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LET'S HOOK UP FAST! HOTEL REVIEWS AND WI-FI FLAWS

Juan Pedro Mellinas, PhD
Departamento de Economía de la Empresa
Facultad de Ciencias de la Empresa
Universidad Politécnica de Cartagena, Spain
Calle Real, 3, 30201, Cartagena
E-mail: losmellinas@yahoo.es

Juan Luis Nicolau, PhD
Howard Feiertag Department of Hospitality and Tourism Management
Pamplin College of Business
Virginia Tech
Blacksburg VA 24061
Phone 540-231-8426
e-mail: jncolau@vt.edu

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Abstract

Free Wi-Fi connection is a prevalent service in the modern hotel industry. The effects of Wi-Fi services on customers' satisfaction have been investigated in existing literature. However, the attributes that lead to customers' negative reviews on hotels and the effects of these attributes on hotel ratings remain unexplored. Therefore, this article attempts to fill this gap by using a sample of 4,800 reviews and estimating a Heckit model. This methodology allows us to model customers' decisions to write a negative review and rate a hotel simultaneously. The effects of Wi-Fi flaws on hotels' overall ratings are estimated and discussed. Moreover, important managerial implications are consequently derived. Reference dependence and sample selection bias also remain critical when analyzing hotel ratings.

Keywords: Wi-Fi; online reviews; Heckit; hotel; reference dependence.

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1. INTRODUCTION

The factors to consider for optimal Wi-Fi service are not limited to bandwidth allocation and the correct placement of access points; specifically, up to 14 principles should be considered to meet the demands of a dense client population (Aerohive Networks, 2012). These technical considerations indicate various complexities in the implementation of free Wi-Fi service in hotels, given the tens or hundreds of users attempting to connect to hotels' Wi-Fi networks simultaneously.

In today's interconnected world, Internet access seems to be essential for most people—either at home or while traveling (Tribe & Mkono, 2017; Fan, Buhalis, & Lin, 2019). During travel, people are unable to connect to Wi-Fi networks of their home or workplace. Thus, they tend to seek alternative Internet connections mainly in public places such as hotels. With the emergence of smartphones, social networks, and video streaming platforms, the Internet has been transformed from a paid service aimed primarily at business travelers to a highly in-demand service by all hotel customers who primarily access the Internet through a free Wi-Fi connection. This service becomes even more necessary when travelers go overseas, given the significant roaming charges for Internet use. This issue has been partially resolved among European Union countries since June 2017 (European Commission, 2017). However, it remains unaddressed in rest of the world.

According to Smith (2014), Tripbarometer (2015), and the American Hotel and Lodging Association (2016), free Wi-Fi connection is offered by most hotels in the world, and managers are well aware of its importance. Kristine Rose, the vice president of Hyatt brands, said in 2015, "Internet connectivity is no longer an amenity. It has become an integral part of travelers' daily lives and a basic expectation" (McCracken, 2015). An analysis of 500,000 properties in the Kayak database in 2014 indicates that 90% of hotels offer free Wi-Fi (Smith, 2014). This figure is similar to the 87% of hotels found in a TripAdvisor survey (Tripbarometer, 2015). Similarly, a study by the American Hotel and Lodging Association (2016) shows that 98% of hotels in the US offer in-room Wi-Fi, 9% of which charge for the service. Today, a hotel should offer free Wi-Fi as part of their primary services. The differences in Wi-Fi services among hotels are determined by the quality of service perceived by customers.

Wi-Fi connection speed can be the main factor influencing perceived quality. Mellinas (2017) identifies the correlation between the Internet connection speed of hotels and the satisfaction of hotel guests with this service. The results indicate a positive but weak relationship between both parameters. Thus, additional factors must determine the level of user satisfaction.

A wide variety of studies by academics and practitioners demonstrates the importance of free Wi-Fi service in hotels. In all cases, this service is presented as a determining factor in customer satisfaction. However, no study has confirmed the specific elements that rank the experience with Wi-Fi usage from better to worse. Therefore, this study delves deep into the subject by identifying factors that affect the value of Wi-Fi services in hotels, given that speed does not appear to explain the satisfaction levels fully. Specifically, we focus on the determinants that generate dissatisfaction with hotels' Wi-Fi service by analyzing 4,800 opinions on the subject. Our theoretical framework is provided by satisfaction-related theories of Herzberg's motivation–hygiene model (Herzberg, Mausner, & Snyderman, 1959), Kano's (1984) model and Chitturi, Raghunathan and Mahajan's (2008) model. In sum, this article seeks to analyze the effects of negative comments on hotels' Wi-Fi services on guest satisfaction by looking at the attributes that lead to negative reviews and the effects of these attributes on hotel ratings.

2. IMPORTANCE OF WI-FI SERVICE

2.1. Hotel industry perspective

According to Bulchand-Gidumal, Melián-González, and González López-Valcárcel, 2011), free Wi-Fi is an expected service that allows hotels to raise their scores by up to 8%. Another contemporary study observed the growing relevance of this service, in which business travelers attribute more importance to Wi-Fi than leisure travelers do (Lee & Tussyadiah, 2010). Hotels eventually understood that free Wi-Fi was not an optional amenity to attract customers but a basic service that should be offered to guests (American Hotel and Lodging Association, 2016; Smith, 2014; Tripbarometer, 2015).

By 2012, hoteliers from the biggest chains recognized its importance. A hotelier from Carlson Hotels stated, "free Internet is the greatest demand in terms of amenities of the travelers. It's almost like having water or air conditioning in the room. So we have a strategy of offering this for free." Another manager from Marriott admitted the increasing intensity of its use, expressing that "guests want to download everything they can. It is getting to be quite a

challenge." InterContinental Hotel Group acknowledged the problems arising from unsatisfactory Wi-Fi service, revealing that "it's one of the big dissatisfiers that you see in a lot of hotels" (Hanashiro, 2012). Similarly, another hotelier from Best Western confirmed in 2013 that "[t]he lack of consistent, reliable access was damaging the overall Best Western customer experience" (Netgear, 2013).

Heo and Hyun (2015) revealed that modern hotels should set up Internet services in guestrooms as an essential feature to avoid customer dissatisfaction. Bulchand-Gidumal et al. (2013) found that such a service is a fundamental element to increase the total score of a hotel. Wi-Fi service has become standard for hotels, but some of them only provide Wi-Fi access in common areas. Nevertheless, the prevalence of mobile devices makes in-room Wi-Fi indispensable (Heo & Hyun, 2015). Nowadays, high-speed Internet connection has become more relevant than possessing a phone in the room (Li et al., 2015). By 2015, Wi-Fi became the major cause of customer dissatisfaction among full-service hotels in the USA (Xu & Li, 2016). Customers mentioned attributes, such as slow speed, difficult connection, low signal, and additional charges. Using data from 2015, another study suggested that the most important feature for business travelers was free Internet access, followed by a business center with Internet access (Radojevic et al., 2018).

Complimentary Wi-Fi is the most important factor when selecting a hotel for leisure purposes (30% of leisure travelers choose this service as the top determining factor) and a must-have for 50% of business travelers (eHotelier, 2015). The Global Business Travel Association 2016 report (Global Business Travel Association, 2016) showed that 46% of business travelers with low global satisfaction suggested "improved Wi-Fi access" as a key factor that would have helped enhance their satisfaction, whereas 25% indicated that lack of access to reliable Wi-Fi is the most frustrating part of business trips. According to the Amba Hotels' report, free unlimited Wi-Fi in a hotel is the strongest determinant for travelers when rating a hotel: 67% of travelers chose Wi-Fi over location (65%), a good night's sleep (58%), and friendly and knowledgeable staff (40%) (Amey, 2014). When asked about "the irritations that ruin their relaxing trip or business stay," 28% of travelers complained about slow or hard-to-use Wi-Fi.

A US-based survey (RedRoof, 2016) indicated that free Wi-Fi came second after cost when deciding to book a hotel stay. Such a service was more important than breakfast or parking,

wherein 96% of consumers expected Wi-Fi to be free. Interestingly, an article from the Daily Mail (Pemberton, 2016) addressed this issue by using the title "Forget diving into the infinity pool or rushing to the beach: Hotel guests just want to access Wi-Fi when they arrive (with 65% logging on within seven minutes)." The article reveals that 30% of Londoners would reject a hotel if it does not offer free Wi-Fi.

Tripbarometer (2015) showed that a hotel's amenities were "very important" to 39% of customers when deciding where to book, and free in-room Wi-Fi connection was the amenity that most people (74%) considered important when deciding on accommodation. Wi-Fi was the most crucial technological amenity in a hotel, wherein business travelers gave more importance to it than leisure travelers (Brochado, Rita, & Margarido, 2016). The Forrester Research report (2013) indicated that 90% of hotel customers wanted to have Wi-Fi in their rooms, and 34% of business travelers would not opt for a hotel without in-room Wi-Fi.

Hotel Wi-Fi complaints grew as people increasingly used online streaming services such as Netflix, 4K video, or Skype. "There is not really an end in sight for a hotel guest's insatiable need for more bandwidth," stated Robert Cole from the travel consulting firm RockCheetah (Trejos, 2016). Using these services required bandwidth and could affect the connection speed of other guests. When several users demand considerable bandwidth at the same time, the situation becomes critical, given the numerous devices being used simultaneously in the same room.

Certain hotels started to implement Wi-Fi access points and networks by room to cope with heavy traffic (McCracken, 2015). Data seemed to suggest that the infrastructure to support hotel Wi-Fi services had been outdated in several cases and demanded constant maintenance. An installation and/or bandwidth that were adequate in 2012 may be insufficient for the current demand in 2019.

Revinate is a software platform that helps hotels collect and sort data from consumer review websites. This platform searched 53 million reviews from different review sites and online travel agencies and found that over two million reviews (approximately 4%) explicitly indicated the terms "Internet" or "Wi-Fi" (Revinate, 2014). These two million reviews had average scores that were lower than the other 51 million reviews in which nothing related to Internet was mentioned. This result suggested that mentioning Internet in a review implied a flaw in a hotel experience.

2.2. Online reviews, Wi-Fi, and satisfaction

Electronic word of mouth can be defined as "all informal communications directed at consumers through Internet-based technology related to the usage or characteristics of particular goods and services, or their sellers" (Litvin, Goldsmith, & Pan, 2017). Given its speed and convenience, electronic word of mouth exerts a greater influence on tourists' behavior than traditional word of mouth (Sun et al., 2006). Electronic word of mouth is related to attitudes and intentions (Ladhari & Michaud, 2015), which in turn, can affect firms' performance (Chevalier & Mayzlin, 2006). Travelers are more inclined to trust hotel reviews than advertising and marketing campaigns (Browning, So, & Sparks, 2013). Moreover, they are willing to pay high prices for services with a satisfactory rating (Yacouel & Fleischer, 2012).

The relationship between electronic word of mouth and hotel performance has been studied in recent years (Yang, Park, & Hu, 2018). Empirical research has also demonstrated that the impact of hotel reviews can be observed in the number of bookings, occupation levels, and price increase (Anderson, 2012; Viglia, Minazzi, & Buhalis, 2016).

As guests select hotels according to reviews provided by other guests, hotels must identify the services, facilities, and features that have a great influence on consumer satisfaction. This information leads to better guidance and optimal use of a hotel's resources and investments as the decisions are based on factors that customers consider relevant, which do not always match hotel managers' perceptions. Therefore, knowing the elements that determine customer satisfaction has been a major research thread in hospitality literature (Pizam, Shapoval, & Ellis, 2016; Strandberg et al., 2016).

Free Wi-Fi has been identified recently as one of the critical factors that show positive returns on investment given its attraction element (Hamilton, Rust, Wedel, & Dev, 2017). According to Eriksson and Fagerstrøm (2017), free Wi-Fi can be considered an attribute similar to other critical criteria, such as rate per night, particularly when the market is highly competitive and lacks variety. Free Wi-Fi rating should be a clear determinant of a hotel's global satisfaction, wherein a positive effect is expected when improvements are made (Bulchand-Gidumal et al., 2013; Heo & Hyun, 2015). However, considering the importance of Wi-Fi when analyzing satisfaction, it is not surprising that a Wi-Fi service is found to be the main cause of

dissatisfaction (Xu and Li, 2016). Thus, analyzing the factors that explain this dissatisfaction is fundamental.

According to Herzberg's motivation–hygiene theory (Herzberg, Mausner, & Snyderman, 1959), if Wi-Fi service is considered a *motivator*, then an improvement in its quality should lead to an increase in satisfaction; however, if it is perceived as a *hygiene factor*, then any improvement would not cause an increment in satisfaction and its absence would generate dissatisfaction. Moreover, the Kano model (Kano, 1984) suggests five quality dimensions that can have an influence on satisfaction: *must-be quality* (wherein Wi-Fi service would be regarded as a basic service that customers would expect and would take for granted; thus, although its presence would lead people to remain neutral, its absence or malfunction would cause dissatisfaction); *one-dimensional quality* (customers are satisfied if Wi-Fi is provided and dissatisfied otherwise), *attractive quality* (it refers to unexpected services; thus, if Wi-Fi is considered a value-added service, then its absence or malfunction would not lead to dissatisfaction); *indifferent quality* (it refers to services that are indifferent to customers' satisfaction); and *reverse quality* (a service whose presence brings dissatisfaction, whereas its absence leads to satisfaction).

Finally, Chitturi et al. (2008) propose a model in which the type of positive emotional response derived from consuming a service is contingent upon whether its performance is greater than customers' expectations on utilitarian dimension ("functional, instrumental, and practical benefits" [p.49]) or the hedonic dimension ("aesthetic, experiential, and enjoyment-related benefits" [p.49]). They further suggest that: i) satisfaction is increased if the performance of a service is greater than utilitarian expectations; ii) delight is raised if the performance of a service is greater than hedonic expectations; iii) anger is increased if the performance of a service is lower than utilitarian expectations; and iv) dissatisfaction is raised if the performance of a service is lower than hedonic expectations.

Based on these theories and the previous literature review on Wi-Fi, we hypothesize that Wi-Fi service is a *hygiene factor* (its absence generates dissatisfaction) (Herzberg et al., 1959) and a *must-be quality* (basic service which is taken for granted and its absence or malfunction lead to dissatisfaction) (Kano, 1984), whose poor performance will evoke *anger* (Chitturi et al., 2008). Accordingly, the following hypothesis is stated:

H.1. Absence or malfunction of free Wi-Fi service reduces the overall rating that an individual gives a hotel.

Moreover, considering that connection speed can be seen as an extra value within the general Wi-Fi service, we hypothesize that connection speed is a *motivator* (faster speed results in better satisfaction) (Herzberg et al., 1959), a *one-dimensional quality* (customers are satisfied if connection speed is fast and dissatisfied otherwise) (Kano, 1984), whose good performance will evoke *delight* (Chitturi et al., 2008). Consequently, we state that:

H.2. The faster the connection speed is, the lower the probability of writing a negative review.

H.3. The faster the connection speed is, the greater the overall rating an individual gives a hotel.

3. RESEARCH DESIGN

3.1. Methodology

To analyze the effect of Wi-Fi on overall satisfaction, we estimate a Heckit model as it allows us to identify the factors that can explain customers' overall rating by controlling potential selection bias through simultaneously examining the decision to write a negative comment.

The Heckit model, also known as Heckman selection model (Heckman, 1976), estimates regression models in which sample selection bias may result in spurious parameter estimates. Under the Heckit framework, the dependent variable is only observable for a number of observations. For our empirical application, the sample selection problem can appear in the overall rating equation. A customer's rating is only observed if this customer decides to write a negative review, whereas it is considered unobservable otherwise. Apart from the technical advantage of solving the potential sample selection bias, a benefit of the Heckit model is that it allows us to analyze the influence of a set of factors on two different decisions simultaneously. Specifically, one decision is qualitative and the other is quantitative. In this study, the qualitative decision is whether to write a review, whereas the quantitative decision is the rating the individual gives the hotel. Thus, we find potential differential effects of an explanatory variable. For example, a variable can have a significant effect on one decision and a null influence on the other, or a positive effect on one decision and a negative influence on the other.

Let z_{tik} be a set of variables k that explain the decision of individual t to write a negative review on a hotel i. The "negative review decision" is measured by a latent dimension NRD_t*; γ_k represents the parameters that capture the impact of these variables on this decision; x_{tis} is a set of variables s that reflect the opinions of individual t on hotel i, which explain the overall rating R_{ti} of the hotel being assessed by individual t. β_s represent the parameters that show the influence of these opinions on this rating. A set of control variables CV_{th} is included in both equations with parameters δ_h^{NRD} and δ_h^R reflecting their impacts on each dependent variable. Accordingly, the form of the Heckman model (1979) is as follows:

$$NRD_{ti}^* = \sum_{k=1}^{K} \gamma_k z_{tik} + \sum_{h=1}^{H} \delta_h^{NRD} CV_{th} + u_t, \quad (1)$$

$$R_{ti} = \sum_{s=1}^{S} \beta_s x_{tis} + \sum_{h=1}^{H} \delta_h^R CV_{th} + \varepsilon_t \qquad \text{observed only if } NRD_{ti}^* > 0. \quad (2)$$

In these equations, the error terms u_t and ε_t follow a bivariate normal distribution in which the mean is assumed to be zero, and the variances are σ_u and σ_ε, with covariance $\sigma_{\varepsilon u}$. A dummy variable NRD_{ti} is defined which takes a value of 1 if the latent variable $NRD_{ti}^* > 0$, and 0 otherwise. Accordingly, $NRD_{ti} = 1$ means writing a negative review and $NRD_{ti} = 0$ otherwise. Equation 1 is used to control for sample selection bias. Thus, the central equation to this empirical application is Equation 2, which shows the determinant factors that explain the effects of Wi-Fi malfunctions.

For this empirical application, in equation 1, the z_{tk} variables include the constant (γ_1) and "speed," and the control variables (CV_{th}) include "level of expertise," "Wi-Fi mentions," and "guests with roaming." In equation 2, the x_{ts} variables are the constant β_1, "speed," and the following seven opinions: "Wi-Fi is bad," "Wi-Fi does not work," "Wi-Fi is slow," "Wi-Fi has a poor coverage," "Wi-Fi has an unstable connection," "low number of devices the customer can connect," and "lack of security." The control variables (CV_{th}) include "level of expertise" and "Wi-Fi mentions." The variable "guests with roaming" is not included as control variable in this second equation, because this variable is used as the so-called "exclusion restriction" in the Heckit model. For the proper estimation of Heckit models, the "exclusion restriction" imposes the condition that a variable must be identified as significant in Equation 1 but non-significant in Equation 2. Thus, such a variable is included in the former but not in the latter when running the

estimation. Evidently, preliminary analyses need to be conducted to identify a variable that complies with these conditions. Consequently, both equations are specified as:

$$NRD_{ti}^{*} = \gamma_1 + \gamma_2 \cdot speed_i + \sum_{h=1}^{3} \delta_h^{NRD} \cdot CV_{th} + u_t$$

$$R_{ti} = \beta_1 + \beta_2 \cdot speed_i + \sum_{r=1}^{7} \beta_r \cdot opinion_{t,r} + \sum_{h=1}^{2} \delta_h^{R} \cdot CV_{th} + \varepsilon_t$$

3.2. Data collection

We select eight destinations with the most hotels tested on the hotelwifitest.com page: New York, London, Paris, Barcelona, Berlin, San Francisco, Singapore, and Bangkok. These major destinations attract millions of visitors annually. Given that they are large cities, access to high-speed Internet providers (fiber optic) is guaranteed unlike in rural destinations or small towns where fiber optic is sometimes lacking.

With the aim to obtain a sample of approximately 4,500 to 5,000 opinions, we take 30 hotels from each of the 8 cities and the most recent 20 opinions for each hotel, thereby acquiring 240 hotels and 4,800 opinions. We take 30 hotels per city on account of the standard statistical rule of thumb of n = 30 (Boos and Hughes-Oliver, 2000), which is the minimum sample size from which one can reasonably expect a study on the basis of normal distribution to be valid. Although this recommended size is an arbitrary rule (it depends, for example, on the skewness of the actual distribution), on the one hand, in this research the 30-observation sample is obtained repeatedly (one per city) in line with the central limit theorem. On the other hand, our unit of analysis is "opinions" (not hotels). Thus, the 30 hotels per destination is simply a device to obtain a reasonable number of opinions, that is, 4,800.

The selection of hotels is done randomly among hotels that offer "free Wi-Fi." Booking.com allows users to filter opinions based on different criteria. Thus, we use the language filter to select reviews written in English or Spanish. Booking.com also allows users to filter opinions by 16 different topics. In this case, we are interested in the topic "Wi-Fi." We chose the word "Wi-Fi" over "Internet" because the topic "Wi-Fi" as presented in Booking.com is more comprehensive than the concept "Internet." The topic "Wi-Fi" includes concepts like

"Internet," "computer," or "Wi-Fi," among others. Thus, as Wi-Fi encompasses more concepts than Internet, even if from an operational viewpoint regarding the database, we select "Wi-Fi." Moreover, a caveat is the fact that even though the cities used in this study are modern cities and will most likely have Wi-Fi rather than the cable to plug in for the Internet, hotels using cable could still exist.

Booking.com also prompts the writer to separate positive and negative opinions. Thus, the identification of whether this aspect is valued positively or negatively is straightforward. Analysis of positive opinions does not generate much interest, as they usually simply state "great Wi-Fi" or "good Internet." Consequently, we focus on negative opinions that show substantial variety. Although they generally tend to indicate "bad Wi-Fi" or "poor Wi-Fi," most of these opinions identify the specific reason why they consider the Wi-Fi unsatisfactory.

By looking at the negative opinions within the topic "Wi-Fi," we proceed as follows. 1) We arrange the results from newer to older to follow a homogeneous criterion in all samples; 2) We analyze each opinion comment one by one. The system that Booking.com provides performs a semantic analysis that is somewhat accurate but also imperfect. For example, sometimes, the comment refers to computers with an Internet connection in the hotel lobby or to the fact that the hotel is not as it appeared on the Internet. Therefore, we did not include these opinions as they did not refer to the free Wi-Fi in the room. A caveat to take into account is the fact that, even if marginal, customers could have written a review and include an assessment on Wi-Fi although they had not used it (although it is quite unlikely that non-users of Wi-Fi write a review and include an assessment on Wi-Fi, it is possible that these non-users of Wi-Fi rate the Wi-Fi service as prompted by Booking.com's questionnaire); 3) With the objective of obtaining 20 opinions per hotel, if an opinion had to be discarded because of reasons like the ones exemplified in step 2, then the immediate subsequent one is included; and 4) All opinions are read to identify the phrase in which reference is made to Internet connection with the purpose of ascertaining general causes under which we classify negative opinions (in particular, we detect seven groups of opinions with similar content in each of them).

3.3. Variables

This section describes the dependent and independent variables used in the model. We also indicate the equation in which they are included. Table 1 shows the descriptive statistics for these variables.

[*Insert Table 1 about here*]

Dependent variables

Negative review: if an individual writes a negative review, then this variable takes the value of 1 and 0 otherwise. This variable is included in Equation 1.

Individual's overall rating of the hotel: the rating that an individual gives to a specific hotel, measured through a 2.5–10 scale (Mellinas et al., 2015). This variable is included in Equation 2.

Independent variables – Wi-Fi opinions

Connection speed: The hotel's Wi-Fi speed is measured by the number of megabits per second as indicated in Hotelwifitest.com. This variable is included in Equations 1 and 2.

Seven groups of opinions on Wi-Fi reflecting the causes of poor Wi-Fi (the first one is generic and the other six are specific) include "Wi-Fi is bad," "Wi-Fi does not work," "Wi-Fi is slow," "Wi-Fi has a poor coverage," "Wi-Fi has an unstable connection," "low number of devices the customer can connect (*Number of devices*)," and "lack of security." These variables are included in Equation 2 only, given that they have values only for people who have written negative comments on Wi-Fi. Thus, these variables are not estimable in Equation 1.

Independent variables – Control variables

Level of expertise: In line with Weiss et al. (2008), we use the number of reviews that customers have written as a proxy of their expertise. This variable is included in Equations 1 and 2.

City-wide average of Wi-Fi mentions (*Wi-Fi mentions*): This variable reflects the percentage of hotel reviews that discusses Wi-Fi for the city where the hotel is located. This variable is intended to capture the quality of Wi-Fi that hotels in the area receive. Accordingly, frequent mentions of Wi-Fi in the reviews of the city where the hotels are located should be

indicative of low quality. Consequently, a high probability of writing a review and of low overall ratings should be expected when Wi-Fi is frequently mentioned. This variable is included in Equations 1 and 2.

Guests with roaming: This variable represents US and EU citizens who are staying in their respective areas where mobile data is available to them. This variable is included in Equation 1 only, as it is used as the "exclusion restriction." (see section 3.1 for a detailed description of this restriction).

4. RESULTS AND DISCUSSION

Prior to estimating the model, we examine the potential existence of collinearity. According to the variance inflation factors (VIF), all parameters are below the recommended value of 10 (Neter, Wasserman, & Kutner 1989). Thus, collinearity does not seem to be an issue. Moreover, heteroskedaticity is tested, and the Breusch–Pagan test rejects homoskedasticity (F_{10} = 3.60; $p < 0.01$). Therefore, the White heteroskedasticity-consistent standard errors are computed (White, 1980). Table 2 shows the parameter estimates for the two equations: the negative review decision and the rating decision. Before describing the individual parameters, the results that support the use of the Heckit model must be emphasized. First, the "exclusion restriction" warranted as the variable "guests with roaming" is significant in Equation 1 (γ_k = 0.084; t_1-statistic = 2.246; p-value < 0.05) and non-significant in Equation 2 (δ_h = 0.118; t_1-statistic = 0.158; p-value = 0.457). The latter result on the non-significance of this parameter in Equation 2 was obtained during preliminary analyses, which, although relevant to the model's justification from a technical viewpoint, are not shown in Table 2 to avoid large sets of parameter estimates. They are available upon request from the authors. Second and more importantly, we find a significant rho parameter (ρ) when estimating the model. This parameter is relevant as it is a correlation measure that links Equations 1 and 2, thereby supporting the use of the Heckit model.

Regarding the negative review decision (Model 1 in Table 2, right section), we find significant and negative parameters for "speed." This result supports hypothesis 2 that the faster the connection speed is, the lower the probability of writing a negative review. In line with the satisfaction-related theories of Herzberg et al. (1959) and Kano (1984), connection speed can be seen as an extra value. Thus, it is regarded as a *motivator*, given that fast speed lead to high satisfaction, and as a *one-dimensional quality*, given that customers are satisfied with fast

connection speed and dissatisfied otherwise (the negative sign of the parameter estimate shows these effects on satisfaction and dissatisfaction). In line with Chitturi et al. (2008), good performance will evoke *delight* among customers.

[*Insert Table 2 about here*]

As for the control variables, "level of expertise" has a negative and significant parameter, whereas "city-wide average of Wi-Fi mentions" and "guests with roaming" have significant and positive parameters. The negative sign of "level of expertise" implies a reduction in the likelihood of writing a negative review. This result is in line with the studies of Bargeman & van der Poel (2006) and Laurent and Kapferer (1985) who justify it by assigning a greater ability for expert reviewers to recognize potential malfunctions and evaluate them in a more objective and less emotional way than non-expert reviewers. As for the positive sign of the variable "Wi-Fi mentions," it means that frequent mentions of Wi-Fi in the reviews of hotels located in hotel's city increase the likelihood of complaints on Wi-Fi. Certainly, as this variable captures the quality of Wi-Fi that hotels in the area receive, the higher the Wi-Fi mentions in hotel's city, the higher the likelihood of writing a negative review. Finally, the positive sign of "guests with roaming" implies that those guests who are citizens of the area where the hotel is located and have access to roaming tend to write more complaints regarding Wi-Fi. They certainly seem to be more demanding than non-citizens, given that if the Wi-Fi does not meet their expectations, they are more likely to complain. Despite their access to roaming, they feel that they should not be using their data on their cell phones when staying in a hotel. This finding may seem unexpected, but it can be explained by an underlying psychological phenomenon, which is the loss aversion characteristic of Prospect Theory (Kahneman & Tversky, 1979). Guests with national roaming may have different reference points from other guests. Specifically, when staying in a hotel, people with national roaming switch from a fast mobile data connection to a slow Wi-Fi connection, which causes dissatisfaction. By contrast, long-distance travelers switch from having no connection to having a slow connection, which causes satisfaction.

Regarding the rating decision (Model 1 in Table 2, left section), the determinant factor are "speed," and the following groups of opinions: "Wi-Fi is bad," "Wi-Fi does not work," "Wi-Fi has a poor coverage," "Wi-Fi has an unstable connection," "low number of devices the customer can connect," and "lack of security."

The variable "speed," has a significant and positive sign, which is line with hypothesis 3 which states that the faster the connection speed is, the greater the overall rating an individual gives a hotel. As in the previous qualitative decision to write a negative review, and in line with Herzberg et al. (1959) and Kano (1984), connection speed can be regarded as an added value and is qualified as a *motivator* (the more speed, the more satisfaction) and a *one-dimensional quality* (customers are satisfied if connection speed is fast and dissatisfied otherwise). Thus, hotels' Wi-Fi services' good performance should evoke *delight* (Chitturi et al., 2008).

As for the groups of opinions, all the significant variables have a negative sign, which supports hypothesis 1 which states that absence or malfunction of free Wi-Fi service reduces the overall rating an individual gives a hotel. Regarding qualitative decision to write a negative review, and based on the satisfaction-related theories of Herzberg et al. (1959) and Kano (1984), Wi-Fi service can be seen as a *hygiene factor*, given that its absence generates dissatisfaction; and a *must-be quality* as it is considered a basic service which is taken for granted and its absence or malfunction leads to dissatisfaction. Therefore, poor performance of Wi-Fi service should evoke *anger* in line with Chitturi et al. (2008).

If we examine the opinions with the greatest impacts on overall rating in terms of their effect sizes (parameter size), "low number of devices the customer can connect" has the largest parameter, followed by "Wi-Fi does not work" (however, the Wald test shows that these two parameters are not significantly different [χ_1^2 = 0.450; p = 502]). The latter seems to be critical and thus expected, but the former could be regarded as more ancillary. Therefore, hotels should not scrimp on allowing multiple-device access to Wi-Fi connection. The parameters of "bad coverage," "unstable connection," and "Wi-Fi is bad" are not significantly different among them (χ_2^2 = 0.119; p = 0.942) but significantly lower than the previous two largest parameters, namely, "low number of devices the customer can connect" and "Wi-Fi does not work" (χ_1^2 = 7.027; p < 0.01). The least important opinion groups are "Wi-Fi is slow" and "lack of security," given that neither of these opinions present significant parameters as shown in Table 2. The lack of security is counterintuitive as security is a relevant issue when it comes to Internet. However, in the context of a hotel, people do not seem to attribute much relevance to security (probably because guests restrain themselves from using sensitive information in public Wi-Fi services). Interestingly, slow connection does not seem to have an impact on ratings as if it once guests

have connection, its speed seems to be of "less importance." This result could be in line with the results obtained so far in the sense that, although free Wi-Fi is regarded as a *hygiene factor*, speed is considered a *motivator favor* according to Herzberg's theory (to confirm this result, we will further analyze this variable later by conducting robustness checks). Moreover, an alternative explanation could be that customers leaving a negative comment about Wi-Fi would relieve their dissatisfaction with Wi-Fi speed, leaving the overall score unaffected.

As for the control variables, the level of expertise has a significant and positive parameter. Thus, the higher the level of expertise, the higher the overall rating from an individual. This result is in line with the earlier benevolent pattern found in the negative review decision. Existing literature links high experience and expertise with an ability to detect potential service failures in an objective way (Bargeman & van der Poel, 2006; Laurent & Kapferer, 1985). The city-wide average of Wi-Fi mentions has a significant and negative parameter. Therefore, as the frequency of mentions of Wi-Fi can be seen as a proxy of quality of Wi-Fi, frequent mentions of Wi-Fi in the reviews of hotels of the city lead to low overall ratings.

4.1. Robustness checks and extensions

This section checks for robustness and extends the results obtained in Model 1 in four different ways: 1) by controlling for the potentially correlated variables "speed" and "Wi-Fi is slow" (Model 2 in Table 3); 2) by including additional control variables (Model 3 in Table 3); 3) controlling for potential confounding variables (Model 4 in Table 4); 4) extending the results by employing reference points for the variable "speed" in line with the reference dependence paradigm of Prospect Theory (Model 5 in Table 4).

First, controlling for potentially correlated variables (Model 2 in Table 3). As shown earlier, the VIF values show no concerning metrics regarding collinearity. However, the variables "speed" and "Wi-Fi is slow" capture the same dimensions from two perspectives: "speed" is an objective measure and "Wi-Fi is slow" is a subjective measure. Therefore, the potential correlation between both variables should be investigated. As the former is a continuous variable and the latter a dummy variable, a two-step point-biserial correlation analysis must be conducted to analyze their correlation. The first step is to show the boxplot of these variables to detect a potential relationship between both variables. Graph 1 show that

although the variable "speed" has a lower interquartile range (IR) when the variable "Wi-Fi is slow" takes a value of 1 (IR = 7.9) than when it takes a value of 0 (IQ = 10.7), the slop (the dotted line) that connects both medians is almost flat (if "Wi-Fi is slow" = 0 the median of "speed" is 5.5 and if "Wi-Fi is slow" = 1 the median of "speed" is 5.0). The second step consists of calculating the Pearson correlation, which shows a value of -0.076 ($p < 0.001$). Therefore, even if small, a statistically significant correlation between "speed" and "Wi-Fi is slow" must be considered. Consequently, to check the robustness of the previous estimates, we drop the "speed" variable from the estimation to avoid potential overlapping effects between the variables "speed" and "Wi-Fi is slow." Model 2 shows the parameter estimates for the decisions "writing a negative review" and "overall rating" wherein the variable "speed" has been removed, and the same non-significant result is obtained for the variable "Wi-Fi is slow." The parameters of the other variables maintain their significance and signs, an outcome which reinforces the robustness of the estimates.

[*Insert Graph 1*]

Second, including additional control variables (Model 3 in Table 3). To control for the city effect, six additional dummy variables used as control variables are included to capture the effect of the city where the hotel is located. Through dummy variables, the model includes New York, London, Paris, Barcelona, Berlin, San Francisco, Singapore, and Bangkok (the last two cities are used as baseline variables). The proportion of observations of each city is 12.5%. These city variables are included in Equations 1 and 2. Regarding the negative review decision, compared with the baseline variables Singapore and Bangkok, New York, London, Paris, and San Francisco present positive effects on this decision and Berlin shows a negative influence. As for the rating decision, New York, London, Paris, and San Francisco present negative and significant effects, whereas Berlin has a positive influence (compared with Singapore and Bangkok). Importantly, the parameters of the other variables show robustness as they maintain their significance and signs.

[*Insert Table 3 about here*]

Third, controlling for potential confounding variables (Model 4 in Table 4). The city-wide average of Wi-Fi mentions (*Wi-Fi mentions*) was introduced to control for the quality of Wi-Fi that the area wherein the hotel is located offers. As our dependent variables are at the hotel

level (not at the city level), potential confounding effects could be expected. Therefore, we drop variable "Wi-Fi mentions" and re-estimate the model. Robustness is confirmed as all other parameters are as significant as in Model 1 and with the same signs.

[*Insert Table 4 about here*]

Fourth, extending the results (Model 5 in Table 4). Model 5 presents an extension of the results in Model 1 by incorporating the tenets of reference dependence of Prospect Theory. By using reference points of "speed" obtained through the average value of the variable "speed" in the city the hotel *i* is located (*cityspeed*$_i$). According to Mazumdar et al.'s (2005) typology, these average values are external reference points that consider the distribution of the variable across competitors (in contrast to internal references that are memory-based standards). The average of the city-wide speed is a proxy of the expected speed for that city. Accordingly, by replacing the variable "speed" from Model 1 by the difference between the "speed" and the "city-wide speed" (*cityspeed*$_i$), the specification of this model 5 is as follows:

$$NRD^{*}_{t,i} = \tau_1 + \tau_2 \cdot (speed_i - cityspeed_i) + \sum_{h=1}^{3} \delta_h^{NRD} \cdot CV_{t,h} + u_t,$$

$$R_{t,i} = \theta_1 + \theta_2 \cdot (speed_i - cityspeed_i) + \sum_{r=1}^{7} \beta_r \cdot opinion_{t,r} + \sum_{h=1}^{2} \delta_h^{R} \cdot CV_{t,h} + \varepsilon_t,$$

where τ_2 is the parameter that captures the reference dependence in the decision to write a negative review, and θ_2 is the parameter that reflects the reference dependence in the rating decision. τ_1 and θ_1 are the constants in each equation. The other variables are as previously defined.

The results show that the difference between hotels' speed and city-wide speed is significant in both equations. Thus, reference dependence is observed in the relationship among speed, the decision to write a negative review, and the rating decision. In the decision on whether to write a negative review, this variable presents a negative and significant parameter, meaning that the higher the hotels' speed is than the city-wide average speed, the lower the likelihood of writing a review. In the rating decision, this variable has a positive and significant parameter. Thus, improvements in hotels' Wi-Fi speed that make it faster than the city-wide service increases the rating.

5. CONCLUSIONS

Free Wi-Fi connection is a prevalent service in modern hotels. The effects of Wi-Fi on guest satisfaction have been investigated in existing literature. However, the attributes that lead to negative reviews and the effects of these attributes on hotel rating have remained unexplored. Therefore, this article attempted to fill this gap by using a sample of 4,800 reviews pertaining to 240 hotels and estimating a Heckit model. Apart from allowing us to simultaneously model the decisions to write a negative review and rate the hotel, this methodology permitted the control of sample selection bias. The empirical application led to the following conclusions:

1) *Joint modelization.* The way hotel guests rate a hotel based on the performance of the Wi-Fi service involves two stages: deciding whether to write a negative review and the rating itself. Therefore, modeling the process of rating should be made simultaneously with the decision to write a review, given their interdependency as proven by their significant correlation. By doing so, potential sample selection bias may be avoided.

2) *Decision to write a negative review.* The variables that seem to have an impact on this decision are "speed," "level of expertise," "city-wide average of Wi-Fi mentions," and "guests with roaming." A low propensity to write a negative review is related to "high speed" (high speed leads to high quality of the Wi-Fi service and a low likelihood to write a negative review) and to "level of expertise" (the higher the expertise of the reviewers are, the more they tend to be "benevolent" concerning Wi-Fi; benevolence that comes from the expert reviewer's ability to recognize potential malfunctions and perform objective evaluations). Furthermore, a great propensity to write a negative review is associated with "city-wide average of Wi-Fi mentions" (frequent mentions [mainly because of low quality of Wi-Fi] in the reviews of hotels located in a city lead to a high probability of writing about Wi-Fi) and with "guests with roaming" (apparently, despite having access to roaming, they do not want to use their data on their cell phones and in line with Prospect Theory's loss aversion, people with national roaming gain dissatisfaction as they "lose" their fast mobile data connection and "gain" a slow Wi-Fi connection. By contrast, long-distance travelers obtain satisfaction because they go from "no connection" to having a "slow connection").

3) *Decision about the rating of a hotel.* The determinants that seem to exert an impact on the rating of a hotel are "speed" and the following opinions: "Wi-Fi is bad," "Wi-Fi does not

work," "Wi-Fi has a poor coverage," "Wi-Fi has an unstable connection," "low number of devices the customer can connect," and "lack of security." The language of these opinions is self-explanatory, but indicating that the potential flaws that guests find in the hotel Wi-Fi connection have different effects is crucial. "Low number of devices the customer can connect" and "Wi-Fi does not work" are the most relevant issues, whereas "Wi-Fi is slow" and "lack of security" are the least important.

4) *Differentiated effect of the variables*. Interestingly, each variable may have a different effect on each decision. The variables "speed," "level of expertise," and "city-wide average of Wi-Fi mentions" are used in both equations. In all three variables and in both equations, the signs are as expected. Nevertheless, the relevant outcome is that the effects of each variable on either decision differ. The Heckit model permits the distinction and accurate measurement of the impacts of any dimension on the qualitative decision (whether to write a negative review or not) and on the quantitative decision (the rating published as a consequence of previously making the decision to write a negative review).

With regard to theoretical implications, a reference dependence relationship between connection speed and the decision to write a negative review and rate the hotel is observed. Therefore, variables that allow the inclusion of reference dependent dimensions should be considered to further investigate connection speed as a determinant factor of these decisions. Moreover, the factors that determine the rating of a hotel should be analyzed by controlling any potential sample selection bias. This statement is obviously applicable to any context in which this bias may exist. This empirical application has proven that for the specific case of the examination of the dimensions that produce a specific rating, this sample selection bias must be considered when examining the decision of writing reviews.

As for managerial implications, we can point out that: i) Beyond the evident recommendation that a hotel securing a certain connection speed is essential, individuals who singled out slow Wi-Fi did not publish significantly lower ratings. Two potential interpretations can be: first, according to Herzberg's theory, free Wi-Fi is regarded as a *hygiene factor*, whereas speed is considered a *motivator favor*; and second, it is as if leaving a Wi-Fi-specific negative comment would relieve customers' dissatisfaction with Wi-Fi speed, leaving the overall score unaffected; ii) Hotels must take special care of local citizens that have easy access to roaming, as

they seem to be especially sensitive to malfunctions in Wi-Fi service; iii) Hotels located in cities where Wi-Fi does not function properly may find an opportunity to distinguish themselves by investing in improving this service, thereby positioning themselves as the ones that offer "the best Internet service in town"; and iv) Considering that the opinion group "low number of devices the customer can connect" was found to have the largest parameter, hotels should consider the number of devices that guests can connect to the Wi-Fi. Far from being regarded as an ancillary perk, such feature is relevant to the overall satisfaction of guests.

Regarding limitations, note that when introducing the tenets of Prospect Theory, we used external reference points as benchmarks. Although the use of external reference points is well-established in existing literature (Nicolau, 2008), testing alternative reference points (external and internal) is appropriate to find the optimal benchmark. Moreover, as indicated in the literature review, different customers may have distinct Wi-Fi needs (a clear example is the distinction between business and leisure travelers). However, our database does not provide such information as it would probably have an effect on the decision to write a negative comment and the rating decision.

Four potential streams can be followed in future research. 1) Given that the variable "speed" and the rating decision seem to follow a reference dependence relationship, delving into it would be worthwhile by examining the two main tenets of Prospect Theory: loss aversion and diminishing sensitivity (these two are also applicable to the decision to write a negative review); 2) from a practical viewpoint, identifying the optimal number of devices which guests may desire to use can help ascertain the capacity of Wi-Fi service that hotels should offer; 3) Wi-Fi remains a top attribute that customers expect from a hotel. However, with the use of smart phones' signal service and new technologies, people have the option to use their phone to give Internet access to their computers. Similarly, the study of eHotelier (2015) shows that "with the increased availability of free public Wi-Fi hotspots and enhanced mobile data plans, travelers appear to have lessened their reliance on hotel Wi-Fi." In line with Kono's (1984) taxonomy, Wi-Fi service could end up being re-classified from a *must-be quality* (a basic service which is taken for granted and its absence or malfunction leads to dissatisfaction) to an *indifferent quality* (a service that is indifferent to customers' satisfaction). Consequently, finding the factors that can influence this shift in customers' preferences regarding the way they connect to the Internet would be critical to anticipate when this change could take place in an extensive way. Although

customers are not yet at this stage (recall that even guests with roaming are reluctant to use data on their cell phones when staying in the hotel and tend to complain more about Wi-Fi than non-citizens), as technology advances, a new behavioral pattern can be investigated; and 4) we have only used Booking.com to obtain the data. Thus, a future line of research could extend the results by looking at more platforms. However, using only one platform has the advantage of not having the need to homogenize the information provided by multiple platforms (specifically, Booking.com directly classifies the opinion comments into groups with similar content). Certainly, if more than one platform were to be used, various uniform criteria should be used in which each group of opinions reflect similar content.

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Table 1. Descriptive statistics

	Mean/Proportion	SD
Dependent variables		
Negative review	57.5%	
Customers' overall rating of the hotel	7.37	1.85
Independent variables – Wi-Fi quality		
Speed	12.29	17.66
Wi-Fi is bad	25.2%	
Wi-Fi does not work	9.2%	
Wi-Fi is slow	10.1%	
Bad coverage	2%	
Unstable connection	7.2%	
Number of devices	0.5%	
Low security	0.5%	
Independent variables – Control variables		
Level of expertise	11.82	16.25
Wi-Fi mentions	6.40%	
Guests with roaming	23.2%	

Table 2. Determinants of negative reviews and rating decisions (main model 1) (standard errors in parentheses)

	Model 1			
	Rating decision		**Negative review decision**	
	Parameter	t_1−statistic	Parameter	t_1−statistic
Speed	0.030[a]	5.041	−0.013[a]	−6.427
	(0.006)		(0.002)	
Wi-Fi is bad	−0.374[a]	−2.622		
	(0.143)			
Wi-Fi does not work	−1.011[a]	−5.343		
	(0.189)			
Wi-Fi is slow	−0.200	−1.313		
	(0.152)			
Bad coverage	−0.429[b]	−1.987		
	(0.216)			
Unstable connection	−0.399[b]	−2.360		
	(0.169)			
Number of devices	−1.193[a]	−4.439		
	(0.269)			
Low security	−0.394	−0.932		
	(0.423)			
Level of expertise	0.019[a]	5.088	−0.009[b]	2.246
	(0.004)		(0.002)	
Wi-Fi mentions	−7.366[a]	−3.507	4.553[a]	−5.012
	(2.100)		(0.868)	
Guests with roaming			0.084[a]	5.248
			(0.037)	
Constant	9.687[a]	46.385	0.098	
	(0.209)		(0.067)	
Rho	−0.091[a]	−104344		
	(9E−06)			

Table 3. Determinants of negative reviews and rating decisions (models 2 and 3) (standard errors in parentheses)

	Model 2				Model 3			
	Rating decision		Negative review decision		Rating decision		Negative review decision	
	Parameter	t_1−statistic	Parameter	t_1−statistic	Parameter	t_1−statistic	Parameter	t_1−statistic
Speed					0.024[a]	4.141	−0.011[a]	−5.684
					(0.006)		(0.002)	
Wi-Fi is bad	−0.305[a]	−2.956			−0.404[a]	−2.647		
	(0.103)				(0.153)			
Wi-Fi does not work	−0.994[a]	−7.570			−1.033[a]	−5.338		
	(0.131)				(0.193)			
Wi-Fi is slow	−0.136	−1.242			−0.199	−1.230		
	(0.109)				(0.162)			
Bad coverage	−0.284[c]	−1.760			−0.406[c]	−1.849		
	(0.161)				(0.220)			
Unstable connection	−0.319[a]	−2.636			−0.424[a]	−2.330		
	(0.121)				(0.182)			
Number of devices	−0.737[a]	−2.912			−1.260[a]	−4.626		
	(0.253)				(0.272)			
Low security	−0.488	−1.415			−0.384	−0.954		
	(0.345)				(0.403)			
Level of expertise	0.021[a]	7.254	−0.009[a]	3.193	0.019[a]	4.980	−0.009[a]	−5.071
	(0.003)		(0.001)		(0.004)		(0.002)	
Wi-Fi mentions	−6.186[a]	−3.538	3.721[a]	−7.418	−67.358[a]	−5.112	41.500[a]	7.760
	(1.748)		(0.708)		(13.176)		(5.348)	
Guests with roaming			0.076[a]	5.254			0.113[a]	2.866
			(0.024)				(0.040)	
New York					−0.363	−1.002	0.333[b]	2.401
					(0.362)		(0.139)	
London					−1.201[a]	−3.628	0.772[a]	5.966
					(0.331)		(0.129)	
Paris					−0.541b	−2.148	0.368[a]	3.467
					(0.252)		(0.106)	
Barcelona					0.221	0.679	−0.001	−0.005
					(0.326)		(0.130)	
Berlin					3.875[a]	5.070	−2.339[a]	−7.366
					(0.764)		(0.318)	
San Francisco					−0.700[a]	−2.638	0.243[b]	2.295
					(0.265)		(0.106)	
Constant	9.708[a]	62.229	0.056	1.125	13.395[a]	15.142	−2.183[a]	−6.314
	(0.156)		(0.050)		(0.885)		(0.346)	
Rho	−0.091[a]	−127367			−0.971	−86686		
	(7E−06)				(1E−05)			

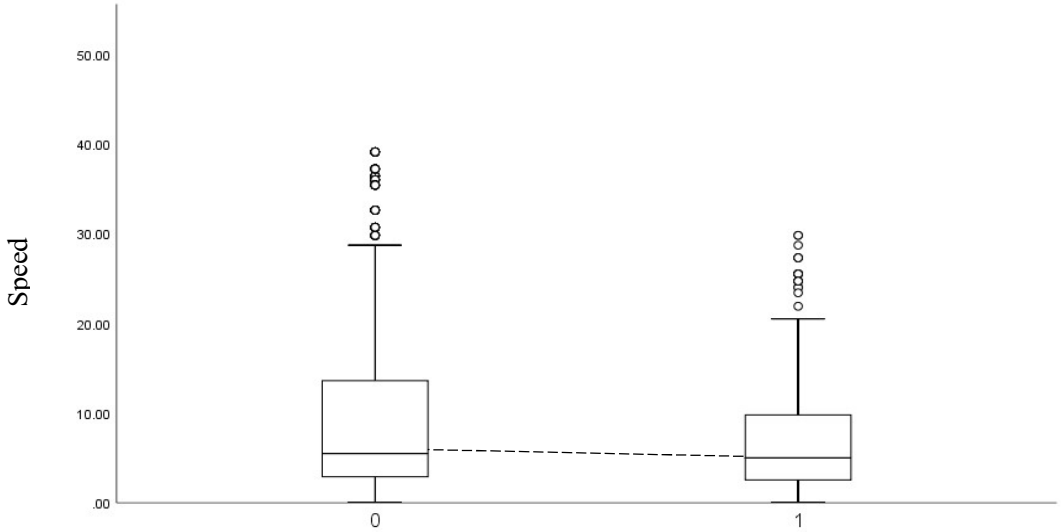
[a] = p < 0.01; b = p < 0.05; c = p <0.10

Table 4. Determinants of negative reviews and rating decisions (models 4 and 5) (standard errors in parenthesie)

	Model 4				Model 5			
	Rating decision		**Negative review decision**		**Rating decision**		**Negative review decision**	
	Parameter	t_1−statistic	Parameter	t_1−statistic	Parameter	t_1−statistic	Parameter	t_1−statistic
Speed	0.030[a]	5.259	−0.013 [a]	−6.648				
	(0.006)		(0.002)					
Speed – city speed					0.023[a]	4.290	−0.010[a]	−0.010
					(0.005)		(0.002)	
Wi-Fi is bad	−0.349[b]	−2.524			−0.371[a]	−2.585		
	(0.138)				(0.143)			
Wi-Fi does not work	−1.007[a]	−5.501			−1.014[a]	−5.333		
	(0.183)				(0.190)			
Wi-Fi is slow	−0.189	−1.276			−0.199	−1.302		
	(0.148)				(0.153)			
Bad coverage	−0.438[b]	−2.044			−0.434[b]	−1.998		
	(0.214)				(0.217)			
Unstable connection	−0.379[b]	−2.287			−0.393[b]	−2.325		
	(0.166)				(0.169)			
Number of devices	−1.172[a]	−4.307			−1.194[a]	−4.514		
	(0.272)				(0.264)			
Low security	−0.469	−1.136			−0.370	−0.878		
	(0.413)				(0.421)			
Level of expertise	0.019[a]	4.918	−0.008[a]	−4.982	0.019[a]	5.050	−0.009[a]	−0.009
	(0.004)		(0.002)		(0.004)		(0.002)	
Wi-Fi mentions					−8.174[a]	−3.882	4.948[b]	4.948
					(2.105)		(0.868)	
Guests with roaming			0.112[a]	3.161			0.084[a]	0.084
			(0.035)				(0.037)	
Constant	9.195[a]	58.319	0.385[a]	9.504	10.095[a]	49.041	−0.086	−0.086
	(0.158)		(0.041)		(0.206)		(0.064)	
Rho	−0.971	116675			−0.971[a]	−106690		
	(8E−06)				(9E−06)			

[a] = p < 0.01; b = p < 0.05; c = p < 0.10

Graph 1. Boxplot of the variables “speed” and “slow”



Slow: 1 = yes; 0 = no