

Impact of Covid-19 on Tourism and Hospitality: Evidence From Airbnb

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1. Introduction

The tourism industry is one of the industries most affected by the ongoing covid-19 pandemic. However, the impact on workers, businesses and the economy remains limited.

Amidst the COVID-19 pandemic, people start to experience the “new norm” that has created record-level disruptions to almost every aspect of their lives. As such, the tourism industry has been severely impacted by the limit of mobility, due to government prevention measures such as lockdown, and people’s reduced interest in traveling. In particular, peer-to-peer accommodations such as AirBnB have been affected heavily by both the short-term and long-term shocks.

Since its products and services rely heavily on consumer mobility and social activity, the sector is currently in a financial deadlock that is unlikely to loosen up before the end of the pandemic. Due to the ongoing nature of the pandemic, some of 2020’s earlier research findings might already be obsolete, and quantifiable information is either limited, unavailable or outdated.

Therefore, decision makers who need up-to-date intelligence on the financial impact of COVID-19 are left in the dark. This holds for governments trying to allocate bailout resources, managers trying to measure their portfolio losses, as well as individual hosts benchmarking their prices.

In this report, we examine the impact of COVID-19 on AirBnb activities in two main touristic cities in Portugal – Lisbon and Porto - across various dimensions. We used the changes of bookings and reviewed contents before and after the pandemic hit the destinations, using a high-granular dataset.

2. Methodology

This report was developed in the context of Nova SBE Data Science Knowledge Center (DSKC). Since October 2020, a team of masters' students worked closely with DSKC Faculty member, Prof. Qiwei Han, on a data science project about the "Impact of Covid-19 on Tourism and Hospitality". As such, this report was written by students Jannis Fler and Matteo Matera and supervised by Prof. Qiwei Han.

The research team gathered rich historical data about the Airbnb business in Lisbon and Porto from Inside Airbnb. The data consists of bookings and price information for 50,000 properties at daily level in 2019 and 2020, with Inside Airbnb providing new information regularly. The dataset allows for the calculation of the number of bookings, median prices and revenue on any given day.

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Photography by Ed Robinson, Clear Space

3. Main Findings

3.1 BOOKINGS

FIGURE 1.
DAILY BOOKINGS IN LISBON

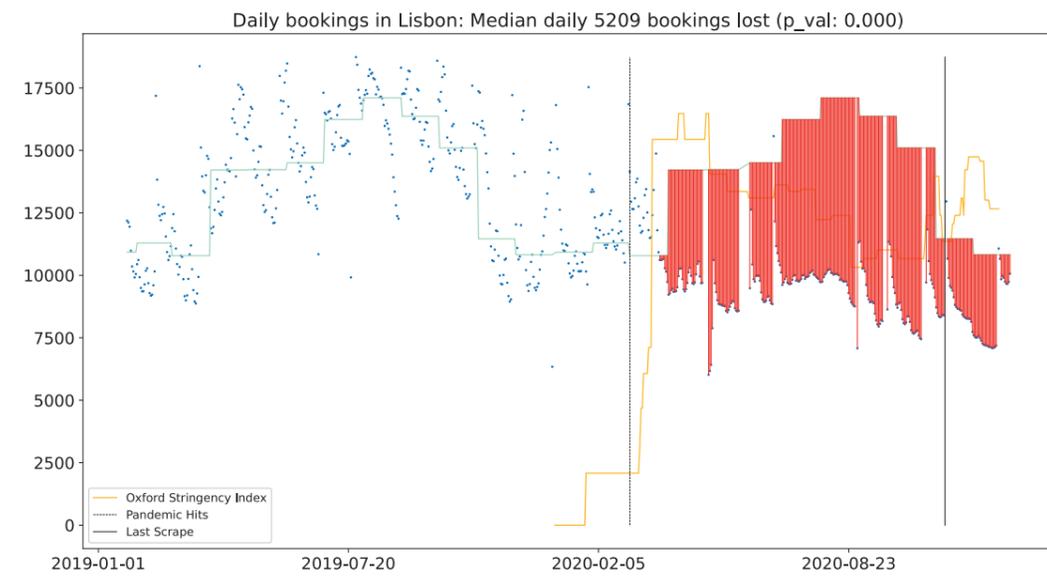
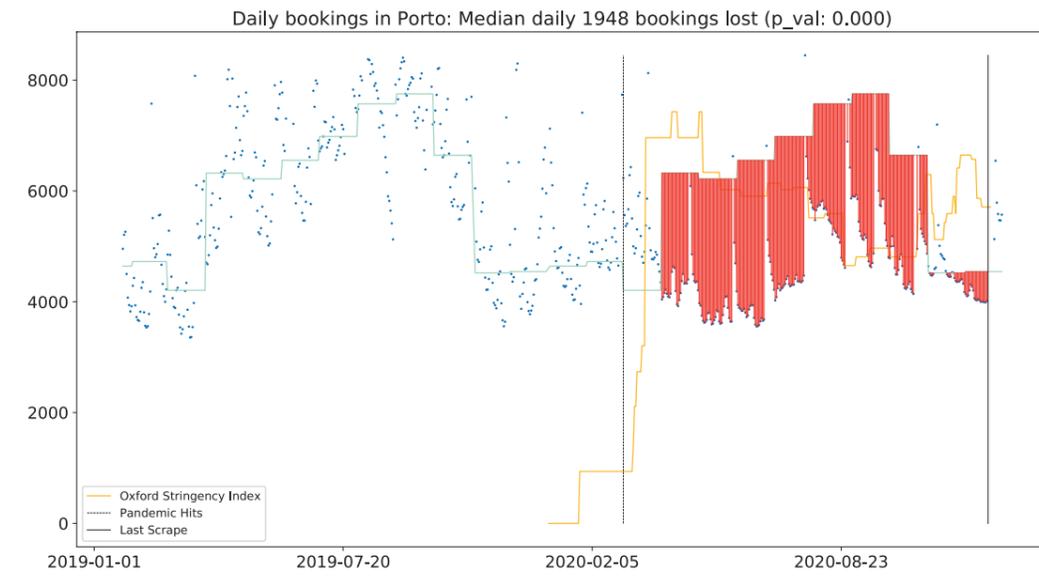


FIGURE 2.
DAILY BOOKINGS IN PORTO



KEY OBSERVATIONS:

- In both Porto and Lisbon, about 2,000 and 5,200 median daily bookings have been lost since the pandemic, respectively.
- The summer months are the peak season in Portugal. However, due to the pandemic, the number of bookings could not reach the previous year level.
- The number of bookings is negatively correlated with the Oxford Stringency Index, i.e., the stricter the government measures are, the less bookings are realized



3.2 PRICES

FIGURE 3.
LISTING PRICES IN LISBON

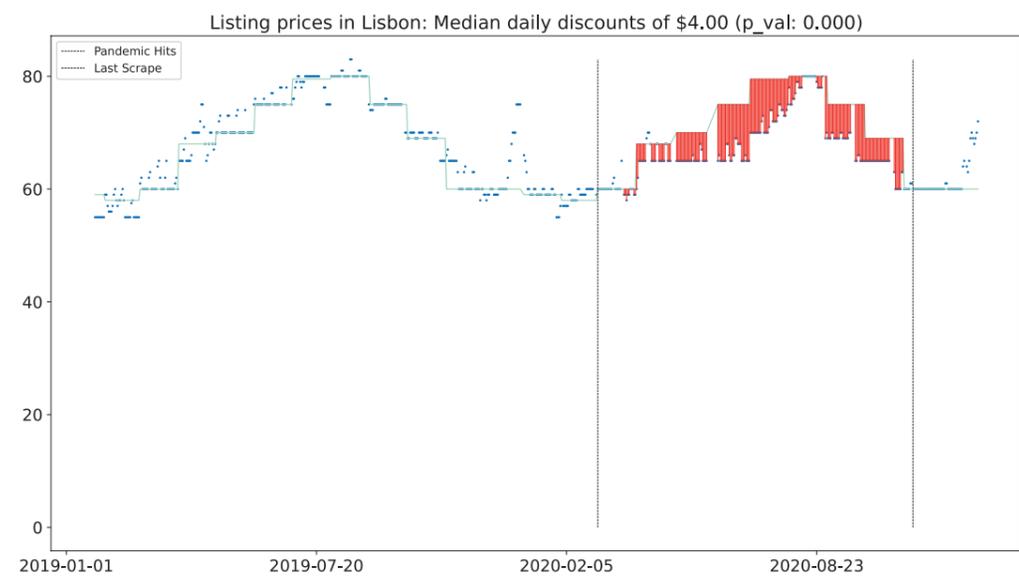
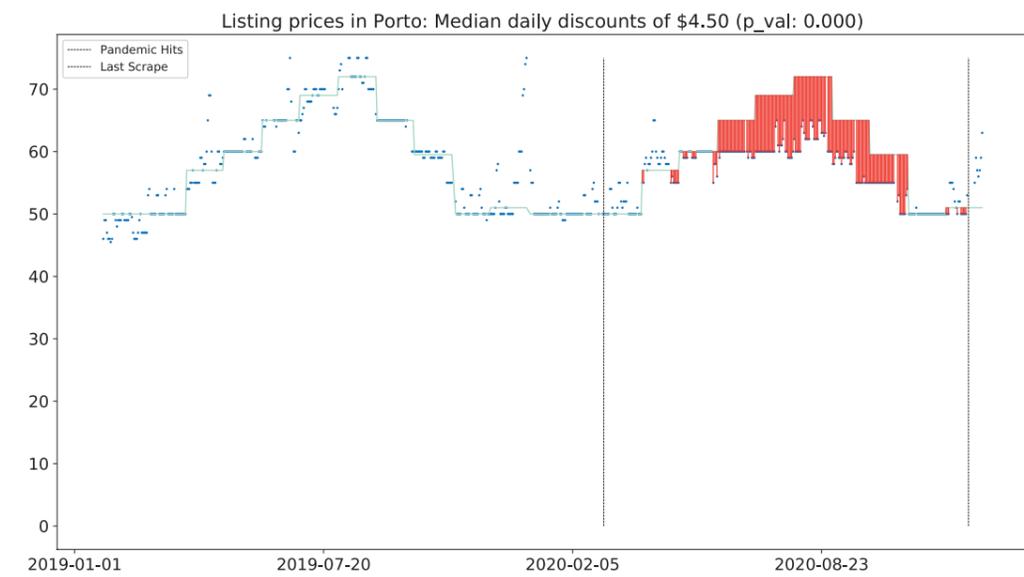


FIGURE 4.
LISTING PRICES IN PORTO



KEY OBSERVATIONS:

- In both cities we identify an average decline of 4 euros in booking prices, since the pandemic.
- During the summer months of 2020, the usual price levels could not be recovered to the same level observed in 2019.
- In Porto, the average price decline was higher than in Lisbon.



3.3 REVENUES

FIGURE 5.
REVENUES IN LISBON

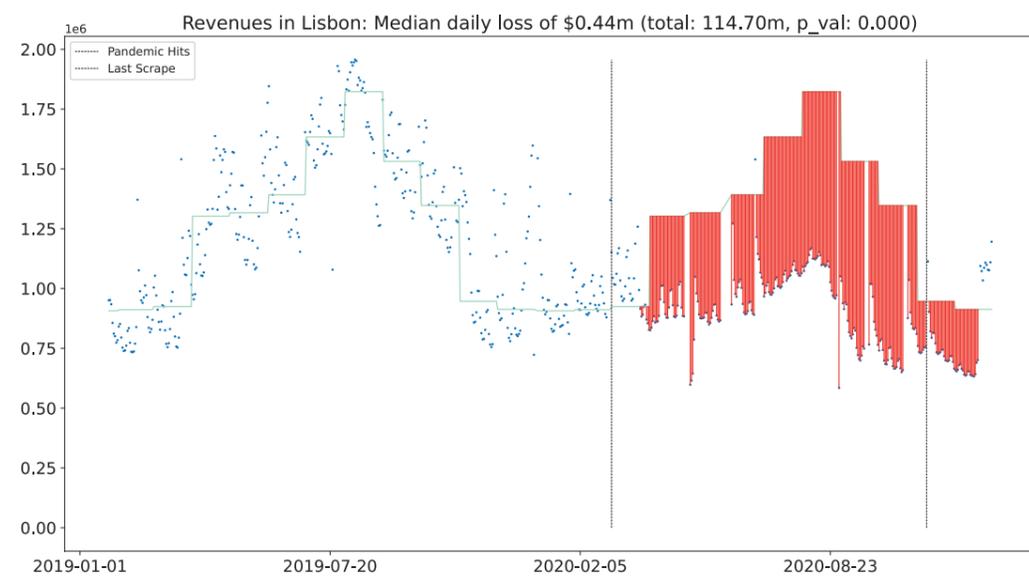
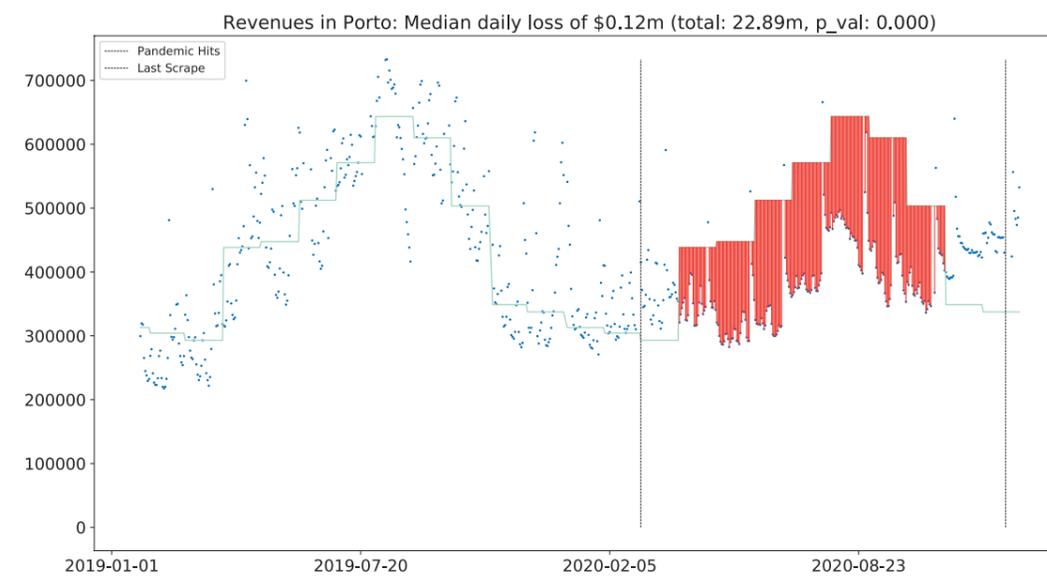


FIGURE 6.
REVENUES IN PORTO



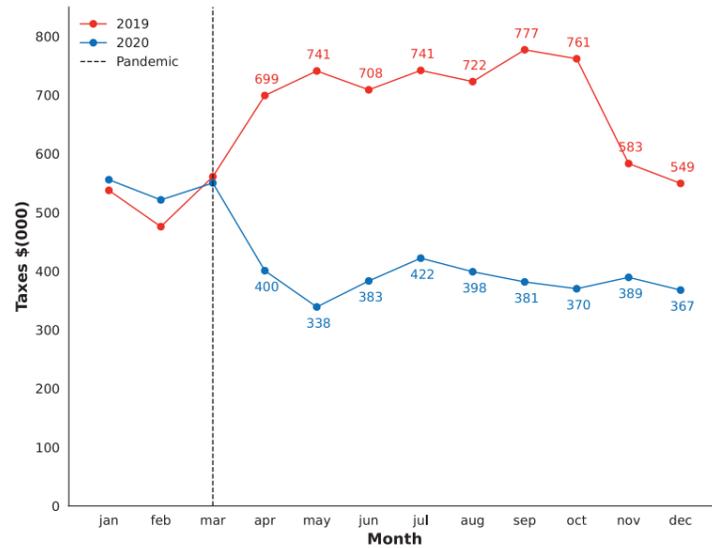
KEY OBSERVATIONS:

- Calculated based on the combination of bookings and prices, revenues display a similar loss pattern.
- In Lisbon, a revenue loss of more than 113 million euros can be estimated, due to the pandemic, in 2020.
- In Porto, the total revenue loss of 23 million euros can be estimated, due to the pandemic, in 2020.

3.5 TAX REVENUE LOSS

FIGURE 9.
LISBON TAX REVENUE LOSS IN 2020 DUE TO COVID-19

2.8 million in city tax revenues have been lost during the pandemic



Taxes received by the Municipality have almost halved since the start of the pandemic

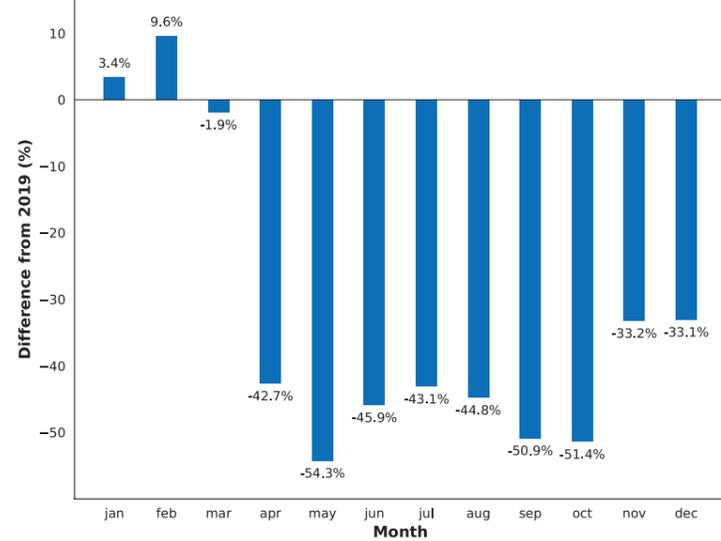
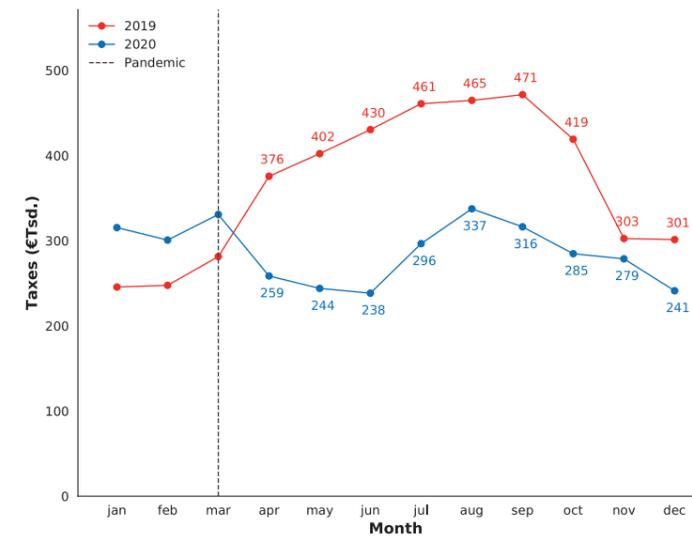
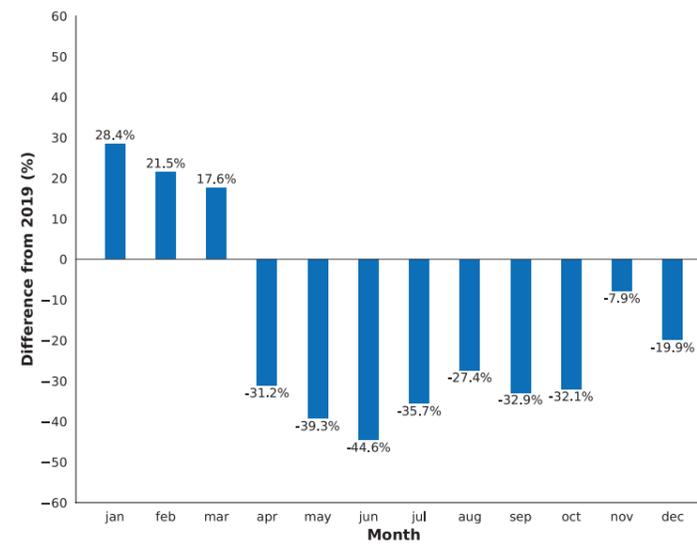


FIGURE 10.
PORTO TAX REVENUE LOSS IN 2020 DUE TO COVID-19

1.0 million in city tax revenues have been lost during the pandemic



Since the beginning of the pandemic the monthly city tax revenues have been below previous year levels



KEY OBSERVATIONS:

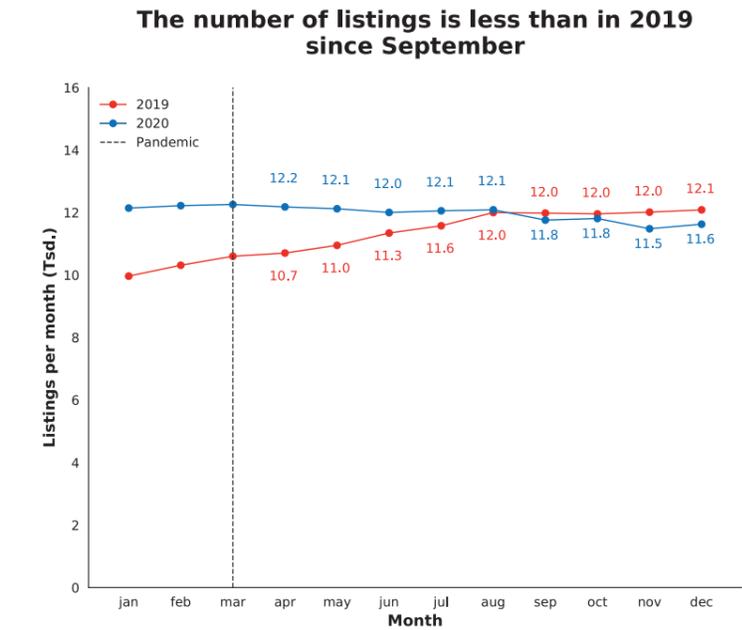
- Both Lisbon and Porto municipalities suffered from a severe loss in occupancy tax revenues, since the pandemic.
- In Lisbon, the tax revenue loss is estimated to be 2.8 million euros in 2020.
- In Porto, the tax revenue loss is estimated to be 1.0 million euros in 2020.

3.6 LISTINGS

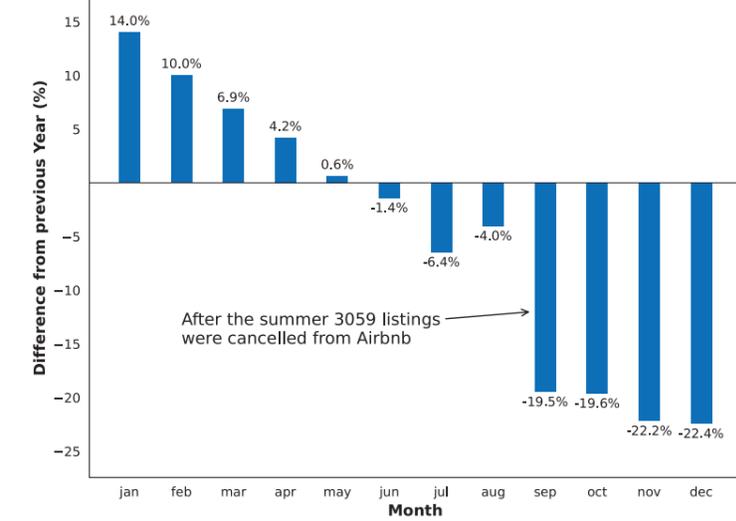
FIGURE 11. LISBON NUMBER OF LISTINGS IN 2020



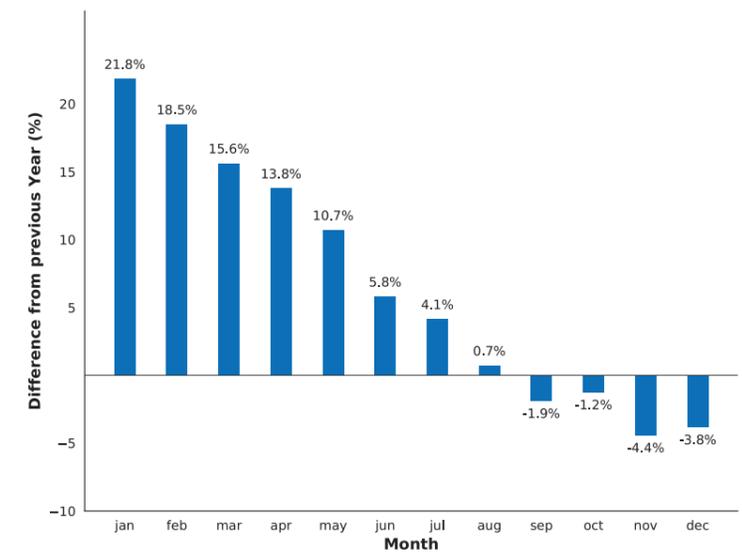
FIGURE 12. PORTO NUMBER OF LISTINGS IN 2020



The impact of the Pandemic has greatly increased since September



Listings continuously decreased compared to previous year



KEY OBSERVATIONS:

- With a lag of 3-4 months, the number of listings in each city started to decrease since the pandemic.
- AirBnB hosts realized that the tourism business is not profitable and switched to offer their properties for long-term rentals.

3.7 COVID-19 IMPACT

FIGURE 13.
LISBON OVERALL IMPACT OF COVID ON AIRBNB (2020)

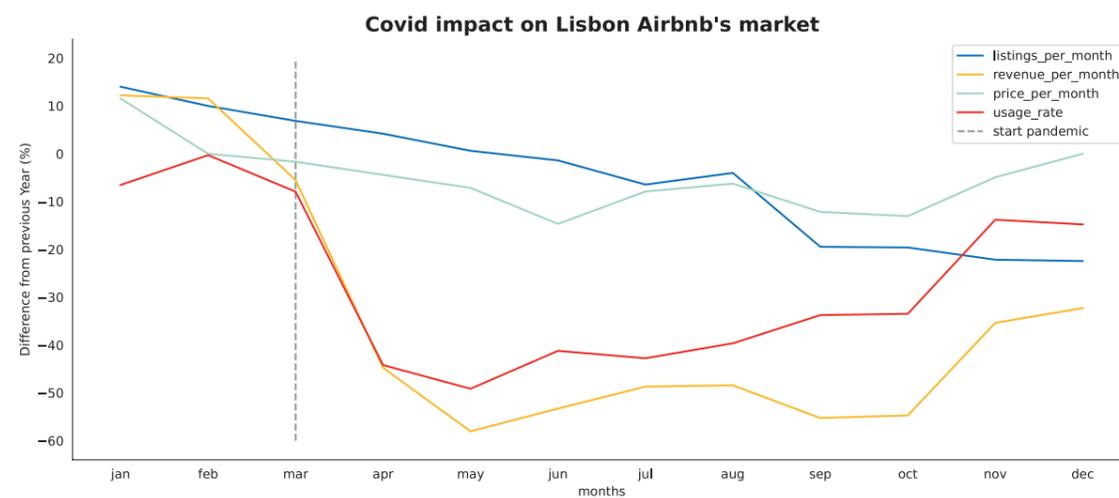
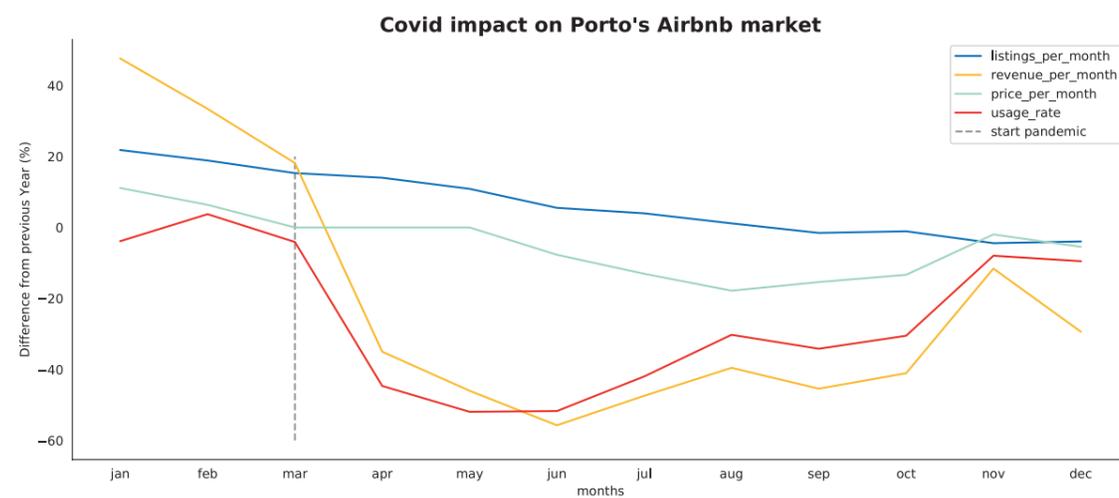


FIGURE 14.
PORTO OVERALL IMPACT OF COVID ON AIRBNB (2020)



KEY OBSERVATIONS:

- In Lisbon, both revenues and occupancy rate fell immediately after the pandemic. The number of available listings has a steady decline with a sharp drop in September.
- A similar pattern for revenues and occupancy rate can be observed in Porto, but with no sharp drop in the number of listings.
- AirBnB hosts may need extra time to adapt to the impact of the pandemic. First, they decreased prices, then they took their listings off of the market.



Photography by Anna Shvets, Pexels

4. Implications

Covid-19 imposes severe threats to Portugal's tourism market.

Bookings, prices and revenues decreased significantly since the pandemic. This poses many challenges for AirBnB hosts whose livings critically depend on renting out their properties for tourism purposes. Meanwhile, municipalities also suffer from the loss of millions of euros of occupancy tax revenues.

The loss calculated in our analyses is just a direct estimation from the large-scaled data retrieved from the AirBnB platform. The overall loss is far greater for the tourism-related businesses that are indirectly affected – for example restaurants, leisure activity providers, etc.

In this sense, how can governments support AirBnB hosts during this time?



5. Appendices

5.1 APPENDIX I | METHODOLOGY



I. Reading the data

In order to calculate the daily bookings, prices and revenues, the calendar.csv files from insideairbnb.com have been used. The files contain the booking information for every property for every single day one year into the future from the date of retrieval. For any given day it can be inferred whether a listing is still available and for which price it is offered. However, the further this information is in the future the less accurate it is. Fortunately, with every new scrape from insideairbnb.com, one gets updated information with which the initial calendar dataset can be updated iteratively. The result is a calendar dataset with the latest booking and pricing information.



II. Filtering the data

In the next step of the process, the relevant time period for the analysis was filtered out. For this work we focused on the period from 21.01.2020 to 31.12.2020, because the calendar csv files prior to that time period do not contain price information. Afterwards, we filtered out available offerings, which prices were outside of the 95% confidence interval. We did so, because some landlords, instead of delisting their properties, would just increase the price to an absurd level. Keeping these offerings in the dataset, would falsify our analysis.



III. Aggregating the information

In order to prepare the data for analysis, the information has been aggregated on a daily basis by calculating the sum of booked properties and revenues as well as the median prices. Afterwards, the monthly median bookings, prices and revenues before the covid-19 pandemic were calculated and this information has then been included row-wise into the dataset based on the date column. The before-covid-19 medians can be used as a simple prediction of the bookings, prices and revenues one would have expected to observe without the covid-19 pandemic. The prediction can then be compared to the actual levels during the crisis. Lastly, we removed some downward outliers in the number of bookings. It turned out, that on the days when insideairbnb.com scrapes a new dataset a significant number of bookings is being lost, since we observe heavy outliers in the number of bookings on these days. Thus, we removed them from the dataset.



IV. Oxford Stringency Index

The Oxford Stringency Index is a composite measure of activities to contain the spread of covid-19 based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). To include the stringency index in the plot of bookings the index has been rescaled in order to fit the scale of the bookings plot.

5.2 APPENDIX II | DATASET DESCRIPTION

The initial Lisbon dataset contains 29,419,037 rows. Each row corresponds to the offering of a certain listing on a certain day. After filtering for offerings between 23.01.2019 and 31.12.2020 and removing outliers, the dataset still contains 16,254,728 rows and 35,601 unique listings can be identified. The listings subdivide into the following categories:

	Observations	Proportion
Entire home/apt	23186	71,2%
Private room	8213	25,2%
Shared room	607	1,9%
Hotel room	570	1,7%
Total	32576	100%

Table 1
Lisbon listing categories 2019-2020

The initial Porto dataset contains 13,999,379 rows. Each row corresponds to the offering of a certain listing on a certain day. After filtering for offerings between 23.01.2019 and 31.12.2020 and removing outliers, the dataset still contains 7,858,247 rows and 17,131 unique listings can be identified. The listings subdivide into the following categories:

	Observations	Proportion
Entire home/apt	12837	74,9%
Private room	1747	21,9%
Shared room	289	1,7%
Hotel room	258	1,5%
Total	17131	100%

Table 2
Porto listing categories 2019-2020

The following table contains the descriptive statistics for the bookings, revenues and prices in Lisbon and Porto before the pandemic started.

	Bookings	Revenues	Prices
count	387	387	387
mean	13611,54	1230904,96€	67,23€
std	27262,13	329248,23€	8,07€
min	6340	723006,0€	55 €
25%	11126	925087,0€	60 €
50%	13823	1224664,0€	67 €
75%	16009	1503884,5€	75 €
max	18735	1956390,0€	83 €

Table 3
Lisbon listing categories 2019-2020

	Bookings	Revenues	Prices
count	374	374	374
mean	5839	433281,42€	57,4€
std	1 399	134728,68€	7,87€
min	3356	217697,0€	45,5€
25%	4666	314372,75€	50 €
50%	5744	415740,5€	55 €
75%	7121	551688,25€	65 €
max	8404	733149,0€	75 €

Table 4
Porto listing categories 2019-2020

The following table contains the descriptive statistics for the bookings, revenues and prices in Lisbon and Porto after the pandemic.

	Bookings	Revenues	Prices
count	291	291	291
mean	9411,055	896105,55€	66,22€
std	1656,571	175999,93€	5,66€
min	4014	359913,0€	58 €
25%	8581,5	752777,5€	60 €
50%	9615	900227,0€	65 €
75%	10052	1033250,5€	69 €
max	15570	1539654,0€	80 €

Table 5
Lisbon bookings, revenues and prices prior to the pandemic

	Bookings	Revenues	Prices
count	294	294	294
mean	4743	394382,11€	56,62€
std	845	67088,92€	4,43€
min	35566	282479,0€	50 €
25%	4147	346613,5€	52 €
50%	4509	385493,5€	58 €
75%	5226	437012,5€	60 €
max	8447	665958,0€	65 €

Table 6
Porto bookings, revenues and prices prior to the pandemic

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