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Host type and pricing on Airbnb: Seasonality and perceived market power*

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8th September 2021

Abstract

The literature on short-term rental emphasises the heterogeneity of the hosts population. Some argue that professional and opportunistic hosts differ in terms of their pricing strategy. This study highlights how differences in market perception and information create a price differential between professional and non-professional players. Proposing an original and accurate definition of professional hosts, we rely on a large dataset of almost 9,000 properties and 73,000 observations to investigate the pricing behaviour of Airbnb sellers in Corsica (France). Using OLS and the double-machine learning methods, we demonstrate that a price differential exists between professional and opportunistic sellers. In addition, we assess the impact of seasonality in demand on the size and direction of this price differential. We find that professionals perceive a higher degree of market power than others during the peak season and it allows them to enhance their revenues.

Declaration of interests: None

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1 Introduction

It is of interest to examine on-line rental platforms such as Airbnb from the economic viewpoint since they are markets in which differentiated goods are sold by heterogeneous sellers. That is, not only do different products coexist on the platform at different prices due to product differentiation but homogeneous products are also potentially sold at different prices due to heterogeneity between sellers. The literature emphasises that, like other markets of the ‘peer-to-peer economy’, the supply side often consists of both professional (experienced)

players practising a ‘profit-oriented supply’ economy and non-professional (inexperienced) players oriented to a sharing-oriented supply (Ke 2017, Krause & Aschwanden 2020, Li et al. 2016)

As they differ both in their motivations and in their expertise, these two types of actors may adopt very different behaviours. Some authors argue that professional hosts vary their prices more (Gibbs, Guttentag, Gretzel, Yao & Morton 2018, Kwok & Xie 2019, Li et al. 2016), obtain Superhost status more easily (Gunter 2018), and have better occupancy rates and better incomes (Kwok & Xie 2019, Li et al. 2016). Furthermore, Leoni (2020) and Li et al. (2016) have empirically demonstrated that the most "expert" hosts (those who manage the most listings or the oldest players in the market) have the highest survival rates. This is thanks in particular to their managerial skills and especially to the implementation of dynamic pricing. The relationship between prices and professionalisation seems to depend on the market and context. In their study of five Canadian cities, Gibbs, Guttentag, Gretzel, Morton & Goodwill (2018) reveal that professionals charge higher prices in Montreal alone. Furthermore, over 33 cities worldwide, Wang & Nicolau (2017) found a positive relationship between the price and the number of listings. Conversely, in the Hong Kong market (Cai et al. 2019) or in New York City (Deboosere et al. 2019), professional hosts are shown to charge lower prices than non-professionals. Finally, Li et al. (2016), who examined the Airbnb market in Chicago, do not find a relationship between the price level and the degree of professionalisation.

Besides the heterogeneity of actors on the supply side, the accommodation and tourism industries are also marked by strong seasonality. However, as Magno et al. (2018) or Faye (2021) argue, most empirical studies on pricing offer a static view. Only a few studies consider the seasonality of demand. These latter studies show that prices charged by Airbnb hosts are positively correlated with the level of market demand, being higher in peak seasons (Aznar et al. 2018, Falk et al. 2019, Magno et al. 2018). Examining month-to-month variation, Deboosere et al. (2019) find a significant impact of seasonality on the price per

night and revenue of Airbnb listings in NYC. The hosts adapt their prices to the holiday calendar and therefore to seasonal demand, applying higher rates during the long summer holidays than during shorter winter holiday periods. However, the response of Airbnb hosts to seasonal fluctuations is not homogeneous. It has been observed that most hosts do not practice dynamic pricing and therefore forego revenue opportunities (Chen & Xie 2017, Gibbs, Guttentag, Gretzel, Yao & Morton 2018, Li et al. 2016). Indeed, hosts who adjust their prices more frequently, upwards and/or downwards, improve the revenue performance of their listings (Kwok & Xie 2019, Oskam et al. 2018).¹

Taking these two aspects into account, hosts heterogeneity, and seasonal variations in demand, we focus on the pricing decision of Airbnb hosts and seek to understand to what extent professional players in the short-term rental market adopt significantly different pricing strategies compared to the rest of the hosts population.

Pricing is certainly one of the most important business practices for hospitality professionals. While some sharing economy platforms, such as Uber or Lyft, impose their prices on supplier-side users, short-term rental platforms leave the pricing to the host, possibly using a pricing tool (Gibbs, Guttentag, Gretzel, Yao & Morton 2018). The possibility for the hosts to set their own prices implies that they must summarise the characteristics of their accommodation, a relevant estimate of demand and, lastly, have a good knowledge of the market in which they operate. As a result, prices and pricing strategies have been the subject of increasing interest among scholars. According to the literature reviews in Dann et al. (2019) and Guttentag (2019), more than 10% of the academic work on Airbnb is devoted to the issue of pricing.

Our analysis relies on the hedonic pricing model (Rosen 1974), which is the workhorse tool for analysing the determinants explaining market prices. In recent years, this model has been mobilised by a few authors to examine the prices charged by Airbnb’s suppliers.

¹The efficiency of dynamic pricing strategies is a general feature of the accommodation industry. In their study on 17 european cities, Abrate et al. (2019) show that hotels practicing dynamic pricing significantly improve their revenue.

These studies focused on markets in North America (Benítez-Aurioles 2018, Chen & Xie 2017, Deboosere et al. 2019, Gibbs, Guttentag, Gretzel, Morton & Goodwill 2018, Lorde et al. 2019, Wang & Nicolau 2017), Europe (Benítez-Aurioles 2018, Chica-Olmo et al. 2020, Dudás et al. 2019, Lladós-Masllorens et al. 2020, Magno et al. 2018, Teubner et al. 2017, Wang & Nicolau 2017), Oceania and Asia (Cai et al. 2019, Wang & Nicolau 2017). All the hedonic studies have shown the permanence of certain price determinants, whatever the market. The prices charged by hosts are systematically higher when the accommodation offers greater privacy (accommodation rented in full and/or not shared with other guests), when it is larger, or when it is located closer to the city centre or tourist attractions. The amenities have an upward influence on the prices charged by hosts since better amenities imply a higher price. However, their effect on prices varies according to the context and the situation. The impact of free parking will be all the greater in metropolitan areas (Gibbs, Guttentag, Gretzel, Morton & Goodwill 2018, Dudás et al. 2019). In the Caribbean, parking is casual everywhere, and air conditioning is one of the amenities most frequently requested by guests (Lorde et al. 2019).

Our approach improves on previous works in three main respects. First, we not only estimate how prices differ with respect to the period and the host type, but also how the difference in prices, if any, between opportunistic and professional hosts varies with the period. We are not aware of any study performing that kind of estimation. The closest analysis to ours (Deboosere et al. 2019) concentrates on the variations of prices between hosts and seasons, but not on their interaction. Second, we provide a characterisation of the host status that differs from the literature and can be argued to be more accurate. To evaluate the degree of professionalism of an Airbnb market, many authors use a supply indicator, the number of listings provided by the hosts. In most of destination market studies, a host is considered as a professional when they list more than one listing (Dredge et al. 2016, Gibbs, Guttentag, Gretzel, Morton & Goodwill 2018, Gurran & Phibbs 2017, Kwok & Xie 2019, Li et al. 2016, Magno et al. 2018, Oskam et al. 2018), others use a threshold of two

or three (Schneiderman 2014). To characterise professional hosts, rather than relying on the number of listings marketed, we have compiled a dataset in which professional hosts are those registered with the French Trade and Companies Register (RCS), which allows to unequivocally ensure their professional status. Finally, on the methodological side, we take advantage of a recent statistical method, double-machine learning (Chernozhukov et al. 2018), that provides more robust estimates to model misspecification than the standard ordinary least squares (OLS) analysis, used in most of the aforementioned hedonic pricing studies.

Using a large dataset of almost 9,000 properties and 73,000 observations of Airbnb sellers in Corsica (France) in 2017, we test the hypothesis that a price differential exists between professional and opportunistic sellers. Furthermore, we explore the source of this differential by examining the impact of seasonality in demand on the size and direction of the price differential.

Our findings reveal that, on average, professional sellers charge prices about 9% higher than opportunistic hosts. Furthermore, accounting for seasonality, we demonstrate that this positive price differential exists and is very large during the peak season, culminating at +24% but vanishes off-peak. These results suggest that professional sellers perceive a higher degree of market power than opportunistic sellers during the peak season, while perceived market power falls dramatically during the low season. This difference in pricing strategies translates into higher revenue for the professional hosts, who manage to generate almost 800€ more revenue in August for a comparable listing.

The remainder of this paper is organised as follows. Section 2 presents a simple theoretical model and our hypotheses. Section 3 describes the dataset and our empirical strategy. The results are detailed in sections 4 and 5. Section 6 proposes two robustness checks while section 7 draws some conclusions and discusses limitations and potential extensions of our work.

2 Theoretical background

A key feature of short-term rental platforms is the existence of a set of close substitutes competing with the property offered by a given host. Hosts charging too high a price will not be able to rent their property even once. Conversely, if hosts charge too low a price, they will attract many consumers, but this behaviour is not economically efficient as they could increase their profit by raising the rental price. In fact, the short-term rental market structure clearly corresponds to monopolistic competition, as defined by Chamberlin (1933). Hosts face a decreasing demand curve for their properties and, as a consequence, benefit from a certain degree of market power that depends on the price elasticity of demand. A host facing a highly elastic demand cannot set a high price because any small change in price would cause a large decline in demand and profit. Conversely, a host facing a rather inelastic demand curve is going to charge a higher price since the rise in price will only cause a relatively small drop in demand. In this case, the host is going to charge a price that is higher than the competitive price and enjoy an economic profit.

The demand curve faced by a given host is typically unobserved. When setting the rental price, hosts must therefore imagine an expected demand curve relying on their knowledge of the market and personal beliefs. Let us consider two different hosts, i and j , proposing two perfectly identical properties and sharing the same marginal and average cost functions. They differ in their perception of the demand side and are characterised by different expected demand curves. Host i perceives the demand as more elastic than host j . Analysing the same market as host i , host j perceives a higher degree of market power and will rent identical properties at higher prices.²

We hypothesise that opportunistic hosts have a limited knowledge (sometimes no knowledge at all) of the market. As acknowledged by Airbnb itself on its website,³ setting a correct price is a challenging task for a host due to the amount of information one has to gather

²Note that the coexistence of different prices for identical properties could also arise from a difference in marginal costs. The host characterised by the highest marginal cost will charge a higher price.

³<https://blog.airbnb.com/smart-pricing/>

and process to forge a satisfying representation of the market. This information acquisition process is costly and casual hosts may not find it worth investing in.

Conversely, professional players are not looking for side revenues but need to generate significant profits. It implies that they develop a more accurate personal knowledge of the market than casual hosts and will use it to maximise their profit. Since the degree of market knowledge of a professional is higher, their perception of demand is different. When professionals perceive a higher degree of market power, they will charge higher prices and conversely if they perceive that demand is very elastic, they will set lower prices.

Furthermore, when markets are characterised by important seasonal fluctuations in demand, hosts have to adjust their expectations and pricing strategy accordingly. Typically, during the peak season and due to the relative scarcity of supply, guests may have more difficulties to find alternative opportunities of lodging, leading to a larger elasticity of demand. This implies that both the size and the direction of the price differential between professionals and non-professionals is likely to vary over time.

In this article, we aim at testing whether professional hosts indeed have a better perception of the degree of market power than non-professionals. This should translate into different prices on average. Furthermore, this differential should vary over the year, depending on the characteristics of demand. Finally, this difference in pricing strategies should materialise into larger revenues for professionals. The remainder of the paper is therefore based on the following three hypotheses:

H1: On average, a price differential exists between professional and non-professional players.

H2: The size and direction of this price differential may vary according to seasonal fluctuations in demand.

H3: This price differential allows professional hosts to generate more revenue.

3 Empirical strategy and data

We focus on the Mediterranean island of Corsica, France, which is a popular destination with strong tourism seasonality. Corsica has 326,000 inhabitants and welcomes an estimated 2 million tourists annually. A total of two-thirds of the visitors come from France, the remainder are mainly Italian and German. The island is one of the most popular tourist destinations in France. Thus, according to official data (INSEE 2018), 3.27 million overnight stays were registered in 2017 in the hotel sector, with total tourism expenditure amounting to 2.5 billion euros a year, one-third of the regional GDP. Furthermore, tourism flow is highly seasonal, as represented in Figure 1. Tourism frequentation is concentrated between April and September, with a peak season in June, July, and August. According to the official survey by the French Statistical Institute and Corsican Tourism Agency (INSEE 2018), the island received, in 2017, 400,900 visitors during the peak day of the tourism season, more than doubling its resident population.

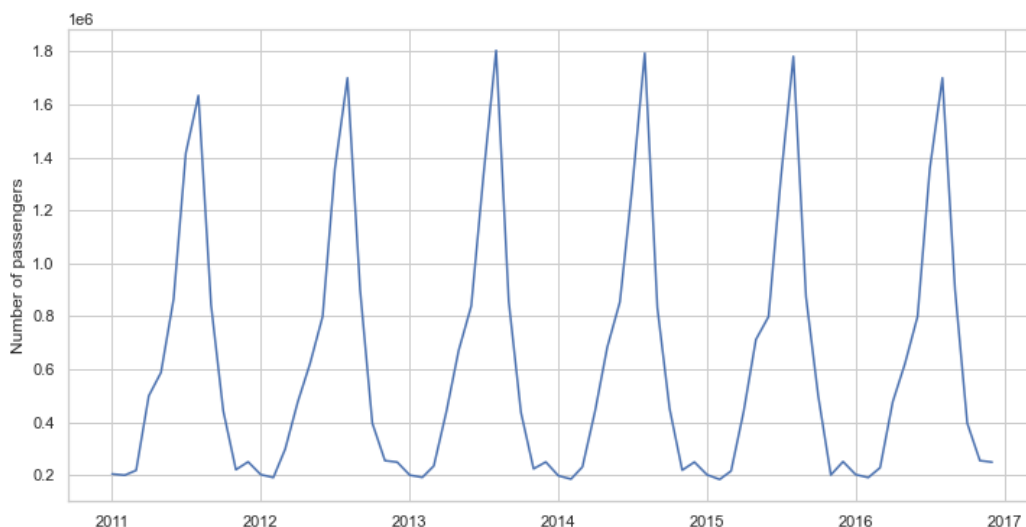


Figure 1: Monthly passengers flow in Corsica between 2011 and 2016, from ORTC 2016, <https://www.data.gouv.fr/en/datasets/trafic-mensuel-de-passagers-dans-les-ports-et-aeroports-corses-entrees-sorties-cors/>

3.1 Description of the sample

The main data are provided by AirDNA, a commercial company that collects short-term vacation rental data. It covers the entire Airbnb listings population of Corsica for the period from September 1, 2016 to August 31, 2017. The data for this study are aggregated at the month level. After cleaning the original dataset, we obtain a sample of 72,986 prices associated with 8,998 listings.⁴

In the following sections, we describe the variables used in our statistical analysis.

3.1.1 Outcome and explanatory variables

We seek to understand the difference in pricing between professional and non-professional hosts, as well as the difference in revenue. The dependent variables in our regressions are prices and revenue. Prices are given by the average daily rate (ADR), that is, the mean over the month of the observed daily prices. Monthly revenues are obtained by taking the sum of prices over the month for the days where a reservation occurred.

We define our main explanatory variable of interest, *Pro*, as a dummy variable that takes the value 1 if the owner of a listing is a professional and 0 otherwise. We define a professional as a host managing more than two listings and that is registered with the French Trade and Companies Registry, the RCS. The method for identifying hosts registered with the RCS first consists of an analysis of the host's Airbnb profile using the unique host ID generated by Airbnb. Indeed, as [Ke \(2017\)](#) has already highlighted, professionals frequently use the name of their company in the description of their profile and/or use the logo of their company as a profile picture. In this way, hosts belonging to an identified company are determined. The others were subject to a complementary search based on the image recognition of their listings. This allowed, via their listing portfolio, to identify the company's website and to exploit their legal informations. Finally, the company was

⁴Listings that did not carry out any transactions during the period under consideration have been removed. Furthermore, observations with no availability and no revenue in a given month, considered to be inactive, have also been dropped.

216 searched, on the basis of their name or registration number, in the public database of the
 217 RCS via the institutional search tool Infogreffe. ([https://www.infogreffe.com/recherche-](https://www.infogreffe.com/recherche-siret-entreprise/chercher-siret-entreprise.html)
 218 [siret-entreprise/chercher-siret-entreprise.html](https://www.infogreffe.com/recherche-siret-entreprise/chercher-siret-entreprise.html)).

219 The mean ADR across all listings and all months is €131.94 but, as shown in figure
 220 2, it varies significantly over the year, denoting a clear seasonal phenomenon due to the
 221 arrival of a large number of tourists during the summer season. The figure also displays
 222 substantive differences between the prices charged by professionals and non-professionals,
 223 with the former charging higher prices during the summer.

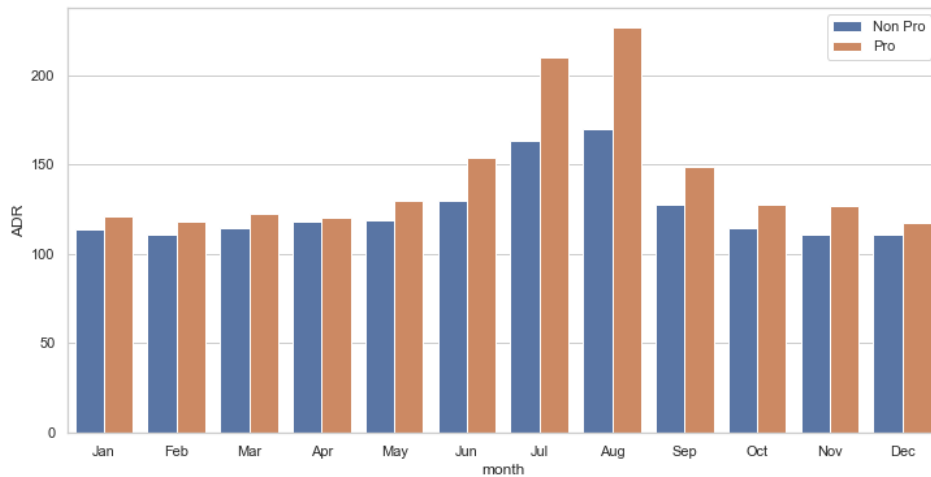


Figure 2: Average price per night and per month on Airbnb

224 3.1.2 Control variables

225 The dataset provides information related to both the listings and the hosts. A first set of
 226 variables deals with attributes and reputation of the listings. A second set of variables is
 227 related to host attributes. In addition, some variables make it possible to account for the
 228 rental policy defined by the host. Finally, we have constructed a variable that provides
 229 information about the location of the listing. These variables are summarised in Table 1 and
 230 described below.

Listing attributes	Listing reputation	Hosts attributes	Rental policy	Location
ListingAge	OverallRating	ResponseRate	CancellationPolicy	Hex
PropertyType		ResponseTime	MinimumStay	
ListingType		Superhost	InstantbookEnabled	
Bedrooms				
Bathrooms				
MaxGuests				
NumberofPhotos				
Amenities				

Table 1: Control variables used in regressions

Listing attributes and reputation For each listing, identified by a property id, the following information is provided:

- The listing age (ListingAge), which is the difference measured in months between the scraping date and the date of creation of the listing.
- The property type (PropertyType), which indicates whether the property is an apartment, a house, or something else.
- The listing type (ListingType) distinguishes between entire homes or apartments, private rooms, and shared rooms.
- The number of bedrooms (Bedrooms) and bathrooms (Bathrooms).
- The maximum number of guests (MaxGuests) the listing can accommodate.
- The number of photos (NumberofPhotos) associated to the listing.
- The overall rating (OverallRating) of the listing, a scale variable from 1 to 5.
- A large set of dummy variables for the amenities.

Hosts attributes We use three variables for characterising the hosts. Information on how fast and how often the host responds to a guest enquiry is provided by the response rate (ResponseRate), the percentage of time a host responds to potential guests within 24 hours, and the response time (ResponseTime), the average number of minutes it takes a host to respond to a new booking enquiry. The dummy variable Superhost tells us if the host has been awarded with this quality badge from Airbnb.

Rental policy The hosts may choose to use a number of options related to the rental conditions of the property. For example, hosts may decide to impose a minimum number of renting days to avoid too frequent a turnover between guests. This information is provided by the minimum stay variable (MinimumStay). Furthermore, because Airbnb is a sharing platform, the hosts can decide whether to accept or not a given guest. However, the hosts have the possibility to automatically accept any guest enquiry by enabling the instant booking option (InstantbookEnabled). This variable is a dummy that takes a value of 1 when the option is enabled. Finally, a key rental variable is the cancellation policy (CancellationPolicy). Airbnb provides the hosts with three basic options: strict, flexible, and moderate. When the chosen option is strict, the guest has the possibility to cancel the reservation for free only during the first 48 hours and provided it is at least 14 days before the booking dates. Under the moderate policy, it is possible to cancel the reservation up to five days before the booked dates. Flexible policy makes it possible to cancel for free 24 hours up to arrival. In addition, Airbnb proposes two very strict policies: Strict30 and Strict60. These are offered to hosts connected to the platform via software, in general professional players. Cancellation is possible only 30 or 60 days before arrival, and only 50% of the paid price is refunded to the guest.

Location The original dataset contains variables that account for the location of the listings. However, due to its peculiar insular geography, these variables may be insufficient in the case of Corsica. For instance, if we used the city in which the listing is located to account

for the impact of space on price, we could observe inconsistent results due to the fact that, in the same city, some places are very attractive for tourists (the seaside) while others are not due to accessibility problems. We have therefore developed an original but simple solution. Using geographical information systems (GIS), the area of Corsica has been divided in 479 hexagons of 10km², with each listing being associated to a unique hexagon, on the basis of geographical coordinates provided for each property ID. The qualitative variable *Hex* with 479 levels has been added to our model to account for spatial fixed effects.

3.2 Methodology of the study

Regarding the methodology, since we examine the pricing strategy of professional hosts on Airbnb, a natural starting point is the hedonic price model proposed by [Rosen \(1974\)](#). The general idea of this model is that the price of a differentiated good, such as housing, is a function of its intrinsic (number of rooms, surface, etc.) and extrinsic (attractiveness of the neighbourhood, etc.) characteristics. This model is commonly used to estimate consumers' willingness to pay. We use this method to estimate the willingness to accept of Airbnb hosts since, as outlined in section 2, the price is chosen by the seller (the host). The originality of our approach lies in the fact that we focus on both the role of seasonality and the host type for the pricing strategy. To account for seasonality, we introduce the variable *Month*, that takes values ranging from 1 to 12.

The model we want to estimate takes the following general form:

$$Y_{im} = \theta_m Pro_i + g(ListAttr_i, HostAttr_i, RentPol_i, Hex_i, Month) + \epsilon_{im}. \quad (1)$$

where i corresponds to the property and m corresponds to the period (month), Y is the price (expressed in logarithm) or revenue, and $ListAttr_i, HostAttr_i, RentPol_i$ represent the listing attributes and reputation, the host attributes, as well as the rental policy variables, respectively. The effect of interest is captured by the term θ_m , which measures the impact

of the host status (professional vs. non-professional) on prices; dependence on m clarifies that we allow this effect to vary with time. The function g is a general function, possibly non-linear, of the control variables.

In a first specification, we assume that this function is linear:

$$g(.) = Cons + \beta_{la}ListAttr_i + \beta_{ha}HostAttr_i + \beta_{rp}RentPol_i + \gamma_{Hex_i} + \gamma_m.$$

Under this specification, equation (1) is estimated using OLS, with clustered standard errors to account for serial correlation.

We consider two cases. In the first, $\theta_m = \theta$, that is, there is no variability in the effect of the host status (professional vs. non-professional) on prices. This first model (Model 1) provides us with an estimation of the effect, if any, of the host status on prices, so that we obtain some answers to validate H1. However, the aim is to understand not only if the pricing strategy of professional players differs from that of non-professional players (H1) but also to understand if and how this difference is affected by seasonal fluctuations in demand (H2). This is why we implement, in a second step, the estimation of a model in which θ_m is allowed to vary with m (Model 2). It tells us how the difference in pricing changes over the year between professional and non-professional hosts. Technically, this is done by creating an interaction variable between the variables *Month* and *Pro*.

We then consider a second specification in which $g(.)$ is a general function of the control variables. This allows us to check the robustness of the linear model.⁵ We adopt the double-machine learning (DML) approach developed by Chernozhukov et al. (2018). Put simply, this method consists of computing, in a first step, a prediction of the dependent (Y) and treatment (*Pro*) variables through a machine learning (ML) algorithm. In a second step, the residuals of the dependent variable (difference between the actual and predicted values of this variable) are regressed on the residuals of the treatment variable.

⁵It is well known that the OLS estimator may be biased in the case where $g(.)$ is misspecified (see, e.g., Robinson (1988) and the references therein).

4 Effect of professionalisation on prices

This section presents the results of our econometric study to assess the validity of hypotheses H1 and H2 presented in section 2. First, we detail the results of the baseline OLS specification. Then, we discuss the impact of the inclusion of variable interacting time and the type of host. Finally, we present the results obtained when adopting the DML approach.

4.1 OLS estimation

4.1.1 Results from the baseline model (Model 1)

As explained above, we start by estimating a simple OLS model in which the explained variable is the natural logarithm of the average daily rate. Results from the baseline specification are summarised in column ‘Model 1’ of tables 2 and 3 in appendix 7. The explanatory variables of interest are Pro and each of the twelve months of the year. Nonetheless, before focusing on these variables, some general comments are necessary.

In this specification, the model includes a very large number of right-hand variables (555), which are presented in section 3.1.2.

The global fit of the model is very good, with an R^2 of 0.693. This does not really come at a surprise since the total number of explanatory variables is high. Nonetheless, it means that our model accounts for most of the variability in rental prices.

It should also be noted that the most significant amenities (see Table 3) and those with the larger positive effect on prices are, to some extent, related to luxury. For example, with a coefficient of 0.190, the presence of a pool in the property increases the price by around 21% *ceteris paribus*. The same holds for the presence of a jacuzzi, which increases the price by 13.3%, an air conditioner (+6%), or a dryer (+10.5%).⁶

Furthermore, as expected, entire homes are much more expensive than private rooms (−20.4%) or shared rooms (−43.2%) *ceteris paribus*. Some property types are also shown to

⁶Since the price is in logarithm, the formula $e^\alpha - 1$ is applied to any coefficient α to obtain the effect in percentage points.

be more expensive than apartments. This is especially the case for guest houses (+26.7%) and bed and breakfasts (+19.8%) that provide the guest with additional services. This is also the case for houses and villas that are respectively 8.4% and 14.2% more expensive than apartments *ceteris paribus*. The number of bedrooms and bathrooms are also proven to be key determinants of the price since an additional bedroom raises the ADR by 15.5% and an additional bathroom by 13.3%. The reputation has a significant positive impact on the rate since an increment by one point of the rating of a listing leads to a 6% increase in the daily rate. Interestingly, we find that being a Superhost is associated with a slightly lower price (−4%).

Let us now consider the impact of seasonality on prices. Our results clearly show that June, July, August, and September are by far the most significant determinants of prices. This is no surprise but the impact of the peak season is proven to be very large. The same property is 19.8% more expensive in June compared to January. The difference amounts to +48.1% in July and peaks to +54.3% in August. It is noteworthy that the year can be divided in two parts with February, March, November, and December being similar or slightly cheaper than January and the rest of the months being more expensive.

Finally, looking at our main variable of interest, Pro, we see that on average, professional hosts ask for higher prices. This variable has a strongly significant coefficient of 0.042: the same property is 4.3% more expensive when listed by a professional host. This result supports our first hypothesis, according to which a price differential exists between professional and non-professional players. More precisely, since the price differential is positive, it suggests that professional hosts tend to perceive a higher degree of market power on average over the year.

4.1.2 Results from the model with interactions (Model 2)

Results from our baseline specification indicate that professional hosts ask for higher prices and that the peak season is a key determinant of prices. However, at this stage, we do not

know if the pricing behaviour of professional hosts is affected by seasonality. As highlighted in section 2, our hypothesis is that the size and direction of this price differential may vary according to seasonal fluctuations in demand. In other words, the pricing behaviour of professional and non-professional hosts should evolve differently over the year.

To assess the validity of this hypothesis, a set of interaction variables between Pro and Month are introduced in the previous specification. Since the model is essentially the same, results for most of the coefficients are only slightly modified.

We now focus on our variables of interest, Pro and Month. In the baseline specification, Pro was positive and significant. Looking at column ‘Model 2’ of table 2, it now appears to be negative. This result must not be misunderstood. It means that professional hosts charge lower prices than non-professionals *for the month of January*. To determine if the behaviour of a professional differs from the behaviour of a non-professional and by how much, one has to add up the coefficient associated with Pro and that associated with the interaction term of a given month (other than January).

Monthly effects of the professional status on prices are depicted in Figure 3, together with 95% confidence intervals.

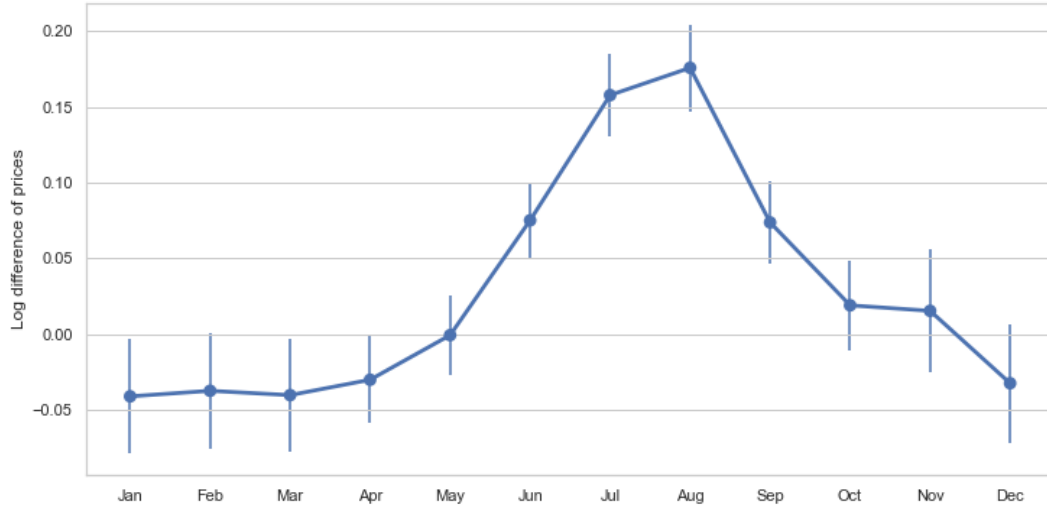


Figure 3: Log difference of prices between professionals and non-professionals in the OLS specification

According to the results of the OLS regression, professional players ask for higher prices than non-professionals between June and September, and for (slightly) lower prices in January, February, March, April, and December. In May, October, and November, the prices are similar. Specifically and as examples, in August, professional hosts ask for prices that are 19.2% higher for the same property. In March, they ask for prices that are 4% lower.⁷

These results support the idea that professional hosts adjust their pricing behaviour across the year and react in a different way to the opportunity created by the peak season. When a high demand is expected, professionals perceive the existence of a potential gain since the extent of their market increases. This is due to the fact that guests face a relatively scant offer and must accept having to pay higher prices. Non-professionals also perceive this reality of the market, but since their knowledge of the market and their objectives are different, they do not set a price that would allow them to extract the totality of what one could call the ‘seasonal rent’. These results confirm that the price differential between professionals and

⁷These percentages are obtained by adding up the coefficients associated to Pro and ProXMonth and then applying the formula given in footnote 7.

non-professionals evolves over time. More precisely, the price differential between professional and non-professional hosts depends positively on the evolution of demand.

4.2 DML estimation

As emphasised in section 3.2, newer methods have recently been developed, which allows for a better identification of the causal impact of the professional status on prices. The estimation results of Model 2 with the so-called DML approach are represented in Figure 4.

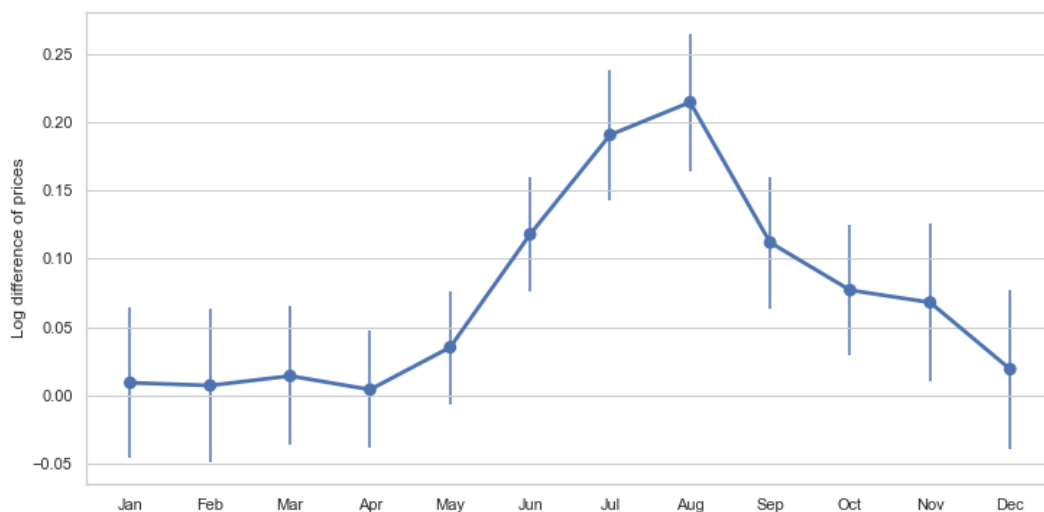


Figure 4: Log difference of prices between professionals and non-professionals in the DML specification

Figure 4 has a similar shape to Figure 3, with the important difference that the price differential between professionals and non-professionals is now larger. For example, the price differential in August is 24% instead of 19.2%. In June and September, professional hosts charge prices more than 11% higher than non-professionals, whereas the OLS estimation revealed a price differential less than 8%. Furthermore, the negative price differential obtained in January, February, March, April, and December, is not robust to the application of the DML method. This latter indeed concludes that *professionals never charge lower prices than*

non-professionals. They happen to choose similar prices in January, February, March, April, and December. Otherwise the price differential is always strictly positive.

These results are confirmed by the DML estimation of Model 1, which reveals an average price differential equal to 8.8%, twice as much as that determined via the OLS (4.3%).

We can conclude that prices are generally higher for professionals, except in the winter and the beginning of spring. Specifically, it is dubious to consider that professionals ask for lower prices off-peak, as suggested by the OLS analysis.

5 Impact on revenue

We have observed that professionals tend to propose higher prices than non-professionals (for comparable listings). We now turn to the question of whether these higher prices translate into higher revenue (H3). For this purpose, we estimate the model (1), with the dependent variable now being the revenue earned, instead of the logarithm of the price. Estimates obtained via the DML method are shown in Figure 5.

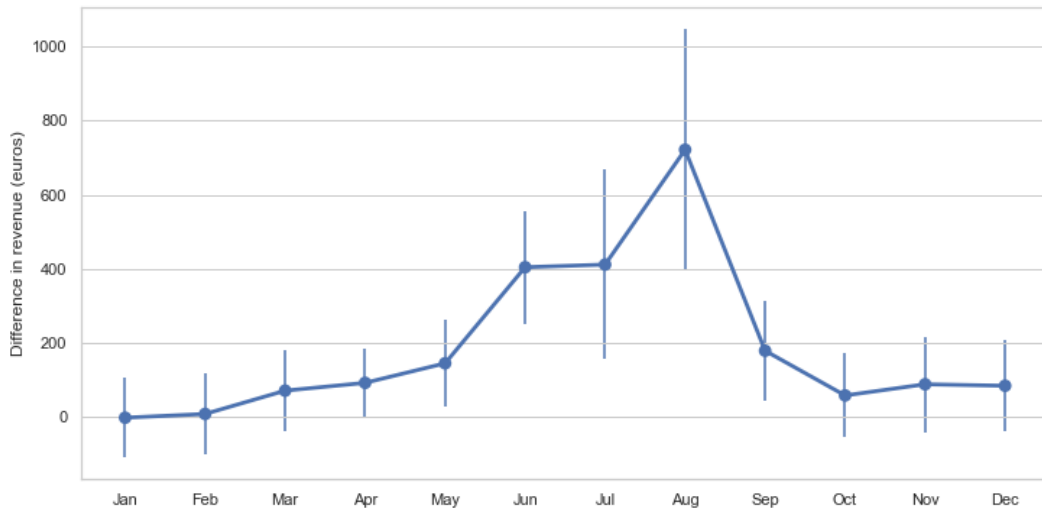


Figure 5: Difference in revenue between professionals and non-professionals in the DML specification

Results are very clear-cut. The higher prices adopted by professional hosts in the summer translate into higher revenue, meaning that the drop in demand, if any, is not sufficient to offset the price differential. Observe that the revenue differential may be quite large, peaking at almost €800 per listing in August.

However, we do not observe such an effect in Autumn (October and November), despite the professionals proposing higher prices than non-professionals. This could be explained by a sensitivity of demand to prices during this season greater than expected by the professionals. Faced with a limited market power, these latter would therefore be unable to transform higher prices into larger revenues.

Finally, despite adopting similar prices, professional hosts tend to generate more revenue than non-professionals in the spring (March, April, and May). This effect could have two possible explanations. Due to the correlation of the professional status with unobserved listing characteristics, it could be the case that professionals tend to rent more easily for a given level of prices. Another, simpler, explanation could well be that professionals make their listings more available, on average, than non-professionals during this period of the year.

6 Robustness checks

We propose two robustness checks. We first contrast our results with what would be obtained under an alternative characterisation of professional hosts, more in line with the usual assumption made in the literature. Then we implement our methodology on a dataset collected two years later in order to assess the temporal consistency of our results.

6.1 Alternative characterisation of professional hosts

The common characterisation of professional hosts encountered in the literature is based on the number of listings managed. A host is considered a professional player as soon as they

manage more than a given number of listings. In the literature, thresholds are commonly between one and three listings. We assume in this alternative specification that a host has a professional activity as soon as they manage (strictly) more than two listings. Adopting the DML methodology, estimation results in this setting are represented in Figure 6.

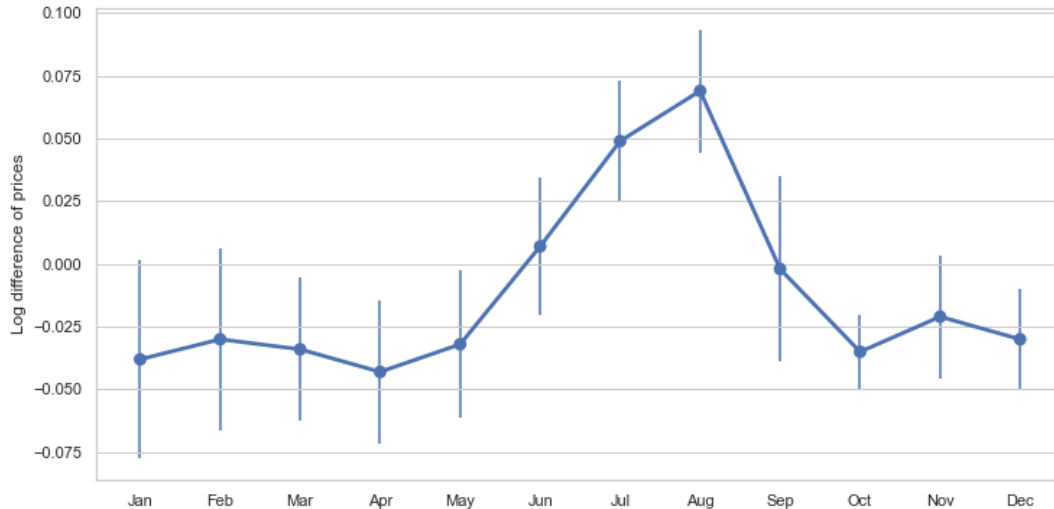


Figure 6: Log difference of prices in the DML specification under the alternative characterisation of professionalisation

The variations of the price differential according to the period of the year follow a similar pattern as with our characterisation of professional hosts. However, two important differences arise. First, the magnitude of the price differential is much lower. It now peaks at approximately 8% in August, compared with more than 20% in our baseline scenario. Second, and contrary to our results, professional hosts now propose lower prices off-peak. When combining these two phenomena, we find that professional and non-professional hosts tend to propose, under this alternative characterisation of professionalisation, similar prices on average. This illustrates the importance of adopting a sound characterisation of the professional activity on the short-term rental market.

6.2 Temporal consistency of the results

In November 2015, Airbnb launched their pricing tool called Smart Pricing to help guests set their prices to maximise their revenue. Smart pricing algorithm uses 70 different variables to provide hosts with pricing suggestions. They can either choose to follow the piece of advice or not. (Airbnb 2017 <https://blog.airbnb.com/smart-pricing/>).

Our data has been collected between September 2016 and August 2017, in a period in which the smart pricing tool was not widely used yet. One could argue that the diffusion of this practice among the hosts is likely to make our results already obsolete.

To deal with this potential issue, we have gathered the same dataset on airbnb sales for the period ranging from September 2018 to August 2019 and run the analysis again considering the same sample of hosts than for 2017. Results about the difference in prices are reported on Figure 7. Comparing Figure 7 with Figure 4, one can observe that, two years later, the price gap between professionals and non-professionals has become larger in both low and peak season. For example, in 2017 the price gap was not significantly different for the months between January and April. In 2019, instead, it lies above 10%. This suggests not only that our previous results are not obsolete but that the price differential is likely to increase with time and experience.

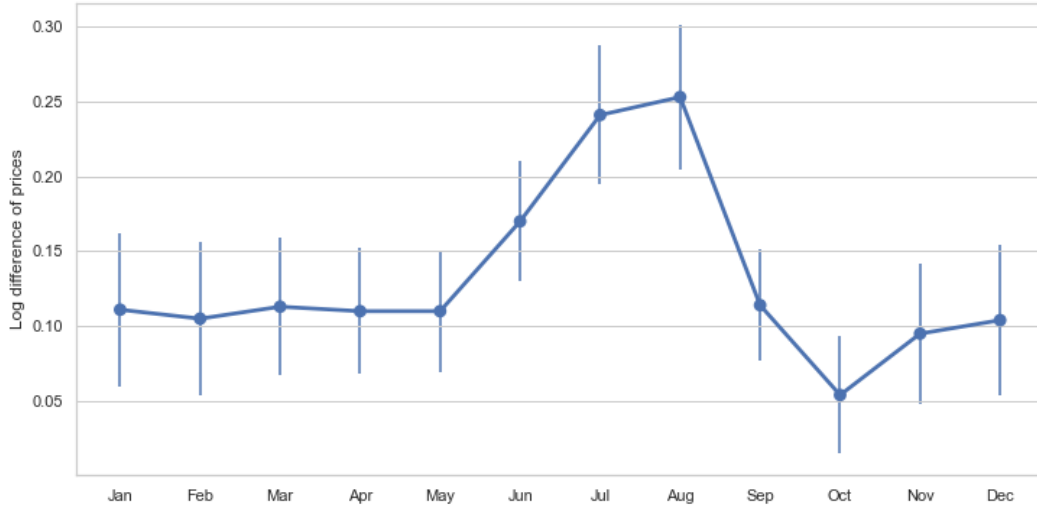


Figure 7: Log difference of prices in the DML specification for the period September 2018-August 2019

As for the difference in revenue, the results obtained with the data collected between September 2018 and August 2019 are depicted in Figure 8. Comparing this Figure with Figure 5, we still observe that professionals generate significantly more revenue during the summer, with a gap peaking at more than €1000 in August. However, it appears that they only perform slightly better in June and July 2019. For instance, while we have obtained a gap in revenue per listing of €400 in July 2017, it is merely above €200 in July 2019. This could be explained by a misperception of the market by professionals, who failed to adjust sufficiently their prices to an increase in the elasticity of demand in July, as compared to 2017. Data from the observatory of transports of Corsica indicate that the number of tourists in 2019 was 5% lower compared to 2018. Furthermore, the number of tourists in July was 25% below the number of tourists in August. These observations suggest that the demand in July 2019 was likely to be more elastic than in July 2017, hence explaining the drop in professionals performance with respect to 2017. The same reasoning applies for the month of June.

Results for the other months are comparable, with slight differences. In June, the gap

between professionals and non-professionals, around €250, appears smaller than in our main analysis. Furthermore, the revenue generated by professionals is now (slightly) larger in Autumn and Winter.

Overall, we can say that our results are fairly robust and that the increased diffusion of the smart pricing tool did not have too much of an impact on the pricing behaviour of the hosts. Interestingly enough, however, we note that even though the difference in prices in July is of the same order with the 2019 data, professionals failed to generate more revenue during this month.

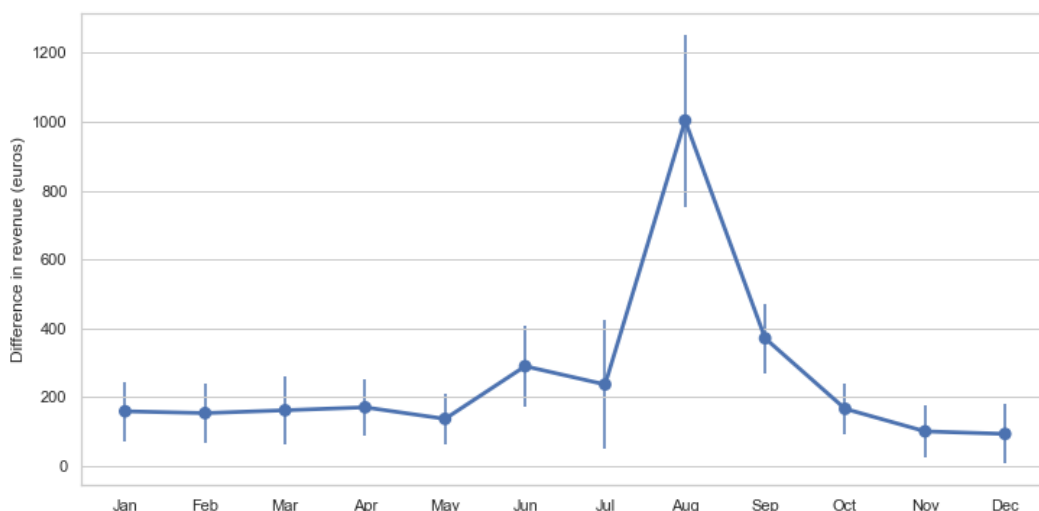


Figure 8: Difference in revenue between professionals and non-professionals in the DML specification for the period September 2018-August 2019

7 Discussion and conclusion

To date, the literature related to the pricing behaviour of Airbnb hosts has highlighted some interesting features that differentiate professional players from casual hosts. According to [Deboosere et al. \(2019\)](#), despite the fact that the price asked by professional hosts does not differ on average from the price asked by casual hosts, the former obtain a higher level of

revenue on average. This enhanced capacity to generate revenue could be partially explained by the fact that professional players practice dynamic pricing and change their prices more often to cope with changes in demand, as argued by [Oskam et al. \(2018\)](#). Nonetheless, even if changing the asked price more often is a key to understand why professional players are more efficient in the generation of revenue, there is a need to understand when and in which direction professionals adjust the prices in more depth. The proposed methodology makes it possible to understand the difference in the pricing strategy of professionals with respect to non-professionals.

Furthermore, our approach relies on a clear definition of the professional host. In the aforementioned studies, hosts are characterised by the number of listings that they manage. It raises a number of potential issues due to the fact that these hosts could be very heterogeneous in terms of objective and characteristics. Some of them are obviously not professionals. By considering only businesses as professional players, we obtain clearer results, indicating that the difference in revenue, as already revealed by [Deboosere et al. \(2019\)](#), is associated to a price differential. In addition, we demonstrate that this price differential depends on time and the intensity of demand.

This study is the first to measure a month-by-month price differential between professional and non-professional hosts. The results indicate that the price differential exists during the peak season. More precisely, asked prices are similar between January and May and they start to differ in June. In July and August, the peak in demand, professional hosts are more than 20% more expensive. This positive price differential slowly decreases as the demand slows in September, October, and November, and vanishes in December. This provides additional evidence that professionals practice dynamic pricing, as suggested by [Deboosere et al. \(2019\)](#) and [Oskam et al. \(2018\)](#).

Professionals tend to adopt a different behaviour only when demand is high. It means that they have a different perception of the economic opportunities associated with the seasonal increase in demand. Their enhanced knowledge of the market, related to experience

or the existence of loyal customers, for example, makes them aware of the fact that during the peak season, a fringe of customers is characterised by a quite low price elasticity of demand. They simply use this temporary market power to raise their prices and increase their revenue. We should stress that professional hosts behave as suggested by the textbook model of monopolistic competition while this is not (or less frequently) the case for casual hosts. Both casual and professional hosts increase their prices during the peak season but, on average, professionals perceive a larger degree of market power and tend to increase their rates more to enhance their revenue.

Our results emphasise that an economic incentive exists for short-term rental platforms to attract a significant number of professionals in destinations marked by an important seasonality, as the revenue of the platform is a fraction of the host's revenue. Since we show that professional hosts perform better in the presence of seasonality, it means that the platform will enhance its profit if the share of professional hosts is sufficiently large. Furthermore, another managerial implication for the platform is related to its ability to train casual hosts. The development of an accurate pricing tool such as smart pricing could be a way for the platform to reduce the gap in market knowledge between professional and casual hosts. By closing this gap, the platform will probably experience a significant increase in profits. Nonetheless, one has to keep in mind that a key attraction factor for the platform is the capacity to provide relatively cheap accommodation to some guests. That is, the correct mix between casual and professional hosts in the portfolio of the platform is destination specific and will partly depend on seasonality.

Finally, it should be kept in mind that the pricing decision may depend, in addition to the numerous explanatory variables included in our model, on some other, unmeasured, variables. In particular, some recent literature has emphasised the importance of human relationships between guests and hosts ([Stofberg & Bridoux 2019](#), [Ert & Fleischer 2020](#)). Guests are shown to value having in-person interactions or the quality of hosts' photographs. Assuming that professional hosts are less likely to provide these "services" than casual hosts, we conjecture

that the pricing gap between these two types of hosts would be even larger than the one found in this article. Our econometric specification indeed implies that professionals charge higher prices, despite offering less human relationships. If we could control for the quality of human interactions, a *ceteris paribus* analysis would compare professional to casual hosts providing the same quality of human interactions. It would therefore conclude to a larger price differential since guests, who value positively human relationships, would be willing to pay more to professionals for an increase in this service. A precise development of this informal statement should, however, be the subject of future research.

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OLS Results

Table 2: OLS Results

	Model 1		Model 2	
Pro	0.041667**	(3.205)	-0.041228*	(-2.144)
<i>Month</i> (ref. Jan)				
Feb	-0.022464***	(-8.709)	-0.022955***	(-8.276)
Mar	0.021615***	(6.130)	0.021945***	(5.962)
Apr	0.041383***	(9.875)	0.040896***	(9.177)
May	0.073532***	(16.555)	0.068979***	(14.765)
Jun	0.181323***	(37.399)	0.166463***	(32.718)
Jul	0.393524***	(69.445)	0.368368***	(62.399)
Aug	0.434069***	(73.192)	0.406592***	(65.937)
Sep	0.154286***	(33.233)	0.139805***	(28.993)
Oct	0.031714***	(7.867)	0.024239***	(5.821)
Nov	-0.015830***	(-4.438)	-0.022960***	(-6.325)
Dec	-0.014841***	(-5.049)	-0.016550***	(-5.287)
Pro X Feb			0.003663	(0.515)
Pro X Mar			0.000803	(0.070)
Pro X Apr			0.010964	(0.842)
Pro X May			0.040409**	(2.821)
Pro X Jun			0.116231***	(7.539)
Pro X Jul			0.198898***	(10.975)
Pro X Aug			0.216955***	(11.531)
Pro X Sep			0.114847***	(7.458)
Pro X Oct			0.060108***	(4.305)
Pro X Nov			0.056468***	(4.288)
Pro X Dec			0.008653	(0.987)
ListingAge	0.001954***	(6.474)	0.001928***	(6.388)

<i>PropertyType</i> (ref. Apartment)				
Bed_Breakfast	0.180840***	(6.573)	0.181498***	(6.587)
Bungalow	-0.042481	(-1.146)	-0.041989	(-1.136)
Chalet	0.028553	(0.626)	0.029146	(0.639)
Condominium	-0.024916	(-1.148)	-0.025170	(-1.159)
Guesthouse	0.236824***	(7.084)	0.234529***	(7.019)
House	0.080729***	(7.953)	0.080793***	(7.960)
Other	0.046692	(1.649)	0.045001	(1.585)
Vacation_home	0.102848***	(3.339)	0.107183***	(3.453)
Villa	0.132657***	(7.389)	0.132275***	(7.367)
<i>ListingType</i> (ref. Entire Home)				
Private_room	-0.227561***	(-10.402)	-0.227307***	(-10.388)
Shared_room	-0.759416***	(-6.245)	-0.758081***	(-6.339)
Bedrooms	0.143918***	(15.845)	0.143885***	(15.856)
Bathrooms	0.124604***	(10.270)	0.124407***	(10.254)
MaxGuests	0.029508***	(5.993)	0.029567***	(6.002)
NumberofPhotos	0.002682***	(6.293)	0.002682***	(6.298)
Superhost	-0.039978**	(-3.029)	-0.040525**	(-3.073)
ResponseTime	0.000000	(1.561)	0.000000	(1.517)
ResponseRate	-0.000127	(-0.404)	-0.000123	(-0.393)
OverallRating	0.058553***	(5.666)	0.059029***	(5.704)
<i>CancellationPolicy</i> (Ref: Flexible)				
Moderate	-0.052426***	(-4.118)	-0.052614***	(-4.133)
Strict	0.002457	(0.242)	0.002217	(0.218)
Strict_30	0.018812	(0.377)	0.019979	(0.405)
Strict_60	0.131867	(1.506)	0.106986	(1.221)
MinimumStay	0.000267	(0.903)	0.000269	(0.904)
InstantbookEnabled	-0.027489***	(-3.417)	-0.027802***	(-3.455)
Constant	3.647006***	(57.070)	3.657152***	(57.272)
Observations	72986		72986	
R^2	0.693		0.695	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: OLS Results for amenities

	Model 1		Model 2	
amenity_kitchen	-0.097777***	(-4.720)	-0.098421***	(-4.753)
amenity_internet	-0.031605	(-1.463)	-0.032460	(-1.500)
amenity_tv	0.040041**	(3.279)	0.039563**	(3.238)
amenity_heating	-0.037649***	(-3.910)	-0.037732***	(-3.919)
amenity_ac	0.058508***	(7.096)	0.058703***	(7.120)
amenity_washer	-0.002933	(-0.227)	-0.002732	(-0.211)
amenity_dryer	0.099710***	(8.727)	0.100336***	(8.783)
amenity_free_parking	-0.013122	(-1.157)	-0.012359	(-1.087)
amenity_wireless_internet	0.036387***	(4.198)	0.036392***	(4.198)
amenity_cable	0.035097***	(3.388)	0.035037***	(3.381)
amenity_breakfast	-0.007901	(-0.492)	-0.007533	(-0.469)
amenity_allows_pets	-0.052749*	(-2.410)	-0.052271*	(-2.383)
amenity_family_friendly	0.025295	(1.604)	0.025325	(1.604)
amenity_event_friendly	0.021278	(0.648)	0.021018	(0.638)
amenity_allows_smoking	-0.016397	(-0.796)	-0.016872	(-0.818)
amenity_wheelchair_accessible	0.136288**	(3.064)	0.135760**	(3.048)
amenity_elevator	0.037092**	(2.952)	0.037217**	(2.964)
amenity_fireplace	0.078426***	(6.208)	0.078339***	(6.199)
amenity_buzzer	-0.012256	(-0.376)	-0.013543	(-0.416)
amenity_doorman	0.162710	(1.721)	0.162783	(1.720)
amenity_pool	0.190425***	(17.565)	0.190240***	(17.549)
amenity_jacuzzi	0.125441***	(4.752)	0.125631***	(4.752)
amenity_gym	0.057221	(1.279)	0.056985	(1.278)
amenity_bedroom_step_free_access	0.581829**	(2.929)	0.591521**	(2.979)
amenity_bathroom_step_free_acces	0.331481	(1.021)	0.315784	(0.978)
amenity_home_step_free_access	-0.357330*	(-2.073)	-0.364094*	(-2.121)
amenity_common_space_step_free_a	-0.254069	(-0.820)	-0.238686	(-0.772)
amenity_bedroom_wide_doorway	0.148071	(0.399)	0.184763	(0.496)
amenity_home_wide_doorway	0.181656	(0.761)	0.186079	(0.784)

amenity_bathroom_wide_doorway	0.468759	(1.535)	0.477076	(1.559)
amenity_changing_table	0.028576	(0.931)	0.028469	(0.927)
amenity_childrens_books_and_toys	0.005353	(0.379)	0.005218	(0.370)
amenity_iron	-0.025709*	(-2.402)	-0.025501*	(-2.384)
amenity_common_space_wide_doorwa	-0.467646	(-1.703)	-0.485591	(-1.776)
amenity_wide_clearance_to_shower	0.408242	(1.175)	0.410585	(1.184)
amenity_fireplace_guards	0.026033	(0.756)	0.026228	(0.764)
amenity_accessible_height_toilet	-0.246174	(-0.789)	-0.255545	(-0.817)
amenity_private_living_room	-0.014194	(-0.330)	-0.016137	(-0.376)
amenity_childrens_dinnerware	0.020375	(0.771)	0.020943	(0.793)
amenity_fire_extinguisher	0.029733*	(2.387)	0.029797*	(2.392)
amenity_bathtub	0.007012	(0.398)	0.007455	(0.424)
amenity_flat_smooth_pathway_to_f	-0.480815	(-1.643)	-0.496317	(-1.691)
amenity_crib	0.058535***	(4.627)	0.058289***	(4.609)
amenity_street_parking	-0.041580**	(-3.275)	-0.041664**	(-3.282)
amenity_table_corner_guards	0.054211	(0.645)	0.056505	(0.671)
amenity_shampoo	0.015533	(1.566)	0.015342	(1.546)
amenity_laptop_friendly	0.002784	(0.320)	0.002776	(0.319)
amenity_carbon_monoxide_detector	0.007587	(0.573)	0.007704	(0.583)
amenity_private_entrance	-0.014792	(-1.481)	-0.014169	(-1.419)
amenity_grab_rails_in_shower_and	0.000000	(.)	0.000000	(.)
amenity_stair_gates	-0.093638**	(-3.127)	-0.093961**	(-3.136)
amenity_window_guards	-0.075419	(-1.518)	-0.076479	(-1.535)
amenity_safety_card	-0.029486	(-0.606)	-0.028223	(-0.581)
amenity_smoke_detector	-0.022282**	(-2.648)	-0.022488**	(-2.673)
amenity_game_console	0.023496	(0.448)	0.024180	(0.460)
amenity_pack_n_play_travel_crib	-0.031209**	(-2.931)	-0.031086**	(-2.921)
amenity_wide_hallway_clearance	-0.121817	(-0.613)	-0.123960	(-0.629)
amenity_lock_on_bedroom_door	-0.033587	(-1.404)	-0.034398	(-1.438)
amenity_room_darkening_shades	-0.041267*	(-2.013)	-0.041463*	(-2.023)
amenity_outlet_covers	0.046484	(1.331)	0.047107	(1.349)
amenity_handheld_shower_head	0.115496	(0.374)	0.118062	(0.383)

amenity_baby_bath	-0.066564***	(-3.780)	-0.066681***	(-3.788)
amenity_wide_clearance_to_bed	-0.637618	(-1.086)	-0.667595	(-1.132)
amenity_paid_parking	0.009683	(0.372)	0.009913	(0.381)
amenity_accessible_height_bed	0.000000	(.)	0.000000	(.)
amenity_disabled_parking_spot	0.472426	(1.333)	0.494744	(1.387)
amenity_baby_monitor	0.067483	(1.289)	0.067375	(1.288)
amenity_first_aid_kit	-0.017050	(-1.319)	-0.016684	(-1.293)
amenity_path_to_entrance_lit_at__	0.043922	(0.262)	0.041852	(0.250)
amenity_hair_dryer	0.009855	(1.019)	0.009956	(1.030)
amenity_essentials	0.073390***	(7.855)	0.073795***	(7.901)
amenity_24hr_checkin	-0.059891	(-1.225)	-0.059173	(-1.211)
amenity_babysitter_recommendatio	0.044604*	(2.059)	0.044517*	(2.056)
amenity_high_chair	-0.052234***	(-4.086)	-0.052313***	(-4.095)
amenity_hangers	-0.011367	(-0.917)	-0.011767	(-0.950)

t statistics in parentheses

Only significant coefficients at the 0.05 level are reported

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$