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Price-setting behavior in a tourism sharing economy accommodation market: A hedonic price analysis of AirBnB hosts in the caribbean☆

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1. Introduction

The methods used by consumers to access, buy and use their favorite products and services has changed fundamentally. While individuals have traditionally seen ownership as the most desirable way to have access to products, increasing numbers of consumers are paying to temporarily access or share products and services rather than buy or own them. Sharing something is a natural, pro-social behavior and has always been a sign of solidarity, cooperation and mutual aid (Benkler, 2006); for example, several firms located in the same building may share services on the same computer network, or even car fleets. Sharing may have become increasingly relevant as we transition from an industrial information economy to a networked economy.

As yet, there is no consensus on the definition of the "sharing economy". The term is often used interchangeably with other terms, such as, collaborative consumption, collaborative economy, peer economy, access economy, access-based economy, connected consumption, the mesh, asset-light lifestyle, and connected consumption, among others; however, Botsman (2013) argues that while there are areas of overlap, the terms have different meanings. The sharing economy has been variously defined as a form of consumption where people share consumption of goods and services online (Hamari, Mimmi, & Ukkonen, 2016); "consumers granting each other temporary access to under-utilized physical assets, possibly for money" (Frenken & Schor, 2017, pp. 4–5); "an economic system in which assets or services are shared between private individuals, either free or for a fee, typically by means of the Internet" (Oxford University Press, 2015); and, "a set of practices and models that, through technology and community, allows individuals and companies to share access to products, services and experiences" (Market Revolution, 2013, p. 14). What emerges is that the sharing economy is a new way to obtain value from untapped potential residing in goods or assets that are not entirely exploited by their owners. It has transformed how people's 'haves' are matched with people's 'wants', by shifting power away from large, centralized institutions to distributed networks of individuals and communities on the basis of trust, facilitated by the use of technology, in particular, the Internet. Indeed, Oh and Moon (2016) identify the following common attributes among prevailing definitions of the sharing economy: social relationship-based open accessibility, trust, value creation and peer-to-peer (P2P) transactions.

P2P platforms permit owners to offer goods and services for rental while the platform operator manages and maintains the marketplace (Botsman & Rogers, 2011). In these rental markets, the goods and services are "shared" in exchange for payment. P2P platforms promise to expand access to goods and services, diversify individual consumption, bolster efficiency by increasing asset utilization, and provide income to owners (Botsman, 2013; Edelman & Geradin, 2016).

In the past, P2P accommodation was limited because of the challenges that hosts found in making their accommodations known to potential guests, and establishing the needed trust between themselves and potential guests (Guttentag, 2015). However, P2P networks have radically transformed the accommodation sector (Zervas, Prosperio, & Byers, 2016). A well-known example is AirBnB, which enables individuals to rent out their spaces as accommodation for tourists. Airbnb has surmounted previous challenges confronting hosts by exploiting Web 2.0 internet technologies, which permits users to create their own content on websites (Guttentag, 2015). Some studies though have uncovered results which suggest that Web 1.0 technologies might have a greater impact on sales than Web 2.0 technologies (Jacobsen & Munar, 2012).

Spaces advertised by AirBnB vary widely, ranging from a living room futon, to entire islands, but typically involve a private room, apartment, or entire house. Since its inception in 2008, AirBnB has grown to more than 3 million listings, serving 65,000 cities in 191 countries, and has booked in excess of 200 million guests (Airbnb, 2017). Financial interest in AirBnB has been very significant. It has

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attracted $4.4 billion in venture capital since its start, $1 billion in its most recent funding round (Series F),[1] and was valued at $31 billion.[2] AirBnB has approximately 24 competitors in the same market space. These include: 9flats, Alterkeys, atraveo TUI Group, Benivo (formerly FlatClub), Couchsurfing, Flat4Day, Flipkey, HomeAway, Home Escape, HouseTrip, iStopOver, Kozaza, Localo, Nestpick, Onefinestay, Roomorama, SunnyRentals, TravelRent, Trip.com, Upiq, VRBO, Wimdu, Wyndham Worldwide, and Zukbox. AirBnB's success points to high demand for such accommodation due to attractive prices (Tussyadiah & Pesonen, 2016), connecting with locals, and exploring off the beaten track experiences (Guttentag, 2015). It is possible, however, that we are not experiencing an overall change in preferences with respect to platforms such as Airbnb, but an adaptation or evolution on a generational level (Jacobsen & Munar, 2012).

Like several other P2P platforms, AirBnB has met with criticism from policymakers and other commentators. The main criticism levied is that the primary competitive advantage of P2P platforms lies in their ability to avoid costly regulations that are meant to protect third-parties (Horton & Zeckhauser, 2016); for example, Baker (2014) writing in The Guardian newspaper, argues that AirBnB and Uber (an Internet taxi service) are “largely based on evading regulations and breaking the law”. Others argue that consumer welfare is enhanced by offering new innovations, more choice, greater service differentiation, better prices and higher quality services (Koopman, Mitchell, & Thierer, 2015). Further, the sharing economy removes the need for regulation in several instances, by providing better information and reputation systems, and expanding choices available to consumers (Koopman et al., 2015).

Unlike the traditional hotel industry, consumers using AirBnB must market themselves in ways that will maximize their chance of securing permission to book (Karlsson, Kemperman, & Dolnicar, 2017). Hosts' risk assessment of a potential booking depends in part on trip-related characteristics (for example, the number of nights, motivation for the trip, the travel party, and guests' self-description of their behavior) as well as personal characteristics (for example, gender, age, and features of the profile picture) (Karlsson et al., 2017). Evidence indicates that travel party composition is the most important attribute, followed by the self-description by guests of their positive behavior, a profile picture, and trip purpose (Karlsson et al., 2017). Research also suggests that race may be a factor in booking success (Edelman & Luca, 2014; Edelman, Luca, & Svirsky, 2017).

AirBnB essentially enables private citizens to become micro-entrepreneurs, offering their accommodation to tourists for a fee. Hosts have the potential to earn substantial income by renting out their accommodation (Jung et al., 2016). This potential is influenced by the demand they are able to generate at the listing price. As the entire process of searching and booking takes place over the Internet, the characteristics displayed on AirBnB likely serve as the single point of reference for potential guests to assess the quality of a listing (Hawlitschek et al., 2016). The listing price is thus likely to depend on the attributes of the accommodation which is offered for rent, other listing characteristics, as well as the feedback received from past customers. Hosts may thus be rewarded with a price premium to reflect their reputation (Ikkala & Lampinen, 2015); for example, a host's overall profile, including pictures of the accommodation and the host, are of significant importance in price-setting (Ert, Fleischer, & Magen, 2016), while hosts' responsiveness, wish list count, number of reviews and length of membership has been found to affect the sales of AirBnB listings (Lee, Hyun, Lee, Rhee, & Suh, 2015).

In this article, we investigate the price-setting behavior of AirBnB hosts in the Caribbean, a region that exhibits differences from country to country concerning biodiversity, geography, culture, historical and political background, and economic performance. Such differences are reflected in their respective tourism sector development (Lorde & Moore, 2008). For instance, there are several countries where tour operators have a significant influence on tourism supply. Some countries target the high-end market while others are more budget-based oriented. In most cases, countries have historical backgrounds which strongly link them to their source markets (Lorde, 2014).

Despite their differences, the tourism products in most Caribbean countries have elements of the following: sun, sea and sand tourism centered on resorts and hotels; cultural and heritage tourism, where the product is based on events (indigenous music forms are a critical element), museums and colonial plantation tours; nature tourism, ecotourism and marine activities, the product being related to soft adventure; honeymoon and wedding tourism; and, cruise tourism. In more recent times, regional tourism planners have begun to develop products in recognition of new forms of touristic experiences that are in demand by particular visitor segments, but also in response to concerns voiced over the unsustainable nature of mass tourism policies operations and management (Weaver, 2001).

Given the growing importance of AirBnB, this study is important for several reasons. Generally speaking, spending on accommodation is one of the largest items in tourists' budgets. More specifically, most visitors to the Caribbean are still accommodated in traditional hotels (Kaidou, Moore, & Charles-Soverall, 2014). AirBnB is also relatively new to the region and is viewed as a threat by established hotels (Lorde & Joseph, 2018). Together, these reasons provide an important inflexion point to investigate the evolving trends in the types of accommodation rented by tourists.

To deconstruct the price effect of the various characteristics that compose the multi-attribute product, we employ a hedonic pricing approach, assuming that the listing price of an AirBnB accommodation in the Caribbean is a function of its characteristics. A point of departure of this study from existing studies is that it also considers the effect of country-level characteristics on price-setting. In relation to rental-price setting, the variation due to differences in accommodation characteristics is empirically well supported, but the evidence on the link between pricing and country-level characteristics is limited. The importance of country-level characteristics for pricing and markup behavior has been established in other contexts (Bellone, Musso, Nesta, & Warzynski, 2016; Kilinc, 2019). This paper attempts to fill this gap within the framework of AirBnB price-setting by estimating the effect of country-specific characteristics. The study thus permits examination of how various characteristics may translate into economic value in the form of price premiums of AirBnB spaces. We contribute to the relatively small but growing literature on the P2P accommodation sector by demonstrating the price effects of different features based on actual AirBnB data for the Caribbean.

The paper proceeds as follows. Section 2 reviews the relevant literature on the hedonic model and its application in tourism and hospitality, and price-setting determinants on AirBnB. Section 3 describes the methods and data. Section 4 presents and analyses the results. Section 5 presents concluding remarks.

2. Literature review

2.1. Hedonic price theory and tourism

In an economic context, hedonics refers to the utility individuals derive from consumption of goods and services. Bartik (1987) claims that Court (1939) was the first application of hedonic price theory, although others, such as Colwell and Dilmore (1999), suggest that Haas (1922) preceded Court.

Despite opposing claims, credit for the hedonic pricing model is typically given to Rosen (Rosen, 1974). Rosen's approach, like that of Lancaster (1966a, 1966b, 1971), imputes characteristics' prices based on the relationship between the prices of differentiated goods and the

[1] See https://www.crunchbase.com/organization/AirBnB#/entity

[2] See https://www.cnbc.com/2017/03/09/AirBnB-closes-1-billion-round-31-billion-valuation-profitable.html

number of characteristics which these goods possess. Rosen's model is also similar to the Lancastrian model in that it assumes that goods possess bundles of characteristics valued by the consumer; however, the models differ in some key ways. While Lancaster assumes that goods are members of a group and that individuals must consume the group members in combinations that will allow them to acquire their preferred attributes, Rosen's model assumes that there is a range of goods from which consumers choose to obtain the requisite attributes.

The hedonic price approach has witnessed increasing use in tourism research. However, much research has focused on the hotel and tour operating sectors (Papatheodorou, Lei, & Apostolakis, 2012). There have been studies on sun and beach package tours (Thrane, 2005), entrance tickets for attractions (Falk, 2008), destination choice (Morley, 1992; Papatheodorou, 2001; Rugg, 1973), pricing strategies at holiday hotels in the sun-and-beach segment (Espinet, Saez, Coenders, & Fluviab, 2003), and bed and breakfast amenities (Monty & Skidmore, 2003). This focus may have arisen because such tourism products are heterogeneous, which calls for a precise valuation of range of elements that they incorporate (Sinclair, Clewer, & Pack, 1990).

2.2. Price-setting factors on AirBnB

A number of studies have examined pricing strategies on AirBnB. Due to minimal or no labour costs, primary fixed costs (for example, rent/mortgage and electricity) already being covered, less than full dependence on AirBnB revenue in general, and not typically having to charge taxes, AirBnB hosts are able to price their spaces competitively (Guttentag, 2015). Gutt and Herrmann (2015) consider the effect of rating score availability on pricing using 14,000 listings in New York city, and find that hosts adjust their prices upward by an average of €2.69 when their offering is publicly displayed online for the first time, which occurs as soon as a host has collected three ratings. Gutt and Kundisch (2016) examine the quality-price relationship on AirBnB to determine if *overall* ratings are a reliable signal of quality by focusing on the *value* dimension of the multidimensional rating system. They show that increases in listing prices are associated with decreases in *value* ratings. Thus, AirBnB's *value* scores offer potentially a more valuable source of information for buyers than *overall* ratings scores. This result also has implications for price-setting as hosts could try to establish a good online rating with intentionally lower prices when entering the market (Gutt & Kundisch, 2016). Wang and Nicolau (2017) investigate price determinants in 180,533 offerings on AirBnB in 33 cities. The authors find that 24 out of 25 variables within five categories (host attributes, site and property attributes, amenities and services, rental rules, and online review ratings) are significant determinants of price.

Research into pricing on AirBnB has also uncovered evidence of racial discrimination by hosts. Edelman and Luca (2014) employ a data set that combined pictures of all New York City landlords on AirBnB with their list prices and information about the quality of their spaces and show that black hosts are forced to charge 12% less than non-black hosts for comparable accommodation. A similar study finds Hispanic and Asian hosts charge prices that are on average 9.6% and 9.3% lower than their white counterparts after controlling for neighborhood property values, user reviews and rental unit characteristics (Kakar, Franco, Voelz, & Wu, 2016). A follow-up study by Edelman et al. (2017) finds that booking requests by persons with distinctively white names are accepted at a rate16 percent greater than those of persons with distinctively African-American names (in the absence of profile photos).

Trust, a belief that persons will behave according to assurances which they make (Ert et al., 2016), is an issue of critical importance for P2P markets (Botsman & Rogers, 2011; Ert et al., 2016; Hawlitschek et al., 2016; Kim, Chung, & Lee, 2011), as strangers are unlikely to engage in monetary transactions without trust (Bonson, Carvajal-Trujillo, & Escobar-Rodriguez, 2015). Therefore, P2P platforms have designed tools that enable the formation of trust between providers and consumers (Resnick & Zeckhauser, 2002); for example, identity verification, mutual rating and review schemes, insurance, and specific web design techniques (Gebbia, 2016). In relation to price-setting behavior, Ert et al. (2016) find that trustworthiness of the host as perceived from their photos ("visual-based trust") is associated with higher prices, while a host's reputation, as conveyed by their online review scores, has no effect. Hosts are able to influence their perceived trustworthiness by strategically discussing various personal topics; for example, occupations, educational background, or interests (Ma, Hancock, Mingjie, & Naaman, 2017), which also has implications for the prices hosts set.

Reputation in e-commerce, a public perception that conveys the collective evaluation of a group regarding attributes of a person or entity (Wang & Vassileva, 2007), is a closely related, but non-identical, concept to trust (Ert et al., 2016), which can have an effect on price-setting behavior. Numerical scores based on reviews by previous customers are the most commonly used method to convey reputational information online (Ert et al., 2016). Typically, an impeccable reputation in an e-commerce setting leads to greater sales, that is, a larger volume (Chevalier & Mayzlin, 2006). However, AirBnB hosts are constrained in terms of sales, since their space can be rented out at most 365 nights each year, or even fewer nights if hosts block some nights for other reasons (Ert et al., 2016). As a consequence, an improvement in reputation which leads to greater demand for a space is likely to result in higher prices, as the number of nights sold cannot be increased (Ert et al., 2016). This hypothesis is supported by findings which demonstrate that AirBnB hosts respond to a higher reputation by demanding higher prices or being more selective in choosing guests (Gutt & Herrmann, 2015; Ikkala & Lampinen, 2015). Another indicator of hosts' reputation, the 'Superhost' badge (a distinction given to hosts by AirBnB for meeting particular benchmarks which they set, such as high response rate, consistent 5-star evaluations, experience and commitment), can incentivize hosts to leverage this badge by setting higher prices, as guests are willing to spend more money for accommodations with the badge (Liang, Schuckert, Law, & Chen, 2017).

Host representation is also important for price-setting. Fagerstrom, Pawar, Sigurdsson, Foxall, and Yani-de-Soriano (2017) find that a host's facial expression has a significant impact on the buying behavior of AirBnB consumers. Negative facial expressions or absence of facial image increase the likelihood that potential consumers will avoid a particular listing and simultaneously decrease the likelihood to rent, while the converse is true for neutral and positive facial expressions. The impact of absent facial images and angry facial expressions on the likelihood of renting is not offset by setting a low price or high customer ratings.

The studies reviewed have started the process of investigating price-setting behavior in the tourism sharing economy. A major deficiency of these studies is that they were conducted with datasets on listings from a single city, primarily in the USA. Another is the limited number of variables considered in the analyses. These deficiencies limit our understanding of price-setting behavior for tourism sharing economy rental accommodation. We argue that an investigation which considers other regions of the world is also appropriate.

Against this background, we argue that AirBnB represents an ideal laboratory for studying price-setting behavior with hedonic price models. First, the nature of AirBnB's P2P platform with many sellers and buyers and high frequency of bookings creates an optimal environment for competition and price discovery. Second, personal attributes are more relevant since AirBnB interactions are conducted on a personal basis. AirBnB's platform provides rich profiles of its users including explicit social cues (for example, photographs, self-descriptions, text reviews), constituting a prerequisite and a powerful basis for price differentiation. Third, AirBnB's platform provides a uniform template for describing users' diverse information. This renders the effects of investigated factors highly comparable across large sets of accommodations and hosts as they contain the same pieces of information.

3. Methods and data

3.1. Methods

This study employs the hedonic price approach to examine price-setting behavior by AirBnB hosts in the Caribbean. This method assumes that a characteristic vector can represent the good under consideration. In the case of the AirBnB, an individual renting a space is purchasing not just access to that space, but also the characteristics of that space.

Although several functional forms are compatible with hedonic price analysis (Papatheodorou et al., 2012), the semi-logarithmic form recommended by Rosen (1974) is most frequently used in research (Andersson, Shyr, & Fu, 2010). The hedonic price model for the rental price of AirBnB accommodation may be specified as a function of a set of attributes:

$$ln\, P_i = \alpha + \beta X_{ij} + \varepsilon_i \quad (1)$$

where lnP_i is the natural logarithm of the rental price of AirBnB listing i; X_{ij} is a vector of attributes j associated with the listing; α is the intercept; and ε_i is a random error term with the usual properties. X_{ij} may be measured in logs or levels. The partial derivative of the hedonic function with respect to each listing characteristic j provides the marginal implicit price, which represents the marginal willingness of buyers to pay for a particular attribute and the marginal willingness of sellers to accept.

Attributes, X_{ij}, are categorized as follows: site, reputation, convenience, personal, amenities, and country. The list of attributes for site, reputation, convenience, personal, and amenities are taken from the existing hedonic literature on accommodation pricing and online commerce (see for example, Bonson et al., 2015; Ert et al., 2016; Espinet et al., 2003; Gutt & Herrmann, 2015; Gutt & Kundisch, 2016; Kaidou et al., 2014; Kim et al., 2011; Liang et al., 2017; Teubner, Hawlitschek, & Dann, 2017; Wang & Nicolau, 2017). Site, reputation, convenience, personal, and amenities attributes are expected to have a positive effect on price-setting by AirBnB hosts.

Country attributes are meant to capture some of the cross-country differences in the Caribbean that might result in cross-country pricing variation: real GDP per capita, a common measure of a country's economic strength and performance; population size, as a measure of the degree of competition within-country to offer accommodation; land area, as a measure of biodiversity[3]; broadband subscriptions per 100 persons, that is the penetration rate, as a measure of infrastructural development[4]; and, exchange rate with US dollar, a measure of the currency's strength. All country attributes are expected to have a positive effect on price-setting by AirBnB hosts, with the exception of the proxy for competition, population size.

OLS and quantile regression methods will be used to estimate the hedonic equation in (1). The main difference in approaches is that OLS regression is based on the conditional mean of the dependent variable, in contrast to quantile regression which is based on the conditional r^{th} quantile of the dependent variable. Quantile regression, therefore, provides a more comprehensive description of the conditional distribution; that is, quantile regression estimates the effects of individual explanatory variables on the whole distribution of the dependent variable, as opposed to estimating the average response of the dependent variable to changes in the explanatory variables. This permits the discovery of relationships that may otherwise remain hidden.

Hedonic price analysis relies on the extensive use of dummy variables to measure qualitative characteristics of a product. The coefficients can be transformed using the transformation $e^{\beta} - 1$, where β is the coefficient and e is the base of the natural logarithm, to provide a more precise explanation of each coefficient (Papatheodorou et al., 2012). This transformation provides the dummy's effect in percentage terms. The monetary effect can be obtained by multiplying this transformation by the average level value of the dependent variable (Monty & Skidmore, 2003).

3.2. Data

Our analysis is based on a dataset of AirBnB listings from 12 Caribbean countries (Antigua & Barbuda, Aruba, the Bahamas, Barbados, Belize, British Virgin Islands (BVI), Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent & the Grenadines, and Trinidad & Tobago). The observations were collected using web crawling techniques to collect publicly available information on AirBnB.com, yielding 7025 listings. All data was collected in August 2017. Only listings with three or more ratings are considered, for which AirBnB provides visible star ratings, to ensure that the price of the accommodation listed reflects the market equilibrium to some extent. This resulted in a final dataset with 3046 listings. Table 1 provides the details of the dataset by country. We then combine this with country-level indicators collected from World Bank *WDI*.

4. Results and analysis

4.1. AirBnB listing attributes and country level indicators

Tables 2a and 2b provide summary statistics of all AirBnB attributes under study. The average price is just over USD $147 per night for the average listing. The large standard deviation in price per night is indicative of the wide variation in prices. The high average overall rating of 4.8 stars on a 5-star rating scale suggests that guests have been very satisfied with their AirBnB accommodation in the Caribbean.

4.2. Site attributes

This category is concerned with physical aspects immediately associated with the AirBnB site. The average listing has approximately 2 bedrooms, 2 bathrooms, and 3 beds (Table 2a). Apartments or similar comprise 44.2% of all listings, followed by houses at 32.1%. Bed & Breakfast operations make up the smallest share of rentals available (4.1%). Almost 86% of listings offer the entire site for rent.

4.3. Reputation attributes

Reputation is comprised of several variables: length of AirBnB membership (in months), number of listing photos, number of ratings, overall rating (1 to 5 stars in steps of 0.5 stars), 'Superhost' status (1 = yes, 0 = no), and wish list[5] (number of times listing has been saved by AirBnB customers).

Fig. 1 shows the distributions of the reputation variables as well as rental price. The distribution of each variable is right-skewed with the exception of overall star ratings. The latter is consistent with the literature where virtually all ratings are 5 stars (61.5%) or 4.5 stars

[3] The use of land area as a proxy for biodiversity is derived from the "geographical area hypothesis" (Terborgh, 1973), which asserts that the tropics are the largest biome and that large tropical areas can support more species. The fundamental proposition is that in tropical zones, larger areas support more species.

[4] Several studies have pointed out the positive relationship between broadband penetration and economic growth (Atif, Endres, & Macdonald, 2012; Minges, 2015).

[5] The number of times which AirBnB customers save a particular listing either for further review or so that they can easily find it again should they wish to return is considered a reputational attribute, as it is an easily visible indicator of potential demand for that listing. Potential demand for a listing alludes to a combination of the attributes on offer from the listing and the quality of the host, that is, reputation.

Table 1
Details of the dataset.

Country	Date compiled	Total listings	Selected listings	Of total
Antigua & Barbuda	7 August 2017	452	162	35.8
Aruba	9 August 2017	744	433	58.2
The Bahamas	6 August 2017	873	503	57.6
Barbados	8 August 2017	1057	459	43.4
Belize	9 August 2017	267	97	36.3
British Virgin Islands	9 August 2017	310	79	25.5
Grenada	12 August 2017	400	134	33.5
Jamaica	5 August 2017	1184	528	44.6
St. Kitts & Nevis	12 August 2017	193	55	28.5
St. Lucia	7 August 2017	624	272	43.6
St. Vincent & the Grenadines	12 August 2017	279	75	26.9
Trinidad and Tobago	13 August 2017	642	249	38.8

Table 2a
Summary statistics of continuous AirBnB variables.

	Mean	Std. dev.	Min	25Q	50Q	75Q	Max
List price ($USD)	147.40	150.10	10	65	100	175	2200
Number of bedrooms	2.1	1.3	1	1	2	3	11
Number of bathrooms	1.8	1.2	0	1	1	2	10
Number of beds	2.9	2.0	1	1	2	4	16
Check-in window (hours, 1–24)	11.0	9.5	1	11	12	14	24
Checkout time	2:00 pm	5.5 h	8:00 am	11:00 am	12:00 pm (midday)	2:00 pm	12:00 am (midnight)
Overall rating (max 5 stars)	4.8	0.3	2.5	4.5	5	5	5
Number of ratings	18.4	19.7	3	6	11	23	171
Response rate (%)	95.3	16.5	0	100	100	100	100
Membership (months)	32.3	18.0	2	19	29	43	97
Wish list	289.5	379.7	3	83	172	344	5988
Minimum stay (nights)	5.9	17.4	1	1	3	3	100
Number of photos	22.4	15.7	3	12	19	29	99
Maximum extra charge ($USD)	33.48	89.41	0.00	0.00	0.00	32.25	1650.00
Cleaning fee ($USD)	34.94	48.44	0.00	0.00	20.00	50.00	500.00
Security deposit ($USD)	128.02	215.96	0.00	0.00	0.00	200.00	2500.00

Source: Authors' calculations based on data collected from AirBnB.com

Table 2b
Summary statistics of discrete variables.

	Percent (%)	Type
Entire rental space (= 1)	85.6	Binary
Property type		Categorical
• *Apartment* (= 1)	44.2	
• *Vacation home* (= 2)	5.8	
• *House* (= 3)	32.1	
• *Bed & breakfast* (= 4)	4.1	
• *Villa* (= 5)	13.8	
Superhost (= 1)	25.0	Binary
Self-Check-in (= 1)	12.5	Binary
Elevator (= 1)	4.0	Binary
Doorman (= 1)	3.5	Binary
Breakfast (= 1)	10.5	Binary
Wifi (= 1)	96.9	Binary
Gym (= 1)	8.6	Binary
Wheelchair (= 1)	13.6	Binary
Pool (= 1)	41.2	Binary
AC (= 1)	78.0	Binary
Cable TV (= 1)	62.5	Binary
Response time		Categorical
• *Within an hour* (= 5)	59.2	
• *Within a few hours* (= 4)	25.6	
• *Within a day* (= 3)	12.6	
• *Within a few days* (= 2)	0.4	
• *Other* (= 1)	2.1	
Hosts with multiple listings (= 1)	69.8	Binary

(32.7%). Caribbean AirBnB rentals have been listed for close to three years, specifically 32.3 months on average (Table 2a). Each listing provides approximately 22 photos on average, which is close to the median of 19. The average number of ratings is 18, which is mainly due to the listings with many ratings; half of all listings have 11 ratings or less. Twenty-five percent of rentals are offered by 'Superhosts' (Table 2b). The average listing has been saved 290 times.

4.4. Convenience attributes

Convenience is comprised of options AirBnB hosts may offer for guests' convenience, or depending on the option could prove inconvenient to guests. This includes the check-in window (11 h on average), checkout time (2:00 pm is the average checkout time allowed, although some hosts allow guests to checkout up until midnight), cleaning fee ($39.94 per listing), security deposit ($128.02), and maximum charge for additional persons beyond the minimum preferred by hosts ($33.48 on average) (Table 2a). The minimum stay required for a booking is 5.9 nights; however, 75% of hosts require at most 3 nights for a booking. Response rates are high, averaging 95.3% (Table 2b). The typical response time to potential guest enquires usually take place within an hour (59.2%) or within a few hours (25.6%). Self-check-in facilities are offered by 12.5% of hosts.

4.5. Personal attributes

The only personal attribute considered was whether hosts offered multiple listings on the AirBnB platform. Almost 70% of Caribbean hosts (69.8%) offer more than one space for rental.

4.6. Amenities attributes

This category comprises amenities considered by the authors to be those that guests likely cannot do without (Wi-Fi and cold air

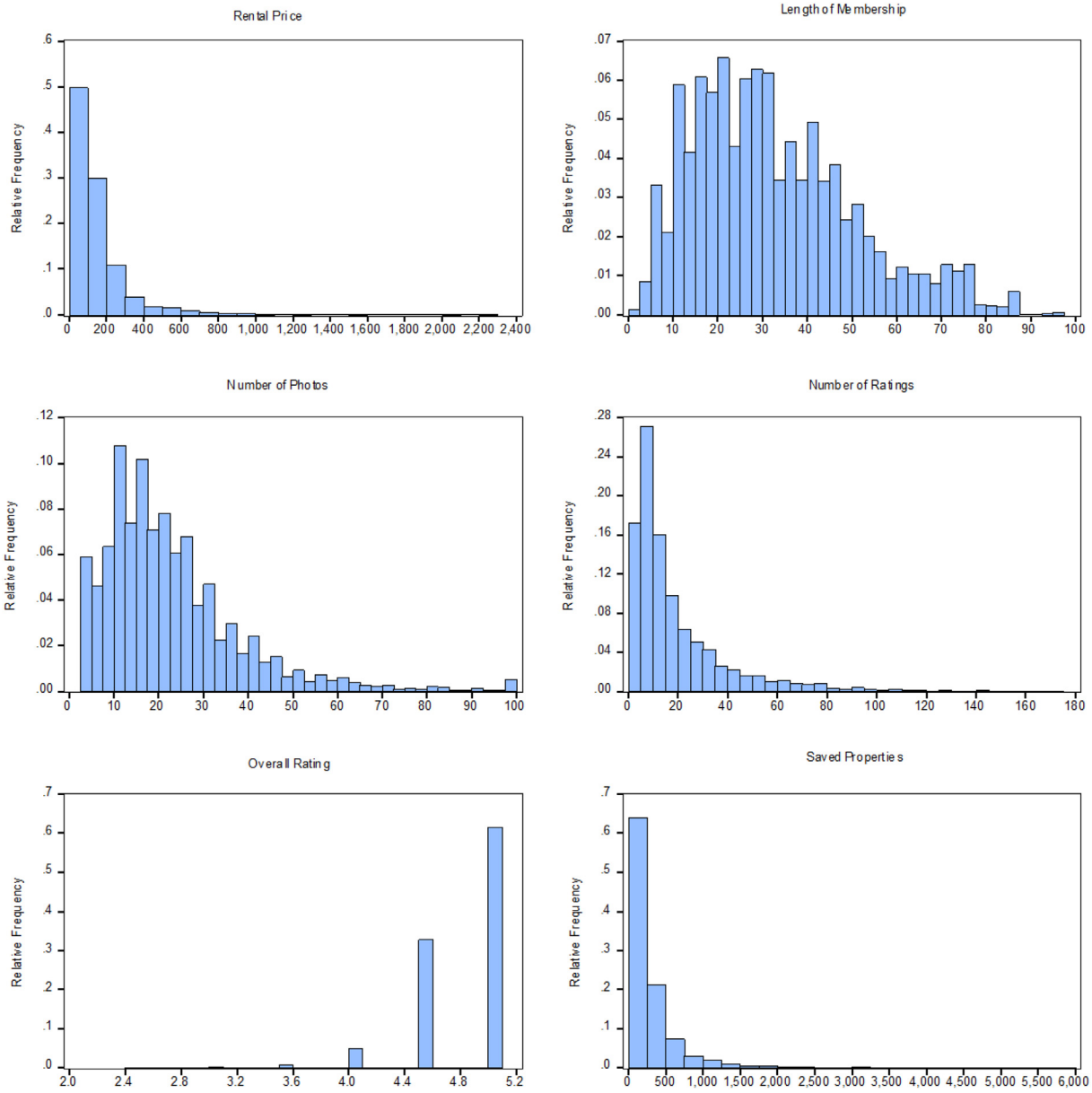

Fig. 1. Distribution of reputation attributes.

conditioning [ac]), and those over and above what most hosts might offer (breakfast, cable TV, doorman, elevator, gym, pool and wheelchair accessibility). Wi-Fi is offered by almost all hosts (96.9%). AC provision is also high at 78%. A breakfast option is provided by 10.5% of hosts, cable TV by 62.5%, a doorman by 3.5%, elevators by 4%, gym facilities by 8.6%, a pool by 41.2%, and wheelchair access by 13.6%.

4.7. Country attributes

The Country attribute category is comprised of several dimensions, outlined previously in Section 3.1, intended to control for country-level effects on price-setting behavior. Table 3 provides statistics for each country under study. Each dimension is indicative of the cross-country variation in the Caribbean; for example, real GDP per capita ranges from USD $4320 in Belize to USD $24,272 in Aruba.

4.8. Regression results

Table 4 provides OLS results along with the estimates of the 25th, 50th, and 75th quantiles. Table 5 presents the results in both percentage and dollar terms. Determinants are categorized by (1) Site, (2) Reputation, (3) Convenience, (4) Personal, (5) Amenities, and (6) Country.

All attributes which fall under the *Site* category are significant determinants of price-setting behavior according to the OLS results (Table 4). Each additional bathroom increases the list price by $24.89 on average (Table 5). The quantile regressions show that price increases are higher at higher price levels, ranging from $7.98 for the 25th quantile up to $33.88 for the 75th quantile. An additional bedroom and bed increase the list price by $4.64 and $2.23 respectively. Quantile regressions show a similar increasing pattern on price-setting across the distribution for both attributes, although it disappears after the 50th quantile for the number of beds. Property type has a positive effect on price-setting, that is, larger rental units are more expensive than smaller ones; an additional $11.48 for each type from apartment all the way up to villa. Hosts which rent out their entire space add an additional $74.94 compared to those hosts which offer shared spaces or private rooms. In percentage terms, rental space has the largest impact on

Table 3
Country level indicators.
Source: World Bank WDI.

	RGDP (USD)	Population	Land area (sq. km)	Broadband (%) (2015 est.)	Exchange rate with USD
Antigua & Barbuda	12,784	100,963	440	13.07	2.7
Aruba	24,272 (2010 est.)	104,822	180	18.29	1.79
Bahamas	20,568	391,232	10,010	20.91	1.0
Barbados	16,157	284,996	430	27.23	2.0
Belize	4320	366,954	22,810	5.00	2.0
BVI	29,160	30,661	150	24.31	1.0
Grenada	8508	107,317	340	18.52	2.7
Jamaica	4796	2,881,355	10,830	8.14	117.64
St. Kitts & Nevis	15,833	54,821	260	29.57	2.7
St. Lucia	7104	178,015	610	15.37	2.7
St. Vincent & the Grenadines	6762	109,643	390	15.51	2.7
Trinidad & Tobago	15,786	1,364,962	5130	19.97	6.49

Notes: Indicators are from 2016 unless otherwise indicated. Real GDP per capita is rounded to the nearest dollar. Exchange rates for Jamaica and Trinidad & Tobago are averages from 2014 to 2016.

price-setting behavior on AirBnB hosts.

With respect to *Reputation*, OLS estimates indicate that all such attributes have a positive impact on price-setting with the exception of the number of ratings (Table 4). Each additional month that a host has been listed on AirBnB.com, adds $0.44 to the price (Table 5). This price effect is greater at higher prices in the distribution. Additional photos are worth $0.15. This pricing behavior only takes place at higher levels of the distribution. As indicated previously, the number of ratings was found to have a negative effect on the price-setting behavior of Caribbean AirBnB hosts. Such a finding is not unprecedented in the literature. Teubner et al. (2017) find a negative association between the number of ratings and price. Other researchers have argued that many tourists choose rent sharing to reduce costs (Guttentag, 2015). So, cheaper listings may receive more bookings and therefore more reviews. This result is persistent, even at higher levels of the price distribution. Each additional star earned by a host can result in an additional $29.61 to the rental price. Spaces with higher prices add more for each additional star. To explore this issue, we interact the variables overall rating and number of ratings (NOR*OR). Like Teuber, Hawlitschek, & Dann, we also find a significant positive effect of this interaction on price setting. The latter suggests that the negative effect of number of ratings on listing price is stronger for spaces with lower ratings (see Fig. 2). As expected, hosts with the 'Superhost' badge set higher prices than those without the badge, specifically, $14.37. The reputational effect caused by AirBnB customers saving a listing results

Table 4
Determinants of price-setting behavior (OLS and quantile regression).

		OLS	Quantile		
			25Q	50Q	75Q
Site	Bathrooms	0.156 (0.014) ***	0.144 (0.024) ***	0.186 (0.018) ***	0.221 (0.025) ***
	Bedrooms	0.031 (0.014) **	0.044 (0.015) ***	0.068 (0.023) ***	0.079 (0.032) **
	Beds	0.015 (0.007) **	0.028 (0.012) **	0.023 (0.013) *	0.015 (0.014)
	Property type	0.075 (0.007) ***	0.062 (0.009) ***	0.062 (0.009) ***	0.062 (0.008) ***
	Rental space	0.411 (0.029) ***	0.384 (0.040) ***	0.341 (0.040) ***	0.298 (0.035) ***
Reputation	Membership	0.003 (0.001) ***	0.002 (0.001) ***	0.003 (0.001) ***	0.003 (0.001) ***
	Number of photos	0.001 (0.0006) **	0.001 (0.001)	0.001 (0.001)	0.002 (0.001) *
	Number of ratings (NOR)	−0.007 (0.001) ***	−0.007 (0.001) ***	−0.006 (0.001) ***	−0.007 (0.001) ***
	Overall rating (OR)	0.183 (0.028) ***	0.205 (0.041) ***	0.166 (0.035) ***	0.146 (0.037) ***
	NOR x OR	0.005 (0.001) ***	0.005 (0.027) **	0.004 (0.002) **	0.005 (0.001) ***
	Superhost badge	0.093 (0.021) ***	0.091 (0.025) ***	0.077 (0.024) ***	0.080 (0.027) ***
	Wish list	0.0002 (0.000) ***	0.0002 (0.000) ***	0.0002 (0.000) ***	0.0002 (0.000) ***
Convenience	Check-in window	−0.003 (0.001) **	−0.002 (0.002)	−0.001 (0.001)	−0.003 (0.001) **
	Checkout time	0.007 (0.002) ***	0.009 (0.003) **	0.002 (0.002)	0.0037 (0.0025)
	Cleaning fee	0.001 (0.000) ***	0.001 (0.000) ***	0.0004 (0.0003)	0.0001 (0.0002)
	Extra charge	0.0001 (0.0001)	−0.001 (0.000) ***	−0.0002 (0.0003)	0.001 (0.0004) *
	Minimum stay	0.0006 (0.0005)	0.0001 (0.0001)	$-2.4E^{-5}$ (0.001)	0.001 (0.001)
	Response rate	0.085 (0.071)	0.024 (0.085)	0.072 (0.093)	0.074 (0.094)
	Response time	0.111 (0.014) ***	0.077 (0.015) ***	0.091 (0.019) ***	0.117 (0.017) ***
	Security deposit	0.0004 (0.000) ***	0.0004 (0.000) ***	0.0004 (0.000) ***	0.0003 (0.000) ***
	Self-check-in	−0.089 (0.004) ***	−0.081 (0.035) **	−0.056 (0.0430)	−0.034 (0.039)
Personal	Multiple listings	0.044 (0.026) **	0.063 (0.023) ***	0.083 (0.023) ***	0.031 (0.025)
Amenities	AC	0.144 (0.024) ***	0.198 (0.032) ***	0.131 (0.030) ***	0.099 (0.032) ***
	Breakfast	0.087 (0.030) ***	0.092 (0.037) **	0.066 (0.039) *	0.072 (0.039) *
	Cable TV	0.009 (0.019)	0.029 (0.025)	0.006 (0.022)	0.002 (0.025)
	Doorman	0.144 (0.056) ***	0.170 (0.058) ***	0.048 (0.074)	0.054 (0.073)
	Elevator	0.218 (0.048) ***	0.282 (0.065) ***	0.289 (0.046) ***	0.197 (0.052) ***
	Gym	0.113 (0.033) ***	0.092 (0.035)	0.065 (0.040) *	0.131 (0.042) ***
	Pool	0.197 (0.020) ***	0.225 (0.026) ***	0.203 (0.023) ***	0.145 (0.025) ***
	Wheelchair	0.043 (0.026) *	0.039 (0.032)	0.064 (0.033) *	0.010 (0.028)
	Wifi	−0.168 (0.051) ***	−0.174 (0.067) ***	−0.229 (0.065) ***	−0.136 (0.064) **
Country	Broadband	0.008 (0.002) ***	0.011 (0.003) ***	0.006 (0.002) **	0.002 (0.003)
	Exchange rate	0.002 (0.0007) ***	0.002 (0.0009) **	0.002 (0.001) *	0.001 (0.001)
	Land area	$3.1E^{-5}$ ($2.2E^{-6}$) ***	$2.7E^{-5}$ ($2.9E^{-6}$) ***	$2.9E^{-5}$ ($3.7E^{-6}$) ***	$3.5E^{-5}$ ($3.0E^{-6}$) ***
	Population	$-1.9E^{-7}$ ($3.2E^{-8}$) ***	$-1.7E^{-7}$ ($3.7E^{-8}$) ***	$-1.8E^{-7}$ ($5.0E^{-8}$) ***	$-1.6E^{-7}$ ($3.3E^{-8}$) ***
	Real GDP	$6.7E^{-6}$ ($1.8E^{-6}$) ***	$8.5E^{-7}$ ($2.6E^{-6}$)	$6.5E^{-6}$ ($2.1E^{-6}$) ***	$9.8E^{-6}$ ($2.2E^{-6}$) ***
Constant		1.591 (0.177) ***	1.307 (0.241) ***	1.895 (0.221) ***	2.244 (0.240) ***
Adj. R^2		0.605	0.340	0.395	0.439

Notes: Values in parentheses are standard errors. White heteroscedasticity-consistent are reported for OLS estimates. Bootstrap standard errors are reported for quantile regression estimates. ***,**, and * indicate significance at 1, 5, and 10 respectively.

Table 5
Estimates of price-setting behavior in percentage and dollar terms.

		OLS		Quantile					
		%	$USD	25Q		50Q		75Q	
				%	$USD	%	$USD	%	$USD
Site	Bathrooms	15.6	24.89	14.4	7.98	18.6	17.05	22.1	33.88
	Bedrooms	3.1	4.64	4.4	2.32	6.8	5.87	7.9	22.36
	Beds	1.5	2.23	2.8	1.46	2.3	1.94		
	Property type	7.8	11.48	6.4	3.29	6.4	5.33	6.4	8.76
	Rental space	50.8	74.94	46.8	24.11	40.6	33.89	34.7	47.56
Reputation	Membership	0.3	0.44	0.2	0.10	0.3	0.25	0.3	0.41
	Number of photos	0.1	0.15					0.2	0.27
	Number of ratings (NOR)	−0.7	−1.03	−0.7	−0.36	−0.6	−0.50	−0.7	−0.96
	Overall rating (OR)	18.3	29.61	20.5	11.72	16.6	15.06	14.6	21.54
	NORxOR	0.5	0.74	0.5	0.26	0.4	0.33	0.5	0.69
	Superhost badge	9.3	14.37	9.1	4.91	7.7	6.68	8.0	11.41
	Wish list	0.02	0.03	0.02	0.01	0.02	0.02	0.02	0.03
Convenience	Check-in window	−0.003	−0.44					−0.003	−0.41
	Checkout time	0.7	1.04	0.9	0.47				
	Cleaning fee	0.1	0.15	0.1	0.05				
	Extra charge			−0.1	−0.05			0.10	0.14
	Minimum stay								
	Response rate								
	Response time	11.1	17.31	7.7	4.12	9.1	7.95	11.7	17.00
	Security deposit	0.04	0.06	0.04	0.02	0.04	0.03	0.03	0.04
	Self-check-in	−8.5	−12.55	−7.8	−4.01				
Personal	Multiple listings	4.5	6.63	6.5	3.35	8.7	7.22	3.1	4.31
Amenities	AC	15.5	22.84	21.9	11.28	14.0	11.67	10.4	14.26
	Breakfast	9.1	13.40	9.6	4.96	6.8	5.69	7.5	10.23
	Cable TV								
	Doorman	15.5	22.84	18.5	9.54				
	Elevator	24.4	35.91	32.6	16.78	33.5	27.95	21.8	29.83
	Gym	12.0	17.64			6.7	5.60	14.0	19.18
	Pool	21.8	32.10	25.2	12.99	22.5	18.77	15.6	21.38
	Wheelchair	4.4	6.48			6.6	5.51		
	Wifi	−15.5	−22.80	−16.0	−8.22	−20.5	−17.07	−12.7	−17.42
Country	Broadband	0.8	1.18	1.1	0.57	0.6	0.50		
	Exchange rate	0.2	0.30	0.2	0.10	0.2	0.17		
	Land area	0.003	0.46	0.003	0.14	0.003	0.24	0.004	0.48
	Population	−0.00002	−0.003	−0.00002	−0.001	−0.00002	−0.002	−0.00002	−0.002
	Real GDP	0.0007	0.10			0.0007	0.05	0.001	0.13

Note: Only estimates which are significant are shown. Any missing values imply that the variable has zero impact in percentage and dollar terms.

in only a marginal effect on prices of around $0.03; however, its monetary effect appears to get larger in the price distribution.

In relation to *Convenience*, all attributes have significant effects with the exceptions of extra charges for additional persons beyond the minimum preferred, minimum stay and response rate (Table 4). Check-in window has a negative effect on price-setting behavior; that is, lower prices are associated with larger check-in windows. The effect is marginal, lowering prices by only $0.44 (Table 5). Further, the effect is only

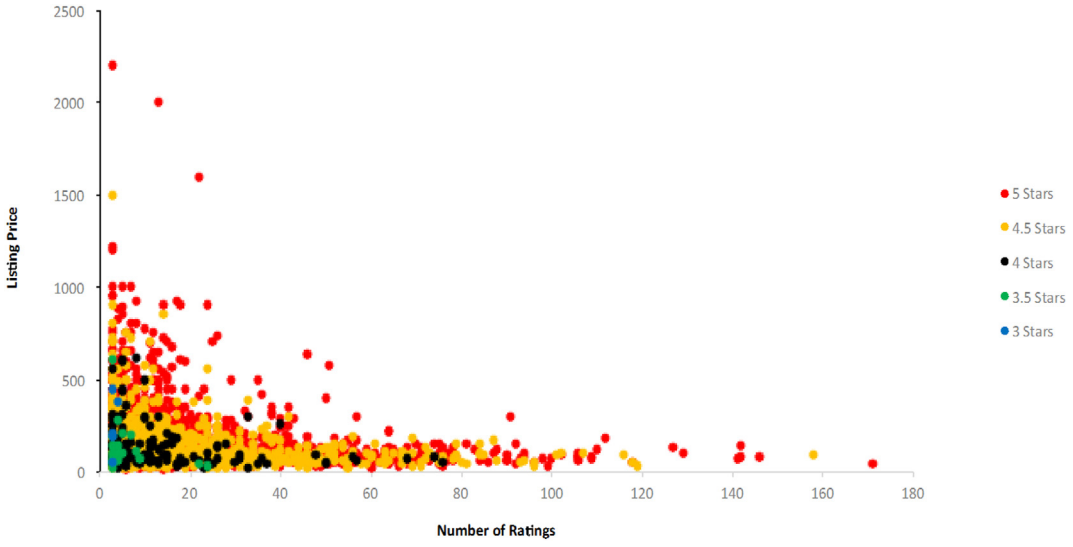

Fig. 2. Marginal relationship between price and number of ratings.

associated with the higher prices in the distribution. This effect though significant, is not likely of major consequence in price-setting behavior. Later checkout times permitted by hosts are associated with higher list prices, around $1.04, but is only a feature at lower prices. Cleaning fees result in an additional $0.15 to the price and is also only significant at lower prices. Hosts with higher response times add $17.31 on average to the list price. Requirement of a security deposit has a very small positive effect on price-setting, and this is consistent across the distribution. Surprisingly, provision of self-check-in facilities has a negative effect on price-setting. The result is limited to properties with lower prices (remains significant up to the 46th percentile). In these cases, hosts with inexpensive listings may offer this facility as a means of attracting customers. It may also be the case that providing the self-check-in option is also convenient for hosts, as they will not have to always be on hand to greet guests and check them in personally. This has the effect of lowering prices by up to $12.55.

With regard to *Personal* attributes, multiple listings by a host is associated with higher prices. So, for each additional listing on AirBnB, hosts add $6.63 to the list price. This behavior is positively associated with the level of prices.

With the exception of cable TV, all *Amenities* attributes have very significant effects on price-setting (Table 4). Provision of AC, breakfast, a doorman, an elevator, gym, pool and wheelchair access result in higher prices, ranging from $6.48 for wheelchair access to $32.10 for pool facilities (Table 5), although there are differences across the price spectrum for each attribute. On the other hand, providing Wi-Fi access is associated with lower prices, an effect that is consistent across all price levels, but increases as prices increase. This may be due to the ubiquity of Wi-Fi provision (96.9% of all hosts offer Wi-Fi). In effect, this may have the effect of hosts offering an implicit discount to guests to distinguish themselves from the competition.

The final category, *Country*, is examined to determine if country-level attributes may affect price-setting behavior across the Caribbean. OLS estimates indicate that the country in which AirBnB hosts are located has a significant effect on price-setting (Table 4). Findings suggest that each additional unit increase in infrastructural development, proxied by the rate of broadband subscriptions, is associated with a $1.18 increase in list prices (Table 5). Hosts in countries with weaker exchange rates against the US dollar (purchasing power) compensate for this by charging higher prices, specifically, each additional unit of domestic currency to one US dollar, is reflected in $0.30 in additional rental charges. These two results concerning infrastructure and purchasing power, hold qualitatively for prices at the bottom half of the price distribution. Biodiversity, proxied by land area has a significant effect on price-setting across the spectrum. Each square kilometer results in an additional $0.46 to list prices. Population, an indicator of competition, has a negative effect on prices. For every additional 1000 persons resident in a country, rental prices are lower by $3. The final country indicator, real GDP per capita (RGDP), suggests that each additional $10 in RGDP is associated with higher list prices of $1. The quantile regressions provide evidence that this price effect takes place in the upper portion of the price distribution.

4.9. Discussion

Findings in this paper demonstrate the importance of site, reputation, convenience, personal and amenities attributes for price-setting behavior by AirBnB hosts. In virtually all cases, estimates support a priori expectations of higher rental prices being associated with such characteristics. These results are also in agreement with existing research. A particular highlight of the study is that country-level attributes matter for pricing. Taken together, estimates for this category of attributes imply that AirBnB hosts in wealthier countries with greater levels of development and biodiversity set higher rental prices. Hosts in countries with weaker currencies charge slightly higher prices, possibly to compensate for said weakness. In any event, the ability to express rental prices in US dollars acts as a hedge for those countries with flexible exchange rates. Greater competition results in very moderate downward price adjustment by hosts.

Another highlight of the study is its findings regarding the sensitivity of the distribution in rental pricing to site, reputation, convenience, personal, amenities and country attributes. In general, hosts with properties in the higher part of the distribution set higher marginal prices than those in the lower part of the distribution. This might indicate that more high-end AirBnB properties operate in a less competitive environment. The goodness of fit of the model also improved as we move from the bottom quartile to the top quartile.

Policymakers across the Caribbean may have to consider the potential effects that the future growth of the AirBnB market can have on the traditional hotel sector. There is already some concern about the potential competition posed by AirBnB and other similar platforms (Lorde & Joseph, 2018). Another consideration for policymakers is that the growth of AirBnB could place upward pressure on property and rental values, resulting in higher property taxes and possibly pricing locals out of certain neighborhoods (Marjavaara & Muller, 2007). Policymakers will need to confront these issues to ensure a sustainable co-existence for all stakeholders.

5. Conclusion

This study investigated the price-setting behavior of hosts in the tourism sharing economy in the Caribbean. Three thousand and forty-six accommodations from 12 countries were examined via analysis of 36 variables in 6 categories. OLS results indicate that 32 of the 36 variables are significant determinants of price-setting behavior. Results from quantile regressions also indicate that these variables do explain price-setting, but these effects vary over the distribution of prices under study. This is evidence of the complexities in the pricing of accommodation in the tourism sharing economy.

Generally speaking, we find that site, reputation, convenience, personal and amenities attributes, along with country-level indicators significantly affect prices in the Caribbean. More specifically, most attributes have a positive effect on price-setting. Hosts with larger accommodations and superior reputations charge higher prices. However, listings with a larger number of ratings are associated with lower prices. This may be an artefact of tourists' preferences for cheaper sharing accommodations, resulting in a relatively higher volume of reviews for properties at the lower end of the price spectrum. Provision of convenience options have an overall positive effect on prices, although some options result in lower rental pricing. The sole personal attribute investigated is associated with higher price-setting behavior. Virtually all amenities examined result in greater prices being charged for the space. Finally, our results indicate that country-level effects are important for price-setting behavior. Hosts in countries with greater economic and infrastructural development, greater biodiversity, but weaker currencies set higher prices. On the other hand, prices are lower in countries where there is more competition.

This paper sheds some light on the factors behind the substantial pricing heterogeneity observed in AirBnB properties across the Caribbean as well as within the same country. Understanding these patterns of pricing heterogeneity is a necessary to assist policymakers in making informed decisions regarding the sector, in relation to regulation and other concerns. Findings are important for hosts, as it allows them to better assess the market environment and improve their sales and profits. The study also provides tools for AirBnB, and possibly other P2P platforms in designing tools to help guide hosts in price-setting.

There are several limitations of the study. First, no socio-psychological variables were considered in exploring price-setting behavior. Second, only one personal attribute was examined in the pricing model. Third, within country locational characteristics, for example, proximity to the nearest beach, park, golf course, city center, or restaurants, or number of attractions, were not considered, as this data are not readily

available. Future research will examine these areas of the tourism sharing economy.

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