuring the occupancy rate.

(Figure 6). Subsequently, the indicator improved, especially in July and August, although remaining significantly lower than a year earlier (the median y-o-y percentage variation was -17%).

However, the vacancy rate and the average number of reviews measure only the degree of utilization of the apartments offered on the market. By taking into account the simultaneous reduction in the supply of houses (extensive margin), the contraction in the absolute number of bookings was even stronger (Figure 7). The median reduction in one-month ahead total bookings was about 60% compared to 2019. The effect was significant over all time-horizons, up to 9-months ahead, and more persistent compared to the previous indicators: bookings increased in July and August, but very modestly.

Prices. Before the epidemic, prices were growing markedly in most cities: the median variation was almost 10% y-o-y. In March and April, prices were not significantly affected, suggesting that the hosts considered demand to be largely inelastic, which is reasonable given that the fall in demand was due to both fear of contagion and limitations to mobility imposed by law (Figure 8). However, prices gradually decreased in the following months: the median variation of one-month ahead prices reached -17% y-o-y in September. The Italian and Spanish cities in our sample are those where prices fell the most. In Barcelona, in particular, during the summer months, prices were more than a third lower than in the previous year.

The drop of prices is quite significant, considering the upward trend before the epidemic and given the simultaneous sharp contraction in apartments' supply. Hosts reduced prices markedly up to one year ahead. That is important for two reasons. In our observation sample, future prices are excellent proxies for the spot prices in the following months. That is to say that the median price for renting a house in August is similar when posted in May, in July or in August. Second, accommodation prices published on Airbnb are significantly correlated with hotel prices.¹⁴ Therefore, our results have implications beyond the Airbnb marketplace, pointing to a decrease in prices for accommodation services even when health conditions have normalized.

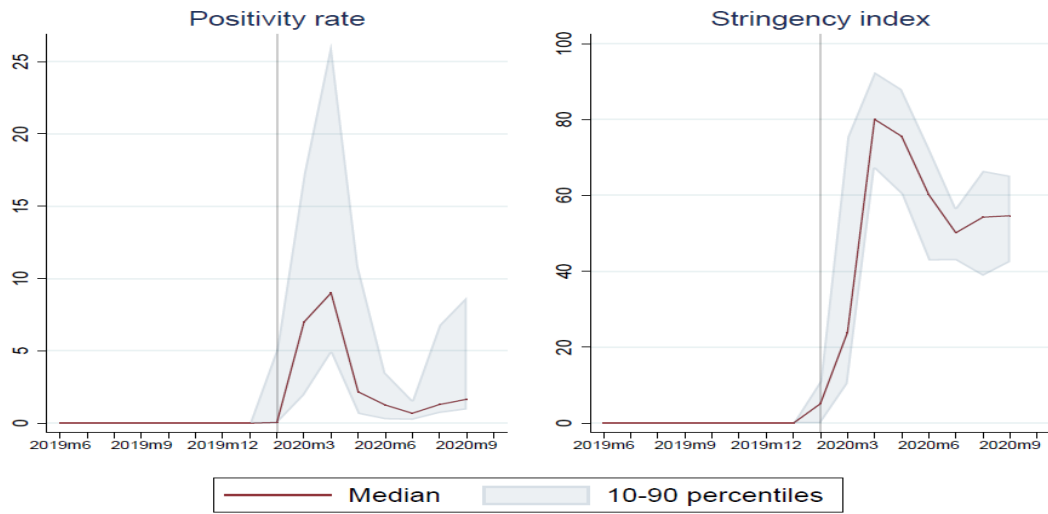
References

- Borin, A., F. P. Conteduca, M. Mancini and L. Rossi, “*Recenti Sviluppi della Pandemia COVID-19 nel mondo*”, Nota Covid, 20 October 2020.
- Guttentag, Smith, Potwarka and Havitz (2017), “Why Tourists Choose Airbnb: A Motivation-Based Segmentation Study”, *Journal of Travel Research*.
- Hale, T., Thomas Boby, Noam Angrist, Emily Cameron-Blake, Laura Hallas, Beatriz Kira, Saptarshi Majumdar, Anna Petherick, Toby Phillips, Helen Tatlow, Samuel Webster. “*Variation in Government Responses to COVID-19*”, Version 9.0. Blavatnik School of Government Working Paper, 24 November 2020.
- MacDonald M., Piazza, R. and Seher, G. (2020), “*A Simple Guide to Estimating the Impact of COVID-19 on Travel and Hospitality Activity*”, IMF Research, Special Series on COVID-19, 2 September 2020.

¹⁴ The correlation between the prices of Airbnb apartments and the price index of accommodation services of the respective countries is 0.4 in the period under consideration. For Italian cities, for which we have the corresponding price index of accommodation services at provincial level, the correlation is 0.6.

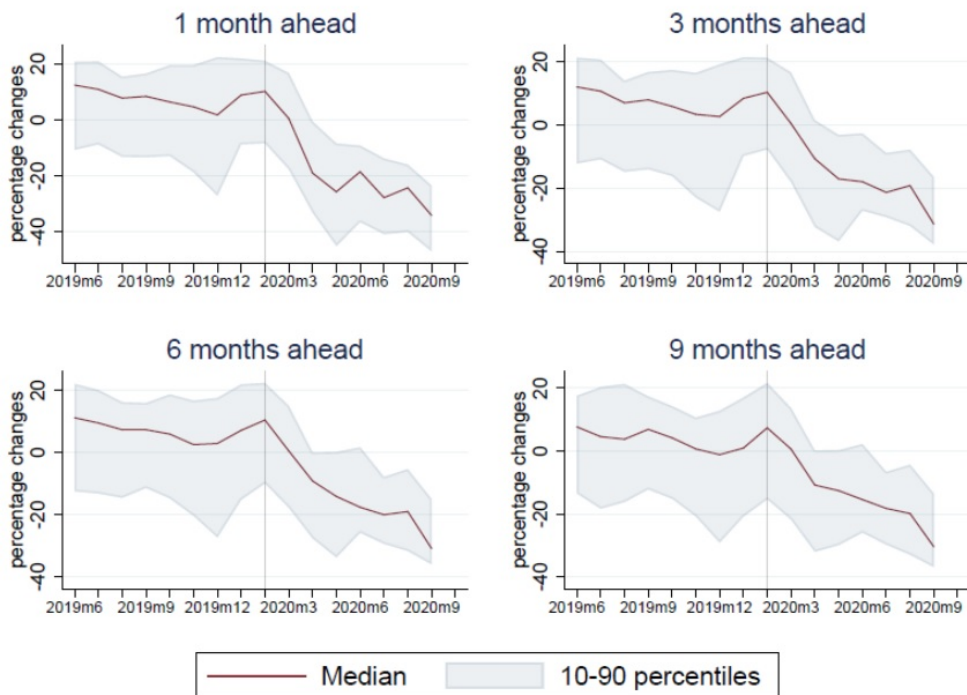
Figures and Tables

Figure 1. The evolution of the epidemic and policy responses



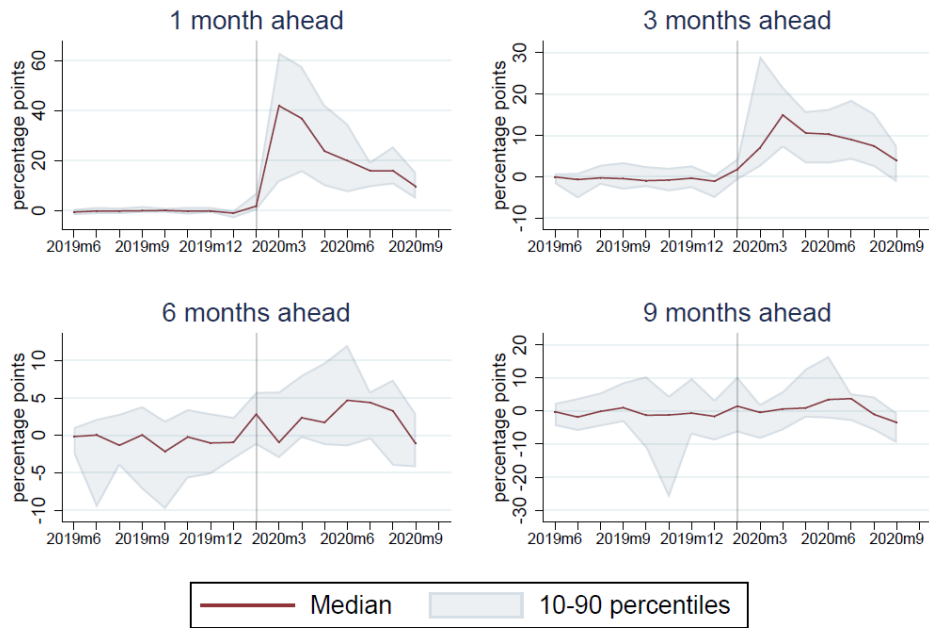
Note: The positivity rate is the share of detected infections over total tests. The data on the spread of contagion is taken from the European Center for Disease Prevention and Control (ECDPC). The Oxford Stringency Index is described by Hale *et al.* (2020).

Figure 2. Number of short-term rentals



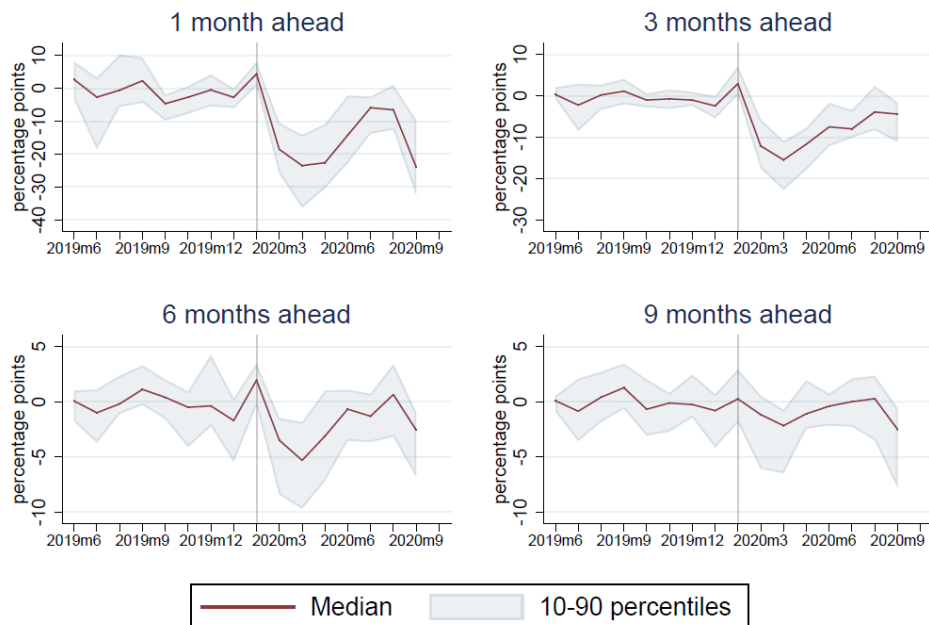
Note: Y-o-y percentage changes. Supply can change over different time horizons because some hosts allow reservations only for a limited period forward in time.

Figure 3. Cancellation rates



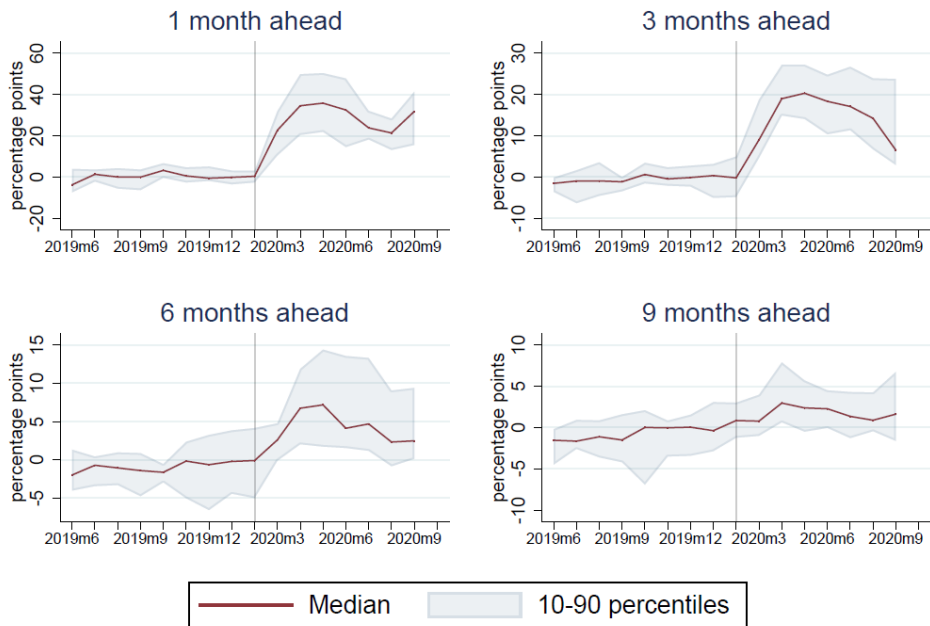
Note: Absolute differences compared to the previous year (percentage points).

Figure 4. Booking rates



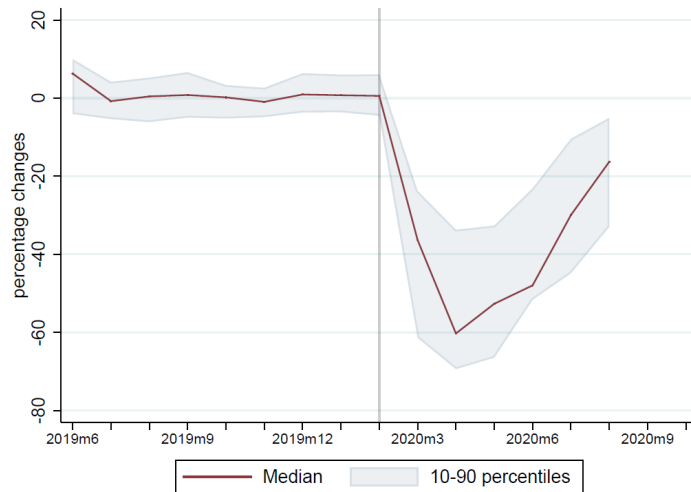
Note: Absolute differences compared to the previous year (percentage points).

Figure 5. Vacancy rates



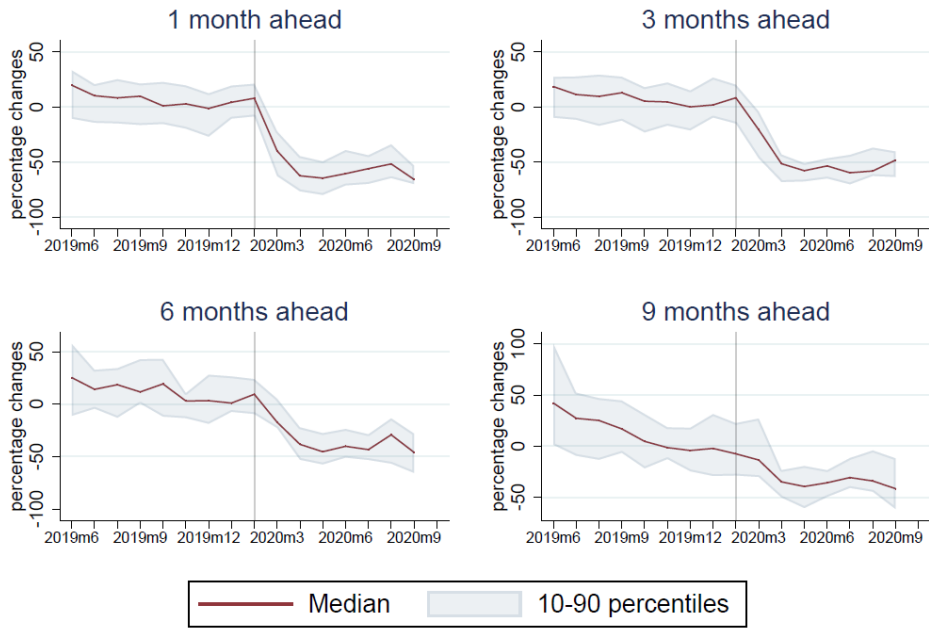
Note: Absolute differences compared to the previous year (percentage points).

Figure 6. Reviews



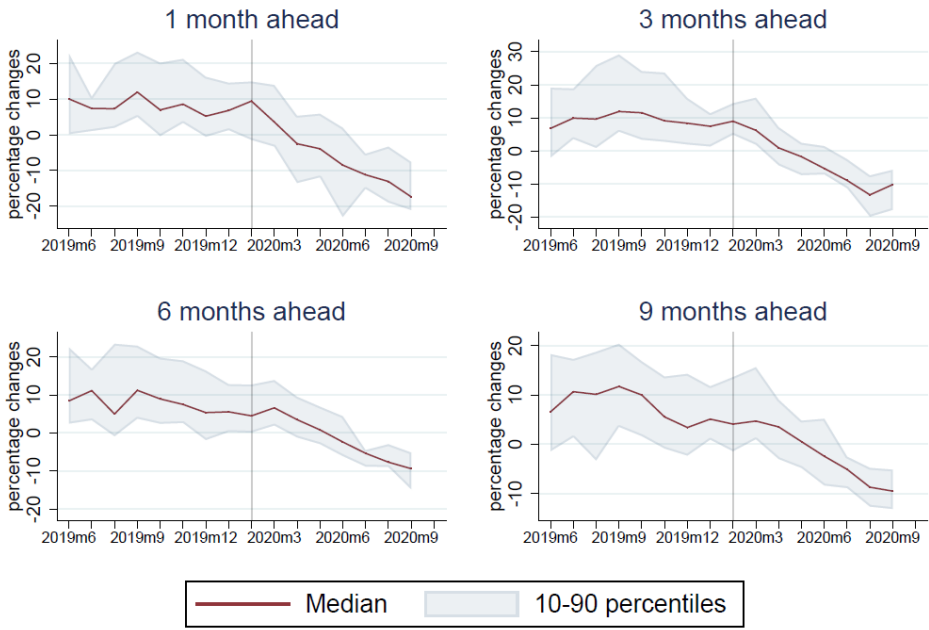
Note: Y-o-y percentage changes.

Figure 7. Total bookings



Note: Y-o-y percentage changes.

Figure 8. Prices



Note: Y-o-y percentage changes.

Appendix

Indicators

Below we describe the methodology underlying the indicators presented in the main text.

Cancellation rate. We can only observe if a given apartment is available or unavailable for booking on a given day. Then, we estimate cancelled reservations based on the number of newly available slots for reservations compared to the previous month. To compute the indicator for the month T , we consider listings present both in the snapshot for month T and the snapshot for month $T-1$. For each listing, we observe the calendar both at time T and $T-1$, and we compute the number of days that at time T are available for reservation out of those that at time $T-1$ were unavailable. We compute for each listing the ratio between the newly available slots for reservations at time T and the number of unavailable slots at time $T-1$ and then take the average ratio across all listings. We consider a ratio instead of the absolute number of cancellations to smooth out seasonal patterns. Finally, we partition future dates on the calendar in different months (30 days period) starting from day T , and we compute the indicator for different time horizons. For example, we compute the share of cancelled bookings five months ahead by considering the number of newly available slots between 120 and 150 days since day T out of those that were unavailable for the same days at time $T-1$.

Booking rate. The methodology underlying the estimation of new bookings is the same used to estimate cancellations, but we consider the number of newly unavailable slots at time T out of those that were available at time $T-1$.

Vacancy rate. We compute the daily share of available slots for reservations across all listings. Then, we partition the calendar in different months (30 days period) starting from day T , and we compute the average for each period.

Occupancy rate. Although we cannot observe ex-post how many days guests have occupied a listed house, we can figure out the evolution of the occupancy rate by using guests' reviews. Airbnb urges guests to give their opinion on their stay within 14 days after checking out; beyond this time, it is no longer possible to provide a review. Since hosts are not professionals, guest reviews are essential for this market to work; otherwise, it would become a "lemon" market. As a result, Airbnb sends several reminders to users to leave their review: according to Airbnb estimates, users review 75% of their stays. Reviews allow tracking the number of stays across different months (with a potential 14 days' lag) in the same city. In particular, we compute for each listing the number of monthly reviews and take the average across all listings.

Unfortunately, we cannot use reviews to compare the occupancy rate across cities because the average period of stay is different, as the reasons why people travel to that city. For example, we expect the average monthly number of reviews per listing to be higher in Venice than in Milan. In the first case, guests are mostly tourists staying in the city for a limited time. In the second case, guests may be workers temporarily moving to the city for job-related reasons, and their period of stay could be longer than for tourists.

Prices. We compute for each listing the average price in euro at different time horizons, as explained above. We consider only prices for dates that are available for booking. Then, we compute the average across listings.