

Visualization of Amsterdam Airbnb Business Performance using Customer Reviews

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Abstract: This article focuses on Airbnb that was one of the most popular sharing models in Economics. This study investigates the Airbnb business performance using customer reviews to calculate the monthly occupancy rate and a yearly income of Airbnb hosts in Amsterdam between 2015 and 2019. This study uses modest and optimistic estimates for the review rate with 0.6 percent and 0.4 percent, respectively, and 3.9 for the average length of stay in Amsterdam. Findings reveal that the visitors increase from May to June, then again in September and October. The monthly occupancy rate of the super host has a higher occupancy rate rather than the regular host at every district. The yearly income of the super hosts in Centrum-West and Centrum-Oost was higher than in other districts, while annual income was most deficient in Gaasperdam - Driemond. In term of average occupancy and number of maximum people per accommodation, accommodations which accommodate more than eleven people have more occupancy rate than others. Customer reviews can be used to calculate the monthly occupancy rate and a yearly income of Airbnb hosts.

Keywords: Airbnb, Amsterdam, business performance, customer review, monthly occupancy, yearly income

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Introduction

The development of the sharing economy business that continues to increase is the main competitor for the hotel industry and impacting the tourism industry (Oskam & Boswijk, 2016). The sharing economy has given people the ability to participate in transaction services through leading online applications such as RedDoorz or Airbnb. This article focuses on Airbnb, a peer-to-peer Internet platform that was one of the most popular sharing models in Economics. Airbnb has emerged as one of the sharing economy's stars (Ert & Fleischer, 2019; Gibbs et al., 2018), and was indeed the topic of many and frequently intense discussions between business and academics (Cheng & Jin, 2019; Heo et al., 2019).

Despite its importance and scale in the tourism and hospitality market, scientists have begun a systematic study of the Airbnb trend, shifting from a model represented in the media to a study goal guided. Current studies have examined as follows. Airbnb's service quality attributes effects on customer satisfaction (Ju et al., 2019), price determinants (Wang & Nicolau, 2017), the construction of home feeling (Zhu et al., 2019), trust evolution (Ert & Fleischer, 2019), super host profile (Setiawan, 2020b), impacts of host quality and quantity attributes (Xie & Mao, 2017), development in Paris (Heo et al., 2019), user review comments (Cheng & Jin, 2019), geospatial analysis (Setiawan, 2020a), and dynamic pricing strategies (Gibbs et al., 2018; Oskam & Boswijk, 2016), price factors (Moreno-Izquierdo et al., 2020), and behaviour (Oskam et al., 2018).

This study investigates the visualization of the Airbnb business performance model using customer reviews to calculate the monthly occupancy rate and a yearly income of Airbnb hosts. This study employs a machine learning technique to process and analyze the data. Studies have already verified the relevance and value of online review comments on the experience of identity

consumers and their connections to business performance (Chang et al., 2019; Cheng & Jin, 2019; Moro et al., 2019).

The remaining part of the paper is arranged according to this. The material and method are presented with details on data collection, data pre-processing, and data analysis. Results and discussion are then presented with occupancy and income model created from customer reviews. The paper concludes with a summary of the main findings.

Methodology

This section discusses three steps taken to create a business performance model for Airbnb in Amsterdam, as follows: data collection, data pre-processing, and data analysis. The dataset was obtained from the Inside Airbnb website (<http://insideairbnb.com/get-the-data.html>). Reviews dataset with a total of 478.196 listing reviews and listings dataset with 19.450 listings were used. Jupiter notebook was used to load and view the data.

Four steps were conducted in the data pre-processing phase. In the first step, the writers change the type of 'date' attribute in the dataset into a specific date format. After that, the writers calculate the average number of reviews per month per listing in the range of 1 January 2015 to 31 December 2019. In the second step, the writers combine the reviews dataset with the listing's dataset. the writers choose eight keys in the listings dataset as follows: 'id', 'neighbourhood_cleansed', 'latitude', 'longitude', 'price', 'cleaning_fee', 'host_is_superhost', and 'accommodates'. After combining it, there are 16.234 rows and nine columns. In the third step, the writers clean two attributes, 'price' and 'cleaning_fee,' because they are both in string data type and have some missing values. As shown in Figure 1, the boxplot shows skewed distribution with a long tail on high priced outliers. 75% or all listings only cost up to €180 per night. In this study, the writers remove listings with rental prices above €600 per night to maintain comparability. In the last step, occupancy and income estimate were created by adopting Inside Airbnb's "San Francisco Model" (<http://insideairbnb.com/about.html>) with the following methodology: (1) monthly occupancy rate = average length of stay * (number of reviews per month/review rate), and (2) yearly income = monthly occupancy rate * price * 12 months.

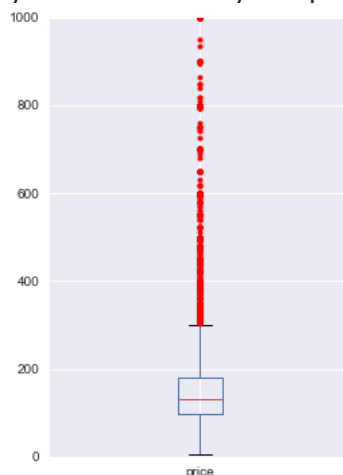


Figure 1. Price boxplot

In this study, the writers use modest and optimistic estimates for the review rate with 0.6% and 0.4%, respectively, and 3.9 for the average length of stay in Amsterdam (<http://insideairbnb.com/amsterdam>).

Figure 2 illustrates the modest and optimistic estimated amount of monthly occupancy for accommodation in Amsterdam between 2015 and 2019, measure in percentage. The modest estimate is 10.7%, and the optimistic estimate is 16%. Detail distribution is shown in Table 1.

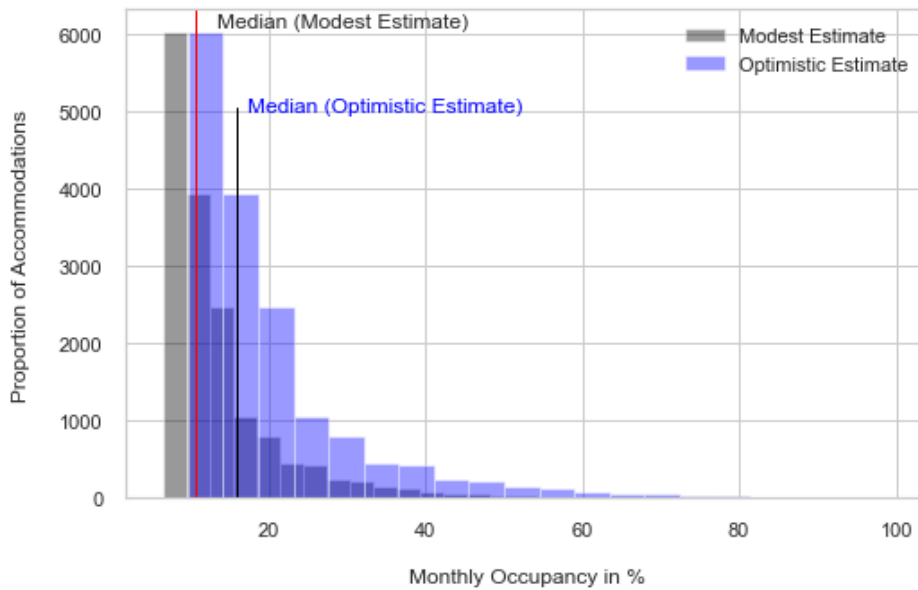


Figure 2. Monthly occupancy rate

Table 1. Distribution of Modest and Optimistic Occupancy Estimate

	Modest Estimate	Optimistic Estimate
mean	13.066170	19.554280
std	7.849159	11.600802
min	6.500000	9.750000
25%	8.120000	12.190000
50%	10.710000	16.040000
75%	14.770000	22.160000
max	89.380000	99.290000

Figure 3 illustrates the modest and optimistic estimated yearly income for accommodation in Amsterdam between 2015 and 2019, measure in euro. For the modest estimate, the annual average income is €17.850, and the optimistic estimate is €26.773. Detail distribution is shown in Table 2.

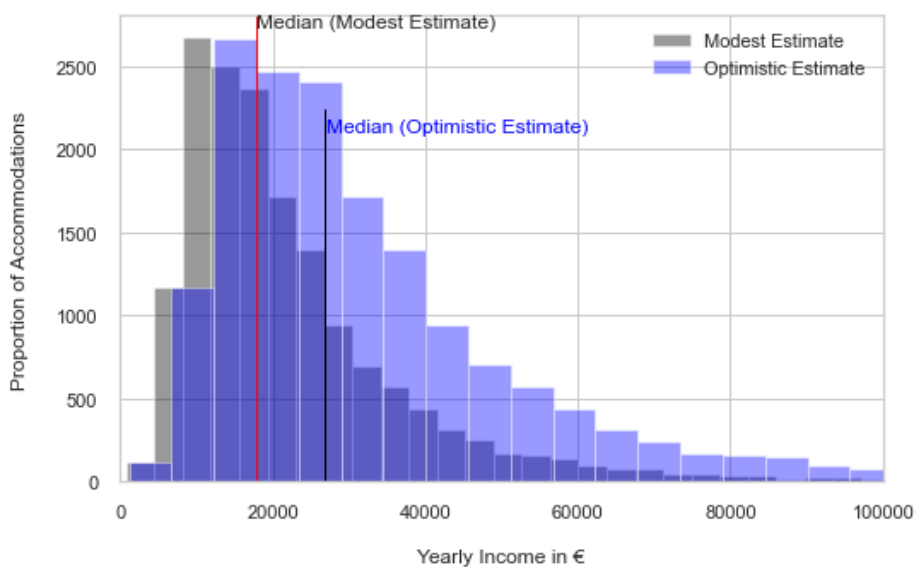


Figure 1. Average yearly income

Table 2 Distribution of Modest and Optimistic Income Estimate

	Modest Estimate	Optimistic Estimate
mean	22409.087555	33613.535683
std	16484.234678	24726.553161
min	780.000000	1170.000000
25%	12038.400000	18057.600000
50%	17850.000000	26773.200000
75%	27300.000000	40950.000000
Max	371280.000000	556920.000000

Data analysis is conducted using exploratory data analysis utilizing the Jupyter notebook. To analyze the data, the writers visualize attribute correlation using a heat map diagram, creating a visualization to see if there are seasonal demand, demand by host type, demand by neighborhoods, demand by price, and demand by capacity.

Results and Discussions

Results

In this paper, the writers have investigated the Airbnb business performance in Amsterdam between 2015 and 2019 using customer reviews to calculate monthly occupancy rates and yearly income.

In this study, Airbnb’s Amsterdam host data was used from 1 January 2015 to 31 December 2019. Figure 4 shows the correlation between the variables in the dataset. Correlation ranges from -0.1 to +0.3. The ‘Accommodates’ attribute has a positive relationship to ‘price,’ ‘cleaning_fee,’ and ‘income’ attribute. On the other hand, the ‘price’ attribute negatively correlates to the ‘review_per_month’ attribute. The ‘Review_per_month’ attribute has a positive correlation to ‘occupancy’ and ‘income’ attribute because the writers use ‘review_per_month’ to calculate them.

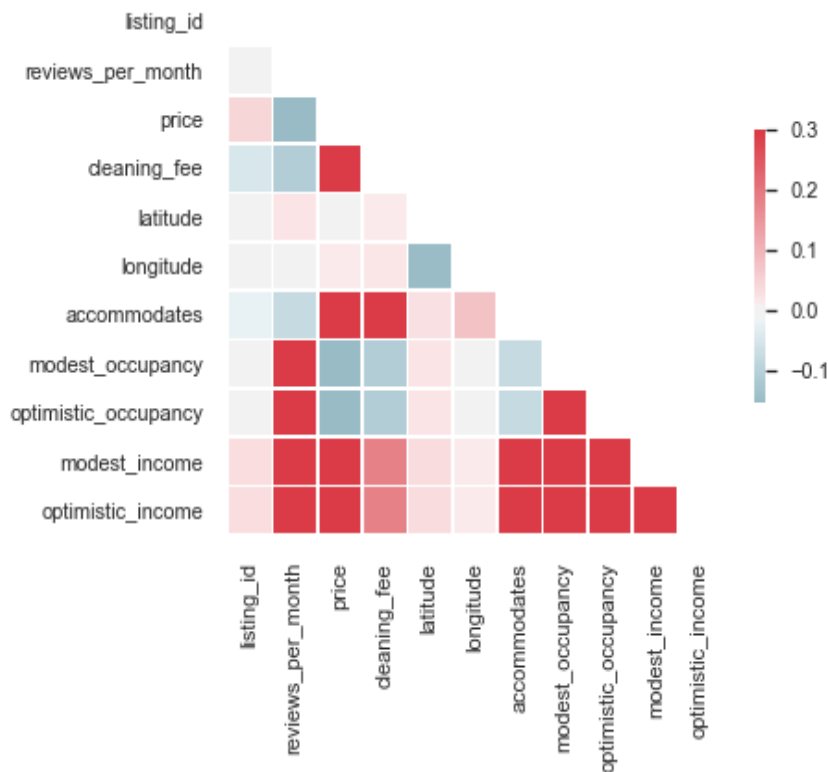


Figure 2. Correlation matrix heatmap for the dataset

Figure 5 illustrates the average reviews per month for accommodation in Amsterdam between 2015 and 2019. Every year the writers see the same pattern: the visitors increase from May to June, then again in September and October. Throughout August and the winter months, it declines dramatically.

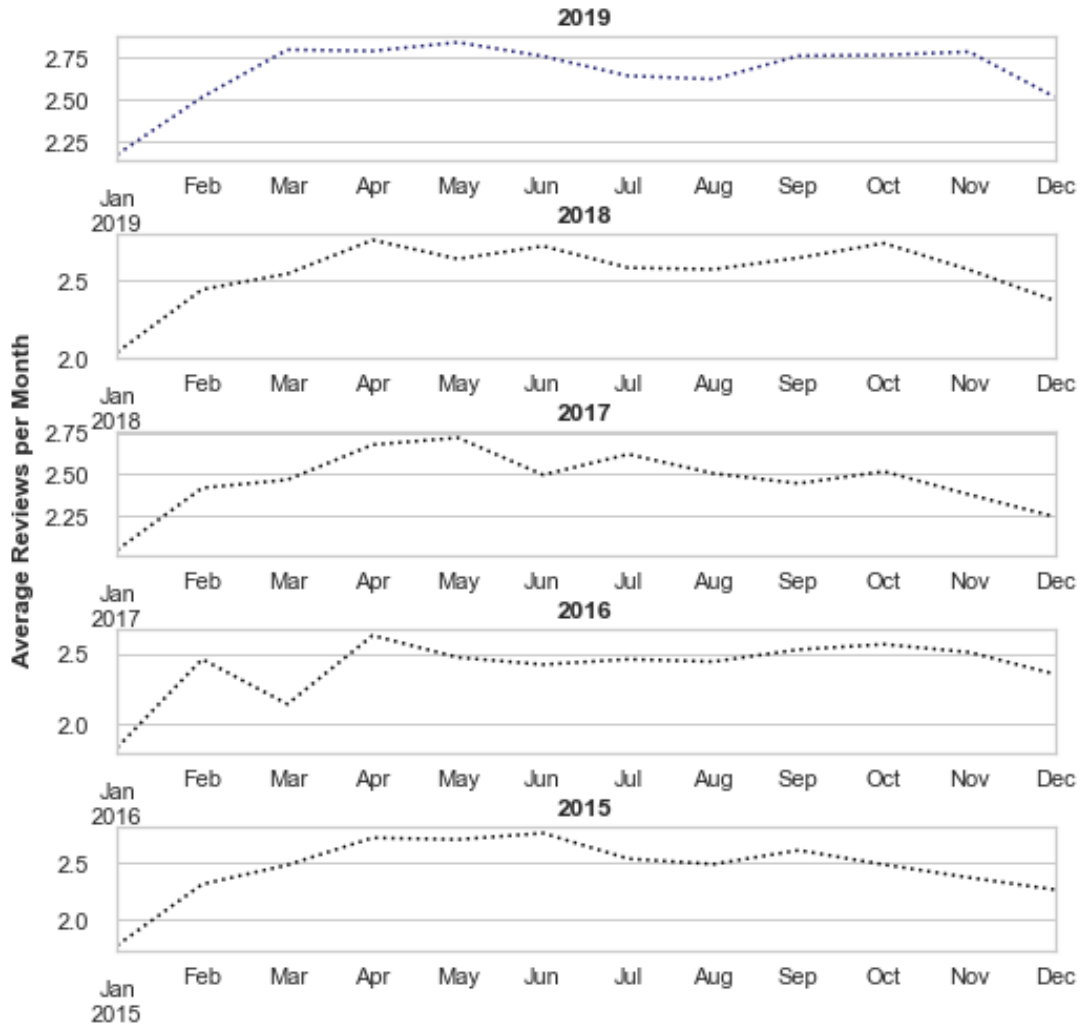


Figure 5. Average reviews per month for Amsterdam

Discussions

Figure 6 illustrates the modest estimated amount of monthly occupancy for super host and regular host in all districts in Amsterdam between 2015 and 2019, measure in percentage. Overall, all super host has a higher occupancy rate than the regular host at every district during the five years. The figure for the super host in Geuzenveld-Slotermeer was higher than in other districts, while the occupancy rate was lowest in Bos en Lommer.

In terms of super host, Geuzenveld-Slotermeer and De Aker-Nieuw Sloten are the most occupied district with 20.2% and 19.3%, respectively. Bijlmer-Centrum is the highest occupied for the regular host with 13%, follows by Osdorp with 12.35%. Bos en Lommer is the district with the lowest monthly occupancy rate for both super host and regular host.

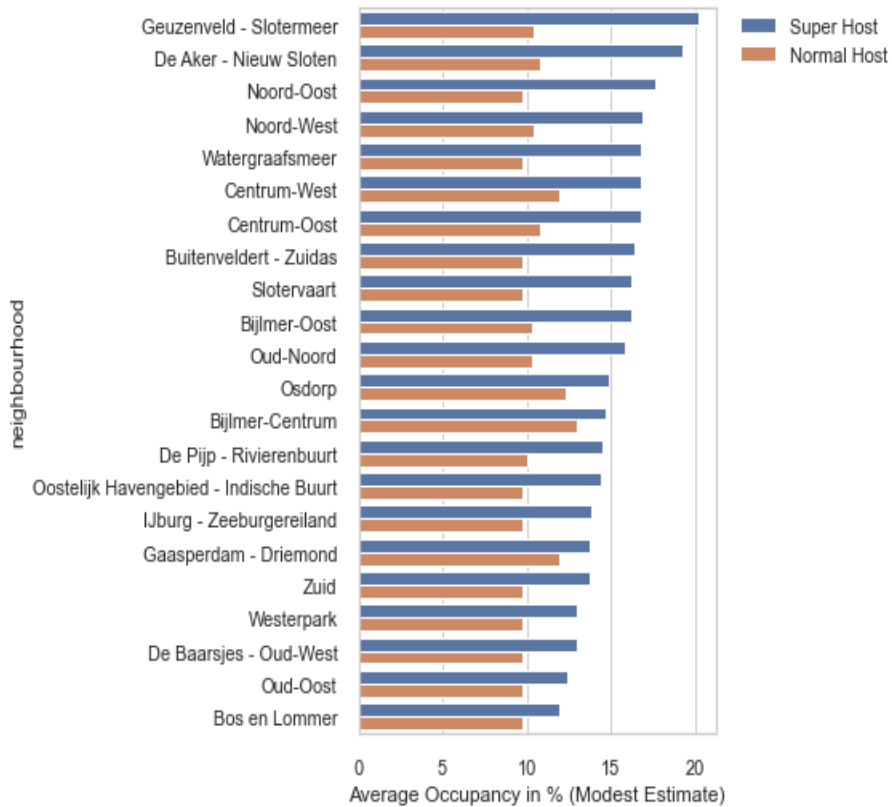


Figure 6. Occupancy by area and host status

Figure 7 illustrates the modest estimated yearly income for super host and regular host in all districts in Amsterdam between 2015 and 2019, measure in euro.

Overall, all super host has a higher yearly income than the regular host at every district during the five years. The figure for the super host in Centrum-West and Centrum-Oost was higher than in other districts, while yearly income was lowest in Gaasperdam - Driemond.

Super host in Centrum-West and Centrum-Oost has the highest yearly income with €34.210 and €33.788, respectively. On the other hand, super host in Gaasperdam - Driemond has the least yearly income with €12.465.

Centrum-West and Centrum-Oost are also the districts that have the highest yearly income for the regular host with €23.587 and €21.840, respectively. Bijlmer-Oost is the least with only €11.232. The detailed monthly occupancy and yearly income for all districts are shown in Table 3 and Table 4.

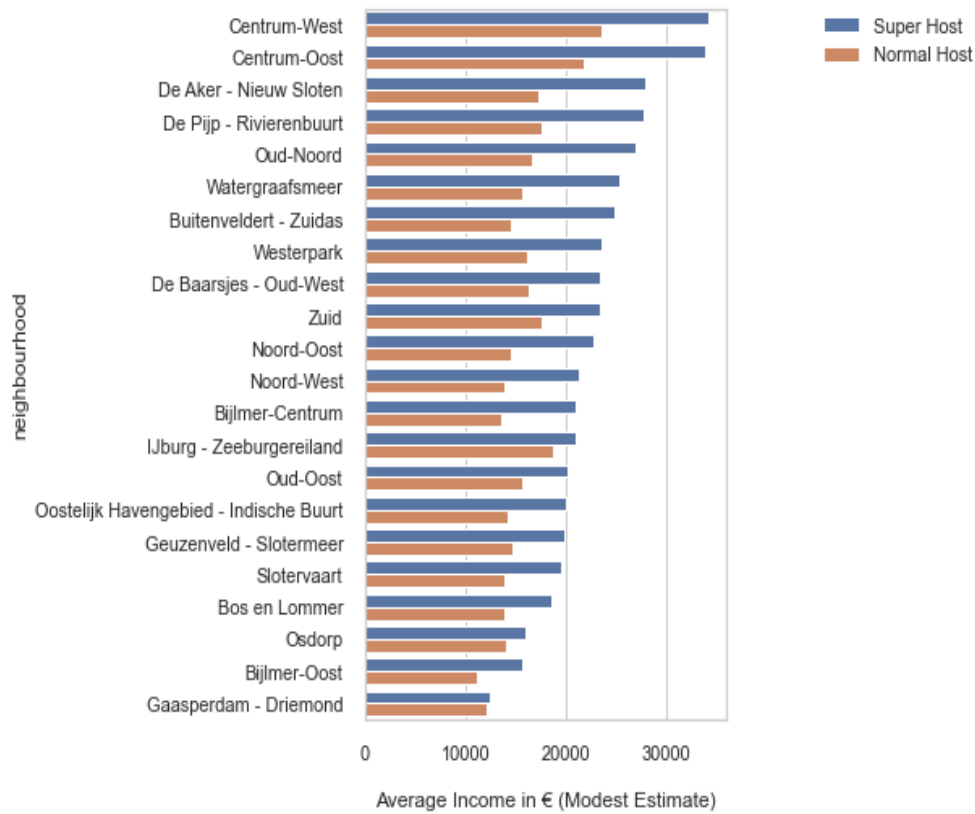


Figure 7. Income by area and host status

Table 3. Super Host Monthly Occupancy Rate and Yearly Income By District

Super Host			
No	Neighborhood	Modest Occupancy (%)	Modest Income (€)
1	Geuzenveld - Slotermeer	20.245	19.862
2	De Aker - Nieuw Sloten	19.305	27.963
3	Noord-Oost	17.640	22.786
4	Noord-West	16.900	21.358
5	Watergraafsmeer	16.845	25.400
6	Centrum-West	16.790	34.210
7	Centrum-Oost	16.765	33.788
8	Buitenveldert - Zuidas	16.430	24.877
9	Slotervaart	16.250	19.503
10	Bijlmer-Oost	16.250	15.696
11	Oud-Noord	15.830	26.917
12	Osdorp	14.940	16.062
13	Bijlmer-Centrum	14.710	21.060
14	De Pijp - Rivierenbuurt	14.480	27.797
15	Oostelijk Havengebied - Indische Buurt	14.440	20.017
16	IJburg - Zeeburgereiland	13.850	21.000
17	Gaasperdam - Driemond	13.775	12.465
18	Zuid	13.760	23.400

Super Host			
No	Neighborhood	Modest Occupancy (%)	Modest Income (€)
19	Westerpark	13.000	23.618
20	De Baarsjes - Oud-West	13.000	23.400
21	Oud-Oost	12.425	20.179
22	Bos en Lommer	11.920	18.596

Table 4. Regular Host Monthly Occupancy Rate And Yearly Income By District

Normal Host			
No	Neighborhood	Modest Occupancy (%)	Modest Income (€)
1	Bijlmer-Centrum	13.000	13.650
2	Osdorp	12.350	14.040
3	Gaasperdam - Driemond	11.960	12.068
4	Centrum-West	11.920	23.587
5	Centrum-Oost	10.830	21.840
6	De Aker - Nieuw Sloten	10.830	17.293
7	Geuzenveld - Slotermeer	10.400	14.669
8	Noord-West	10.400	13.962
9	Bijlmer-Oost	10.320	11.232
10	Oud-Noord	10.290	16.660
11	De Pijp - Rivierenbuurt	10.020	17.550
12	IJburg - Zeeburgereiland	9.750	18.720
13	Zuid	9.750	17.550
14	De Baarsjes - Oud-West	9.750	16.254
15	Westerpark	9.750	16.224
16	Watergraafsmeer	9.750	15.600
17	Oud-Oost	9.750	15.600
18	Buitenveldert - Zuidas	9.750	14.510
19	Noord-Oost	9.750	14.492
20	Oostelijk Havengebied - Indische Buurt	9.750	14.179
21	Bos en Lommer	9.750	13.896
22	Slotervaart	9.750	13.884

Figure 8 illustrates the average rental price and cleaning fee by the district in Amsterdam between 2015 and 2019, measure in euro.

As it can be seen in the diagram, Centrum-West and Centrum-Oost are districts that offer the highest rental price per night, where Bijlmer-Oost is the lowest. In terms of cleaning fees, most hosts in Bijlmer-Centrum offer the cheapest cleaning fee, and IJburg – Zeeburgereiland is the most expensive.

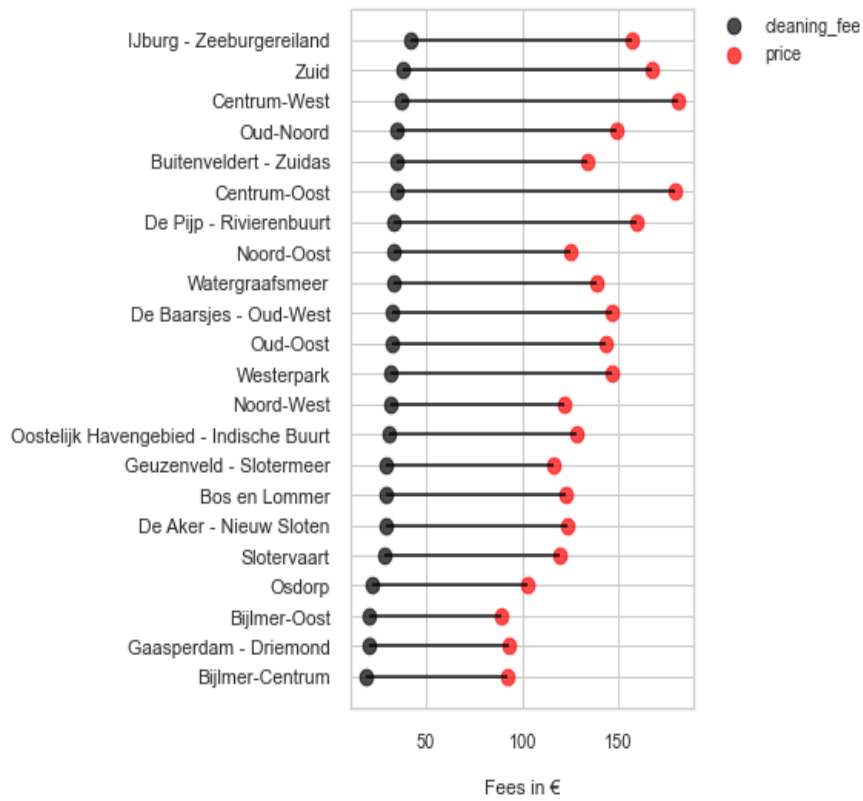


Figure 3. Average fees by the district

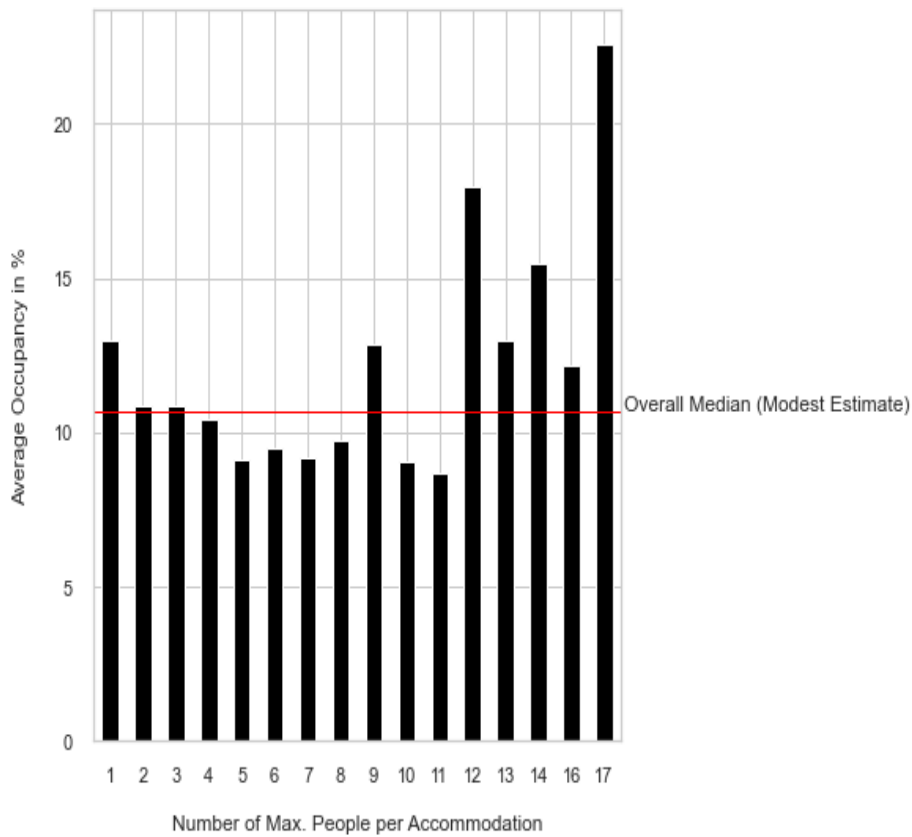


Figure 4. Average Occupancy by Capacity

Conclusions

In this paper, the writers have investigated the Airbnb business performance in Amsterdam between 2015 and 2019 using customer reviews to calculate monthly occupancy rates and yearly income.

Findings reveal that the visitors increase from May to June, then again in September and October. Throughout August and the winter months, it declines dramatically. In term of monthly occupancy rate, all super host has a higher occupancy rate rather than the regular host at every district during the five years. Super host in Geuzenveld-Slotermeer was higher than in other districts, while the occupancy rate was lowest in Bos en Lommer. In term of yearly income, all super host has higher yearly income rather than the regular host at every district during the five years. Super hosts in Centrum-West and Centrum-Oost were higher than in other districts, while yearly income was lowest in Gaasperdam - Driemond. In terms of rental price and cleaning fee, Centrum-West and Centrum-Oost are districts that offer the highest rental price per night, where Bijmer-Oost is the lowest. In term of average occupancy and number of maximum people per accommodation, accommodations which accommodate more than eleven people have more occupancy rate than others.

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