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# Airbnb spatial agglomeration and hotel prices: case of Palma de Mallorca

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## **Abstract**

The traditional accommodation sector is being disrupted by the new concept of Airbnb. In this article we have applied an specific strategy to study Airbnb 's spacial agglomeration impact on hotel prices in Palma. The results show no relevant estimations to prove that Airbnb agglomeration has an impact on hotel prices. The causal assumptions behind these results come from the fact that Palma provides an abundant upper-quality accommodation service, that largely differs from Airbnb's service, and the effect of the seasonal demand that Palma endures.

## **Introduction**

The current idea of Airbnb originated from three air mattresses on the floor of a San Francisco apartment in 2007. The first advertisement of this informal tourism accommodation was published in a simple website under the name 'AirBed&Breakfast' for conference delegates looking to avoid the city's high hotel prices. Since then, Airbnb has been used for the same or similar purpose by millions of tourists (Guttentag, 2015).

Several experts in the matter have catalogued Airbnb as a 'disruptive innovation', due to the company's innovative internet-based business model and its unique attractiveness to tourists (Christensen &Raynor, 2003). Its disruptive potential has been a main concern for all destinations where it has developed a significant growth, leaving the traditional accommodation under a competitor which grows at an exponential rate. However, what currently is a matter of discussion and further studied, is the consideration of the hotel industry and Airbnb as substitutive services, which means that price fluctuation among both parties are correlated.

This paper will focus on the possible threat that Airbnb can represent for the Hotel Accommodation sector in Palma de Mallorca city. Firs we will give an insight in Airbnb concept, followed by a description of the strategy and presence of both types of accommodation in the urban area, and empirical evidence of Airbnb's spacial agglomeration impact on hotel room-night prices.

## **Airbnb concept**

Airbnb describes itself as ‘a trusted community marketplace for people to advertise, discover and book unique accommodations around the world’ (Airbnb, 2013b). It is basically an online platform through which everybody with access to the internet can publish a rental service as accommodation for tourists. These places vary widely, ranging from a sofa-bed to an entire island (Wortham, 2011), but the standard types are reduced to two categories, private room and entire house or apartment. The hosts of the rentals might be living in during the stay of the tourists or may be absent, possibly while they are on holiday or even using their house as a permanent rental.

Airbnb website works as follows: first one searches for accommodation based on destination, travel dates and number of travellers; then the platform shows the available offers according to the traveller’s demands, which can be filtered by attributes like price, neighbourhood, and amenities; further, individual listings can be made, with greater detail, focusing on description, photographs and reviews from previous guests.

To rent or book, the user must have an account on Airbnb’s platform. Once one is interested in an accommodation offer, the tourist will send a reservation request, in which they will also provide information about the travelling group. The host may respond and ask further questions before accepting the reservation. Guest service fees are typically 6-12% but can be higher or lower depending on the specifics of the reservation. The higher the subtotal, the lower the percentage so the guest can save money when booking large reservations. The host service fee is 3% excluding bank fees (Airbnb 2017g, 2017h). To sum up, the Airbnb website ([ww.airbnb.com](http://www.airbnb.com)) is straightforward and, as we have described, resembles traditional accommodation booking websites (e.g. Booking, Expedia).

In its particular domain, Airbnb is the most prominent company among the rest of internet-based companies that allow ordinary people to offer tourism accommodation. Airbnb has several competitors offering identical services, which are HomeAway, HouseTrip, FlipKey (a subsidiary of TripAdvisor), Wimdu, 9flats and Roomorama.

This fact has brought numerous scholars to study the attractiveness of Airbnb rentals. From first impressions Airbnb is considerably lacking in many of the areas that are considered vital at the time of deciding accommodation, such as service quality, staff friendliness, brand reputation, and security (Chu & Choi, 2000; Dolnicar & Otter, 2003).

However, remembering we are in front of a disruptive innovation, the characteristics of such a service are often cheaper and offer new benefits; as is in the case of Airbnb. It typically offers cheaper accommodation service and introduces additional benefits as in staying at a private residence.

Price wise, Airbnb hosts are able to set prices at very competitive rates (see Guttentag, 2013) because the primary fixed costs are usually covered, the labour costs are minimal, generally taxes are not charged and hosts are not usually fully dependent on their Airbnb earnings.

In addition to the economic benefits, Airbnb also provides numerous benefits for staying in a residence. For instance, some tourists prefer the feeling of being in a home rather than in a standard hotel room, and Airbnb hosts may also provide useful local advice to the guests. Moreover, guests will often have access to home amenities, such as kitchen, washing machine and dryer. A description of these new benefits is printed in Yglesias (2012), where he summarises his own experience using Airbnb in Buenos Aires:

*“The owner was able to offer a local mobile phone and helpful restaurant recommendations, arranged a reasonably priced taxi to the airport for us, and even participate in a little mutually advantageous black-market currency exchange. It was cheaper than a hotel, and in exchange we gave up services we didn’t really need. We’re perfectly capable of making our own bed in the morning, and access to a normal refrigerator and kitchen is in practice more valuable than bellhop service”*

The experience of living in a private residence brings tourists closer to a “local” experience. Living in a private house, interacting with hosts or neighbours, and possibly staying in a “non-touristic” area, often assures a closer socio-cultural experience of the visit. Hence, Airbnb has opened a new path for tourists or travellers that are seeking this type of experience at a very attractive rate.

### **Airbnb Growth in Palma de Mallorca**

During the last year there has been numerous publications with respect to the increase in tourist rentals and its pernicious impact on the city. One of the most reliable and official publications was written by Groizard and Nilsson (2017), in which they discussed the main issues related to the impact of Airbnb rentals on the economy and local housing issues,

amongst other topics. The study was based on data extracted from Airdna for August 2016, which I would like to discuss below for further comparison.

In Mallorca, during the month of most tourist influx in the summer season (august 2016), Airbnb platform announced 15.170 units including entire houses, apartments and private rooms. The average housing unit in Mallorca offered 5.4 places and Palma 3.8; then under this assumption Airbnb offered around 63.000 places in Mallorca and 10.000 in Palma by that time.

In comparison with today’s Airdna numbers (august 2017) rental sizes show an increase to 4.8 places on average and 3,714 active rentals; divided in 2,667 entire houses and 1,032 private rooms. Hence, these figures provide an estimate of 13,833 places showing a 38.3% annual growth rate in Airbnb’s supply in the municipality of Palma. However, it is important to take into account that not all are available for all periods as most of the owners block the rental service during the low season.

### **Presence of hotel industry in Palma**

Next, we will give an insight into the presence of the hotel industry in Palma de Mallorca. According to the information provided by “Direcció General de Turisme” (DGT) of the Balearic Islands there are 61 hotels which offer a total amount of 8,108 places (see Table 1).

Table 1: Hotel industry sample size in Palma

	Hotel 1-2*	Hotel 3*	Hotel 4-5*	Total
Nº Hotels	15 25%	6 10%	40 66%	61
Nº Rooms	613 14%	508 12%	3132 74%	4253
Capacity	1132 14%	988 12%	5988 74%	8108

Source: Author, DGT data

As we see, the urban hotel industry in Palma is basically concentrated on the upper-bound quality service. To be exact, 74% of city’s hotel accommodation supply is intended to cover the high quality tourist demand. Hence we ask, does the growing trend of Airbnb apartments have an impact on hotel prices, even though it seems that their target demands are different? Further we will discuss the matter from an empirical approach.

## **Related Work**

The study of competition between peer-to-peer and traditional firms offering similar goods and services, is becoming a topic of high interest among the academia. Recent work (Einav et al. 2016) discusses the rise and regulation of peer-to-peer markets, and provide a theoretical insight about effect predictions of competition between these markets and traditional firms. The closest studies related to the topic of this paper are a set of short studies commissioned by Airbnb enterprise, which claim that Airbnb is a complementary model for the hotel industry and it provides quantified arguments focussed on the net benefit that Airbnb travellers provide to local citizens<sup>1</sup>. However, there has been research done with a more sophisticated process of identification, methodology and segmentation analysis resulting in different results (Zervas et al, 2016). This last paper studied the economic impact of Airbnb's entry into the hotel industry in Texas's cities. Their empirical strategy exploits the cross variability among Airbnb growth and hotel room revenue through a difference in differences (DD) identification strategy. Specifically, they estimated Airbnb's impact on hotel room nights (\$) by comparing changes in hotel room prices before and after Airbnb entered a specific city. Their results revealed, for Austin city case, that the causal impact was in the 8-10% range and the impact was non-uniform among hotels. The impact manifested itself primarily on lower-priced hotels and those hotels not hosting business travellers.

This last case seems different from Palma's case. Palma is a vocational demand destination which, as seen above, is focussed on high quality accommodation service. Groizard & Nilsson (2017) stated that Airbnb is attracting a new demand to the city that differs from the hotel demand due to their differences in the accommodation service.

Hence, we will provide empirical evidence of Airbnb's impact for such a different case scenario, compared with Texas, as it is the capital of Mallorca, a Sun&Beach destination.

## **Dataset**

The hotels of the Municipality of Palma have been examined. The sample size with which this study has based its research has been 54 hotels located in the municipality of Palma de Mallorca. This list of hotels has been collected through the "Direcció General de

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<sup>1</sup> See: <https://www.airbnb.com/economic-impact/>

Turisme” (tourist government institution) on June 8, 2017. Additionally, this list also provided certain specifications for all hotels: *category, capacity, location and opening date*.

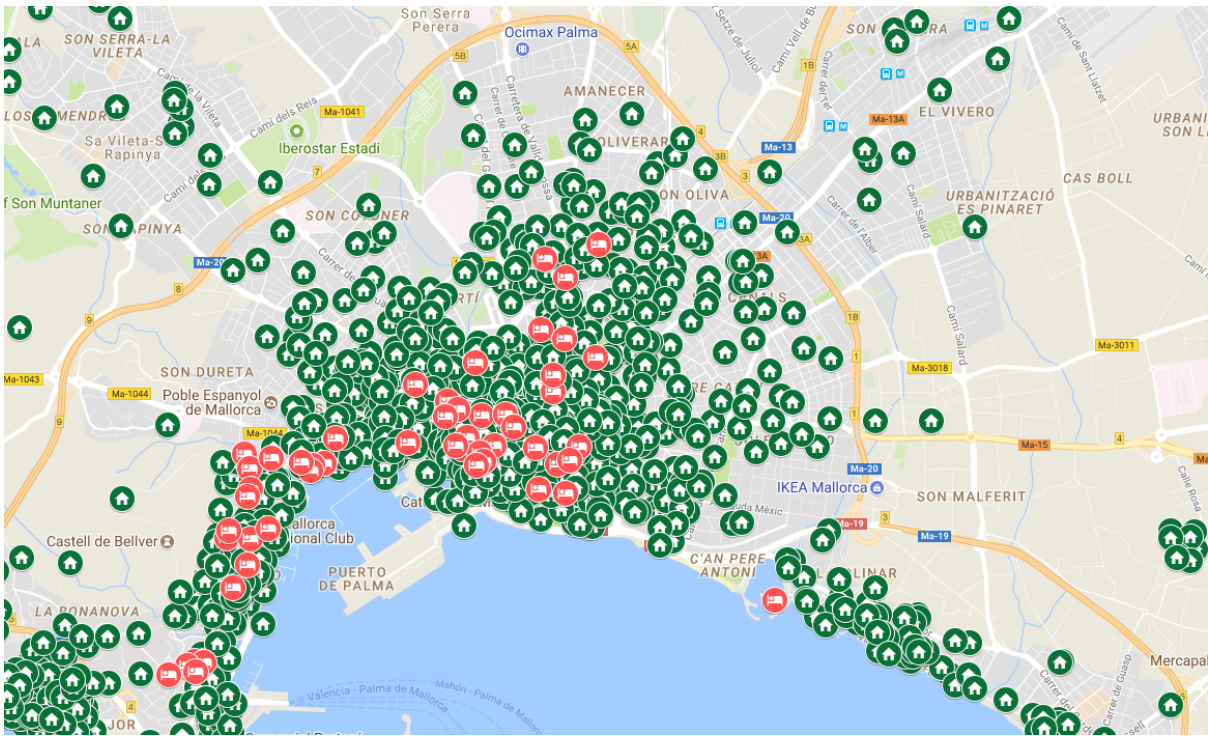
The prices collected for the empirical analysis include taxes (except local Tax) and refer to accommodation for one night in a standard double. These prices were taken from the “Booking” website at <http://www.booking.com>. The room rates are for each consecutive nightover the week period from August 7 to August 13, 2017. In order to avoid the presence of fully-booked hotels as far as possible, the room rates were collected during end of June (June 26, 27, 28, 29). Also, additional information from the hotels was extracted from “Booking” website; specifically:*breakfast, swimming pool, restaurant and parking service offering*.

Having the main characteristics of each establishment, we assume to be able to capture a significant estimate of disparities in prices according to the different type of hotel. These variables will be used in the empirical study as controls for the explanatory variable.

Moreover, we collected data on the numbers of Airbnbs in Palma’s municipality. This information was extracted from InsideAirbnb web site <http://www.insideairbnb.com> on June 25. This data shows the rentals that were registered by 15 March 2017. This was the closest we could get to updated information that interested us. Hence, this is the main drawback related to level of significance of this study, under the assumption that many other rentals, which haven’t been taken into account, advertise at the beginning of the season.

Our study has focussed on the full apartment establishments (leaving single room rental out of the sample), due to the assumption that full apartments are more related to double hotel rooms in terms of competition. Moreover, the interesting Airbnb characteristic for our study is location. The Empirical study will be concentrated on testing the impact of Airbnb spatial agglomeration, in the hotel surroundings, on double room night prices. Hence, the variable *Airbnbs* will represent the number of full-apartment Airbnbs in the surroundings of each hotel within a distance of 150m (see Figure 2)

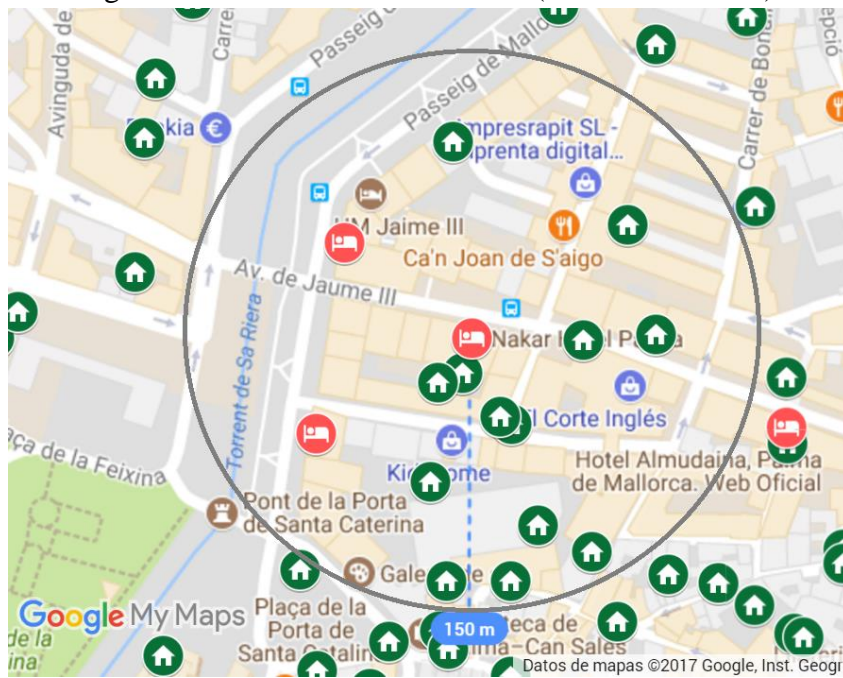
Figure 1: Hotels & Airbnbs in Palma de Mallorca, March 2017



Airbnbs Hotels

Source: Author using "My Maps" (Google), InsideAirbnb data

Figure 2: Airbnbs variable creation (case Nakar Hotel)



Airbnbs (14)

Source: Author, InsideAirbnb data



We observe in Figure 2 an example of the method of calculating the number of Airbnbs within a 150m distance from the hotel. In the case of Nakar Hotel we observe 14 Full-apartment Airbnbs in its surroundings.

To clarify, all the data collecting methodology was inspired by Balaguer&Pernias (2013) in which they studied the relationship between spacial agglomeration and hotel prices amongst hotels from Madrid. In their case they established an agglomeration radius sample of 200m, thus we considered 150m appropriate, as we are studying a much smaller city.

Furthermore, we will provide a summery statistics of the quantitative variables of the sample (Table2) and frequencies of the qualitative variables (Table 3) in an attempt to help the reader understand better the characteristics of the resulting sample:

Table 2: Summary Statistics, using the observations 1:1 – 54:7

Variable	Mean	Median	Minimum	Maximum
Nstars	3.5311	2.0000	1.0000	5.0000
Capacity	144.19	84.000	16.000	742.00
AIRBNBs	22.500	12.500	0.0000	80.000
Roomnight	184.41	169.00	49.000	441.00
Hage	37.333	45.500	1.0000	86.000
Variable	Std. Dev.	C.V.	Skewness	Ex. Kurtosis
Nstars	1.1788	0.45144	0.92494	-0.25556
Capacity	161.07	1.1171	2.1098	4.3679
AIRBNBs	20.778	0.92347	0.89935	-0.50177
Roomnight	77.301	0.41918	0.92973	0.85368
Hage	24.602	0.65899	-0.18517	-1.3377
Variable	5% Perc.	95% Perc.	IQ range	Missingobs.
Nstars	1.0000	5.0000	1.0000	0
Capacity	20.000	553.00	125.00	0
AIRBNBs	1.0000	55.000	39.000	0
Roomnight	65.000	350.75	73.750	82
Hage	1.0000	64.000	45.000	0

Source: Author, Booking data

Taking a look at the statistics we observe the upper quality abundance in hotel supply, observing a 3.5 average star hotel in the city. Also an interesting number is the 22 average spacial density of surrounding Airbnbs we observe for hotels in Palma de Mallorca, which we will further test for its impact on room night hotel prices.

Table 3: Frequencies of different hotel services

	Restaurant	Breakfast	Parking	Swimming pool
0	55.56%	66.67%	96.30%	43.40%
1	44,44%	33.33%	3.70%	56.60%

Source: Author, Booking data

### **Econometric specification**

The data we are analyzing has a PANEL structure. It involves measurements over time,  $t = 1, \dots, 7$  (week days), of the same hotels,  $i = 1, \dots, N$ , which keep their characteristics constant over time.

Our estimation strategy is as follows. First we used the following regression model for the price log:

$$roomnight_{it} = \beta_0 + Airbnbs_i\beta_i + X_{it}\alpha_{it} + T_t\gamma_t + L_i\delta_i + \varepsilon_{it} \quad (1)$$

where  $roomnight_{it}$  is the logarithm of the room price set by hotel “ $i$ ” on day “ $t$ ”,  $\beta_0$  is the constant,  $X_{it}$  is a matrix that includes all hotel characteristics that stay constant over time, except *hotel age*;  $T_t$  is a matrix that includes time dummies,  $L_i$  is a matrix which includes the location dummies, and  $\varepsilon_{it}$  is a regression disturbance. In our case most matrix covariates do not vary across week day in our sample, so the first approach to estimate price model is done by pool OLS (See table 4).

Second, as it is the case, our explanatory variable  $Airbnbs_i$  does not vary along time for each hotel and assuming that it is not correlated with the error, we have used the estimator of random effects in order to capture de effect on each hotel along the week of August 7 to 13 (See table 4). Wooldridge’s book (2015) explains that in order to use random effects, the dataset must comply with the fixed effects assumptions and additionally the

explicative variables must be independent from the rest and constant over time. Then, through random effects we are able to estimate the intergroup variation; i.e it allows us to capture the variations for each hotel during the week period.

Lastly, to have a deeper approach of Airbnbs effect we further added the interactions between week days and Airbnb agglomeration to equation (1) in order to capture Airbnbs impact according to each day of the week. The idea of such approach is due to the fluctuation of room night prices during the week, making reference at the dynamic price from hotel management systems that is interesting to capture.

$$roomnight_{it} = \beta_0 + Airbnbs_i\beta_{1i} + X_{it}\alpha_{it} + T_t\gamma_t + L_i\delta_i + Monday * Airbnbs_i\beta_{2i} \dots T + \varepsilon_{it} \quad (2)$$

Wooldridge's book (2015) explains that in order to use random effects, the dataset must comply with the fixed effects assumptions and additionally the explicative variables must be independent from the rest and constant over time. Then, through random effects we are able to estimate the intergroup variation; i.e it allows us to capture the variations for each hotel during the week period.

Table 4: Pool OLS (1), PANEL with Random Effects (1) and PANEL with Random Effects & Interactions (2) estimates of Airbnb's impact on hotel industry prices.

	(1) OLS lnRoomnight	(1) RANDOM EFFECTS lnRoomnight	(2) RANDOM EFFECTS lnRoomnight
Const	2.721*** (0.237)	3.010*** (0.588)	3.002*** (0.547)
AIRBNBs (150m)	-0.001 (0.001)	-0.001 (0.002)	-0.000 (0.002)
Hotel characteristics:			
Swimming pool	0.140*** (0.039)	0.117 (0.094)	0.118 (0.088)
Parking	-0.008 (0.085)	-0.031 (0.219)	-0.036 (0.204)
Restaurant	0.041 (0.036)	0.068 (0.087)	0.068 (0.081)
Breakfast	0.001 (0.040)	0.046 (0.100)	0.047 (0.093)
Capacity	0.00055*** (0.00011)	0.0007*** (0.0002)	0.0007*** (0.0002)
Number of stars	0.056*** (0.013)	0.057* (0.032)	0.057* (0.030)
Punctuation Booking	0.240*** (0.028)	0.210*** (0.070)	0.210** (0.065)
Hotel age	-0.003*** (0.000)	-0.004** (0.001)	-0.004*** (0.001)
Monday	0.119**	0.080***	0.151***

Tuesday	(0.051) 0.113**	(0.028) 0.107***	(0.041) 0.121***
Wednesday	(0.049) 0.085*	(0.027) 0.068**	(0.040) 0.092***
Friday	(0.049) 0.120**	(0.027) 0.091***	(0.040) 0.088**
Saturday	(0.056) 0.286***	(0.031) 0.237***	(0.044) 0.238***
Sunday	(0.056) 0.096*	(0.031) 0.089***	(0.044) 0.061
Zip7001	(0.049) 0.410***	(0.027) 0.383**	(0.040) 0.378
Zip7012	(0.077) 0.139**	(0.190) 0.122	(0.177) 0.122
Zip7002	(0.056) -0.019	(0.144) -0.064	(0.134) -0.062
Zip7003	(0.096) 0.174***	(0.221) 0.195	(0.206) 0.192
Zip7004	(0.065) -0.158	(0.163) -0.137	(0.152) -0.139
Zip7006	(0.107) 0.634***	(0.283) 0.730**	(0.263) 0.752***
Zip7013	(0.179) 0.350***	(0.303) 0.323	(0.283) 0.320*
Zip7014	(0.080) -0.083*	(0.202) -0.130	(0.283) -0.127
Monday*AIRBNBs	(0.050)	(0.130)	(0.121) -0.003**
Tuesday*AIRBNBs			(0.001) -0.000
Wednesday*ARBNNBs			(0.001) -0.001
Friday*AIRBNBs			(0.001) 0.000
Saturday*AIRBNBs			(0.001) 0.000
Sunday*AIRBNBs			(0.001) 0.001 (0.001)
N	290	290	290
R <sup>2</sup>	0.72	-	-
Schwarz criterion	83.64	101.60	132.14

*Note:* The dependent variable is log Hotel Room Night Price<sub>ikt</sub>. Standard Deviation is shown in parenthesis. All specifications include hotel fixed effects, week-day fixed effects, and geographic fixed effects. Also the interpretation of the estimators have a  $\Delta\%y_i = (100\beta_i)\Delta x_i$  relationship.

*Significance levels:* \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

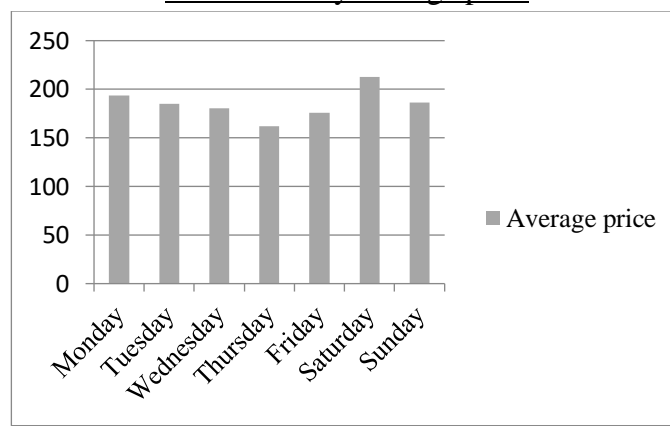
## Benchmark results

The estimates for the price level equations are reported in Table 4. Here we briefly comment on the most interesting results related to the control variables. First, the hotel characteristics that significantly increase hotel room night price are *swimming pool* amenity, which on average increases 14% of the price; this type of information could be useful for the hotels which could consider including a swimming pool amenity. Moreover, “*Capacity*” also has a small positive effect, specifically for each extra 100 places prices show an average

increase of 6%. This could be due to the small size that low quality hotels have in comparison with the higher quality hotels. Also, logically, *number of stars* which represents the hotel's category, shows a 24% average price increase per extra star.

Second, we present the estimates related to time. As base day of the week we have chosen *Thursday* as it was the day with lower average price amongst the hotels (see Table 5), so the other week day dummies would show positive values. It is to highlight that the highest coefficients are found on *Saturday* and *Friday*, with a 28% and 12% higher price than *Thursday*, respectively.

Table 5: Daily average price



Source: Author, DGT data

Further, we analyzed the neighbourhood effect. According to the hotel location, prices show significant changes for different areas. The highest coefficients are located in the central neighbourhoods, which correspond to 7001 and 7006 zip codes. This shows that the closeness to the centre is an important attribute when it comes to prices.

Lastly, we attempt to analyze the relationship between hotel pricing and Airbnb agglomeration. According to the estimates, *Airbnbs* variable, which measures Airbnb spacial agglomeration, has no causal effect on hotel prices. This proves that, on average, Airbnbs and hotel prices are not related at a reasonable significance level. However, after taking a deeper approach on estimating the interactions between day-week and Airbnbs, there has been a coefficient that has shown significant. It is the case for *Monday*. We observe, in Random Effects regression, that Monday's price is  $(15\% - 0.3\% * \text{Airbnbs})$  higher than Thursday. Thus, if for instance, the number of Airbnbs continues increasing, the price gap between both days would be reduced, specifically, by 3% for every 10 new Airbnbs in the neighbourhood. We assume that this phenomenon has some relation to the common difference between the occupancy rate from weekends and working days, which is translated into lower prices that

could introduce some type of competitiveness among hotels and Airbnbs. However, the consistency of this assumption is very weak.

### **Conclusion**

This article has given preliminary insight of Airbnb's impact on hotel prices and estimates of hotel attributes on prices. The results follow the trend assumptions of the past research in this matter. We have not observed significant impact on hotel prices, which is in line with the assumption that Airbnb attracts another type of tourist that is not in the hotel customer target. However, it is important to understand the type of scenario we have analyzed and the period of the sample.

Palma de Mallorca city offers, on average, a high quality service that distances Airbnb's service in terms of similarity. Also the sample makes reference to the period of highest influx rate of tourists (August), which creates a lower atmosphere of competition.

Hence, in a way the results make sense and offers potential for further research. The same methodology could be used, in order to study this matter deeper, on bigger cities, which would allow better clustering in the sample, and which do not have such a high seasonal demand.

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