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Mitigating Resource Dependence on Internet Visibility Providers: Exploring Complementarity Effects in the Positioning of Small Hotels on Online Intermediaries

Abstract

By integrating a resource dependence perspective with a complementarity view, this article investigates how online visibility affects the performance of hotels, through user-generated reviews and their presence on Internet portals. Our core argument is that when firms have gained a positive reputation from user-generated reviews, they should reduce their asymmetric dependence on Internet portals. Using a unique panel dataset of 276 small and medium-sized hotels from 2012 to 2014, we have found that good online visibility and the presence on multiple Internet portals are complementary conditions for the profitability of a hotel, and that the impact on profitability, due to the number of Internet portals on which firms are visible, is negative in the case of a poor reputation and leads to diminishing marginal returns in the case of a positive reputation.

Keywords: Resource dependence theory; reputation; online travel agencies; user-generated reviews; hotels; complementarity.

1. Introduction

Internet visibility is a critical resource that is necessary for hotels to interact with both their prospective and current customers. Being well positioned on the Internet can be an important criterion for a hotel to be chosen by a customer and to increase its performance. Firms, especially small and medium-sized ones, do not generally have the capability to develop a high and positive visibility on the Internet alone, and are increasingly dependent on large intermediation and advertising portals with strong market power [1]. Prior research found that when the only way a firm has of accessing a critical resource is via another firm, it falls into a situation of resource dependence. This dependence may create significant problems for a dependent firm by making it vulnerable to the opportunistic behaviour of resource providers, especially when the firms controlling these critical resources do not need to make relation-specific investments [2].

Although online visibility is a critical resource that is controlled by portals and not by single firms, few of the so-far conducted studies that have addressed the impact of online visibility on performance have used the concept of resource dependency to analyse how firms become vulnerable to portals. The works that approached the topic of online visibility with a resource dependence framework have shown that the more firms diversify and balance their presence on multiple distribution portals, the better their performance is, since they can secure a better bargaining position by having alternative ways of acquiring visibility [3,4]. Although the idea that balancing dependence on online portals has provided an important contribution to the understanding of the performance effects of online visibility for those firms where the Internet is a key distribution channel, progress in our understanding of how online visibility affects a firm's profitability is just at the beginning. This is because visibility in the online world has been becoming a multi-faceted concept that involves balancing resources on different channels through which firms can offer visibility to their products and services. In showing the benefit of bargaining power, due to a balanced dependence on different Internet retail portals, previous studies [3,4] excluded the possibility that any attempt to reduce the asymmetric dependence on a given category of distributors could result in a decrease in a firm's capability of building interdependencies with the providers of alternative visibility resources, or could lead to sacrifice resources for its core offline business operations.

The hospitality sector is one of the industries in which the issue of how online visibility should be accessed through different typologies of visibility providers is apparently more relevant. Online visibility is critical for hotels to attract travellers, especially from abroad, and hotels build visibility through two types of third-party online channels, namely the aggregators of user-generated recommendations and online travel agencies (OTAs). The aggregators of user-generated recommendations, such as TripAdvisor, provide their customers with a "zero moment of truth" in the online environment [5], as they play a crucial role in forming the reputation that hotels have online about their service level and their offered amenities [6]. The importance of such aggregators is due to the nature of the hospitality services as experience goods, for which quality is hard to inspect *ex ante*. In this way, a review acts as a substitutive mechanism of the brand, and is thus particularly important for small and medium-sized hotels, which usually rely on a weak brand. Moreover, aggregators of user-generated reviews offer hotels several operational tools to help them build their reputation in the online world and to direct traffic towards their web sites and towards OTAs, where visitors can book rooms, compare prices and obtain discounts. OTAs, such as Expedia or Booking, thus represent the second type of channel

that provides online visibility to hotels. They have progressively been replacing traditional brick-and-mortar agencies in the distribution process in which customers reserve rooms and other travel-related services.

The increasing importance of OTAs and aggregators of user-generated reviews implies that managing online visibility requires a high deployment of internal resources, whose economic returns remain uncertain for hotels. The uncertainty lies in the fact that any attempt to reduce the asymmetric dependence on OTAs beyond a certain extent may not be necessary, since hotels should also direct their attention towards building and maintaining a high reputation through traveller-generated reviews. Our key argument is that a good reputation, built through travellers' reviews, can help hotels to be in a bargaining position that makes them close to having a mutual dependence with OTAs. Under these conditions, developing relationships with too many OTAs can lead to redundant efforts and to the risk of being unable to develop interdependencies with providers of alternative visibility resources. Thus, we have attempted to develop more fine-grained knowledge on the way hotels should mitigate their relational dependence on critical resource providers in order to monetise on their online visibility to obtain superior profitability. To this end, we offer an answer to the following question: "To what extent is a balanced dependence on multiple distribution channels, such as OTAs, complementary with the reputation gained on portals that aggregate user-generated reviews?" Our hypothesis, which is based on the resource dependence theory that a balanced dependence on multiple OTAs is pointless beyond a certain number, has led us to suppose diminishing marginal returns on the number of OTAs over which a hotel is visible, when it has developed a good reputation through user-generated reviews, and negative returns, when the hotel suffers from a weak reputation.

In order to explore this topic, we have assessed the complementary effects on the profitability of hotels as a result of review scores and the presence on multiple OTAs by taking into consideration a panel of 276 small and medium-sized hotels in Italy. The online presence of these hotels on the main user-generated review platform (i.e., TripAdvisor) and on OTAs has been observed over a period of three years.

The article is structured as follows. First, we illustrate how power relationships around online visibility can be unfavourable for small firms, given the specific traits of Internet as a distribution channel in the hospitality industry. We then formalise our theoretical prediction of complementarity between the online visibility mechanisms provided by OTAs and by aggregators of user-generated reviews. After presenting our research methodology and the main findings, we relate our findings to the theoretical contribution we generated in order to apply the resource dependence theory to study the economic effects of online visibility on performance. Finally, we discuss the managerial implications of how hotels, and firms in general, should mix and balance their budget to procure Internet visibility on third-party channels.

2. Background: Power relationships around online visibility in the hospitality industry

OTAs and aggregators of user-generated reviews, such as TripAdvisor, are essentially the two main typologies of Internet intermediaries that offer hotels the benefit of being visible to a global audience of travellers. They have changed the power relationships within the hospitality value chain by marginalising the role of travel agencies and have put hotels in a situation of relational dependence on them.

OTAs are Internet retail portals that attract travellers by making hotel rooms and amenities visible for reservation during travellers' online searches. Along with the visibility of their rooms during travellers' online searches, OTAs bundle hospitality services with other travel-related services, such as flight booking, car rental and travel insurance [4], and they allow hotels to display their services to those customers who are looking for a "one-stop-shopping" solution to their travels. Moreover, OTAs may help support hotels in their pricing decisions, thanks to their dynamic pricing algorithms that allow hotels to adjust prices to demand. The weak brand of small and medium-sized hotels, along with the lack of well-developed proprietary phone and web distribution channels, implies that the majority of travellers reserve hotels through OTAs rather than through direct methods. In addition, the OTA market is concentrated, given the scale and network economies related to setting up a broad variety of hotels whose rooms are listed for online reservations. However, there is a countless number of small hotels which are fragmented into various brands, especially in countries where the hospitality supply is dominated by family hotels and by bed and breakfast structures that compete in providing a truly "local touch". Thus, the relationship between OTAs and hotels can be considered as an asymmetric power relationship [2]. Moreover, OTAs put hotels in a strong price competition position, as they offer customers the possibility of comparing and sorting hotels according to the price and the availability of the amenities.

An even more critical asymmetric dependence can occur for hotels with reference to their visibility on platforms that aggregate travellers' reviews. This market is even more concentrated than that of OTAs. By promoting interactions between different actors on multi-sided platforms in which travellers, hotels, restaurants, independent software vendors and cultural heritage institutions participate [7], TripAdvisor has achieved a dominant position concerning user-generated reviews by leveraging on network effects. In fact, TripAdvisor aggregates the highest number of travel-related reviews in the world. In 2017, this platform was visited by a total of 350 million single monthly visitors, 320 million reviews were written and opinions pertaining to more than 6.2 million types of accommodation, restaurants and attractions were expressed. Moreover, it operated in 47 countries throughout the world. TripAdvisor posts all the user reviews and ratings produced for each hotel, along with a numerical ranking (i.e., the Popularity Index) that ranks all the hotels within a geographical region. Reviews provide hoteliers with a reputational asset that is specialised according to the offered amenities, such as the type of breakfast, free Wifi connectivity, spa, gym, swimming pool, business centre and baby parking. In this context, the rankings generated by review aggregators, based on travellers' scores, cover the three fundamental dimensions of reputation [8]: i) being known, ii) being known for something and iii) generalised favourability. In this vein, the algorithms deployed by review aggregators contribute to creating a reality, and not simply a support for those travellers who are searching for and sorting it [9]. Hence, a high ranking generated by the search algorithm is a crucial resource for a hotel to gain legitimacy on its local market [2, 11].

Although some OTAs publish travellers' reviews once they have stayed in a hotel, TripAdvisor is seen by hoteliers as being the main means of managing their reputation and legitimacy in the eyes of prospective customers. This is due to its ability of presenting its ranking algorithm, which is based on travellers' reviews, as an objective representation of the reality [11]. In this vein, TripAdvisor's slogan is "Get the Truth, then Go". It describes its ranking algorithm on its website as follows: "Unlike other sites that simply rank a hotel by price or hotel class, our Popularity Index truly reflects what real travellers are saying" [9]. In order to put this vision into practice,

TripAdvisor offers hotels several operational tools to manage their image, starting from the reviews that travellers post on its platform. For example, hotels can stimulate travellers' reviews on TripAdvisor and use them to certify the quality of their services on their web sites through badges or dynamic widgets that echo recent positive reviews received on TripAdvisor. Second, travellers' reviews may be used in a hotel's competitive benchmarking and quality management process in order to improve the services it offers and its market knowledge [3]. Third, hotels can defend or increase their reputation by responding to customer reviews, especially in the case of disgruntled customers. Responses to negative reviews can be aimed at disputing prejudices triggered by previously received reviews [6] or defamatory comments (which is particularly important to identify and disclose fake negative reviews) or at expressing apologies, together with a justification of the poor service delivered [12]. Such reputation management services are not part of the value proposition of many OTAs.

The role of TripAdvisor is also to generate and redirect valuable Internet traffic towards OTAs or towards a hotel's own web site (in the case of large hotel groups), where additional information and booking engines are available to support the purchase of travel products and services. This position in the value chain is well reflected in the words of TripAdvisor's President, Stephen Kaufer.

"The scale at which we operate, and the position in the funnel at which most of our customers are at, makes us a pretty unique traffic source for the major OTAs [...] We're at the stage of the customer journey that can be represented by the sentence 'I'm not sure where I want to get. I'm not sure where I want to stay". That stage is very up in the funnel and it is upstream of where the big OTAs are. As such, it's traffic that's up for grabs. It's traffic that our clients can try to make loyal to their booking engine. And, we're comfortable with that because of our funnel position because of the fact that so many are loyal to TripAdvisor as the place to start their travel planning experience. And our overall value proposition is obviously really quite different from a hotel brand or a straight OTA". **Stephen Kaufer**, August 2, 2018, Presentation of Quarter 2 Financial Results.

Thus, OTAs cover the second stage of visibility in online intermediation, and they manage services related to booking, such as processing payments, modifications and customer requests that follow the online reservation. In the first stage, value is monetised by TripAdvisor through a click-per-through mechanism. As such, in the case where TripAdvisor redirects Internet traffic towards an OTA, hotels do not directly sustain a cost for their visibility on TripAdvisor, and this cost is instead sustained directly by the OTAs (who then charge the hotels).

The overlapping in the areas of specialisation of OTAs and aggregators of user-generated reviews is limited. In 2016, TripAdvisor also started to offer the service of reserving rooms, but its level of after-sales services in this regard is lower and not comparable with those offered by OTAs. TripAdvisor has stopped controlling the relationship between travellers and hotels after the reservation has been finalised (something that OTAs regularly do) and only generates a marginal part of its total revenues, which have been estimated to be around 10%, from online reservations. In the same way, some OTAs, like Expedia and Booking, offer travellers the possibility of posting reviews about their stays in hotels, but they are not as specialised as aggregators of user-generated reviews in giving hotels a tool to manage their online reputation and they collect a smaller number of reviews than such aggregators of reviews as TripAdvisor. Moreover, some OTAs also exhibit reviews collected by TripAdvisor in the listing of the hotels on their portal.

The relational dependence that hotels develop on OTAs and review aggregators implies high intermediation fees being paid to these categories of providers of online visibility. Overall, such fees may reach 30% of the price paid by customers for a room. Hotels can obtain more favourable intermediation fees or can mitigate their overall impact on profitability by enacting dependency-reducing strategies [2]. In other words, hotels can decide to be listed on multiple OTAs. Hotels would suffer from opportunistic behaviour from OTAs if their relative autonomy were low, due to their asymmetric dependence on a very small number of suppliers. This situation is known as small-number bargaining in transaction cost economics [13], and it puts hotels in a situation of high vulnerability to the opportunistic behaviour of the providers of online visibility. An extreme case would be that of a hotel with an online presence on only one OTA. Hotels in this kind of asymmetric dependence relationship would be more likely to be discriminated against than those hotels that are listed on several OTAs, and they might have to pay higher intermediation fees, due to their weaker bargaining position.

In short, OTAs and aggregators of user-generated reviews tend to be positioned at stages of the hospitality value chain that are sequential and characterised by limited overlapping areas. Developing relationships with each of them may be a necessary condition for hoteliers to develop their online visibility, and this may be a way through which hotels reduce their relational dependence on each of these two categories of visibility providers. Hence, a good reputation, gained through travellers' reviews, can be complementary to the presence of hotels on multiple OTAs. Drawing on a resource dependence framework, the next sections discuss how this can occur.

3. Theory and hypotheses

In their formulation of the resource dependence theory, Pfeffer and Salancik [2] identified two types of responses that organisations can enact to mitigate or eliminate their dependency on the providers of resources that are critical for their survival. First, organisations can absorb the constraints in the procurement of these resources through mergers and acquisitions with the providers or through infiltration in the board of directors of the dominant firm. The second type of response foresees that the weaker organisation restructures its dependencies on the dominant organisation in an attempt to increase its autonomy [14]. Such restructuring takes form in the cultivating of alternative providers for the resource of interest, or in reducing the need for this resource. The greater the power imbalance that the firms suffer with the dominant provider [15], and the lower the mutual dependence of the parties (i.e., the existence of bilateral dependence between the dominant organisation and its counterpart in a dyadic relationship), the lower the likelihood is of the dependent organisation enacting constraint absorption strategies, such as mergers or acquisitions. This situation characterises the attempts of hotels to reduce their dependence on OTAs and aggregators of user-generated reviews in their access to online visibility.

The dependency reducing strategies of hotels for online visibility may thus refer to a concept of restructuring their links with OTAs and aggregators of user-generated reviews. A balanced dependence on multiple OTAs and an attempt to improve their reputation through user-generated reviews can act as complementary mechanisms through which a hotel can try to mitigate a situation of high power imbalance with a restricted number of OTAs. Surprisingly, the effect on

performance of such a complementarity between user-generated reviews and the number of online distributors has not yet been investigated in previous studies, despite the fact that user-generated reviews and partnerships with multiple online distributors are a common feature on many markets mediated by the Internet (see Table 1).

--- Table 1 around here ---

In order to assess the complementarity between visibility on OTAs and TripAdvisor, we adopted Milgrom and Roberts' operational definition of complementarity [16]:

Assumption 1. Let us suppose there are two activities, A_1 and A_2 . Each activity can be performed by a firm ($A_i=1$) or not ($A_i=0$) and $i \in \{1, 2\}$. Therefore, the profit function $\Pi(A_1, A_2)$ is supermodular, and A_1 and A_2 are complements if $\Pi(1,1)-\Pi(0,1) \geq \Pi(1,0)-\Pi(0,0)$.

The supermodality concept implies that adding an activity while another activity is being performed has a greater incremental effect on performance than adding the same activity on its own. For the purpose of this study, the performance measure takes into account profitability. The focus on profitability makes it possible to take into consideration whether the potential advantages, in terms of higher price and higher occupancy rates "promised" by online visibility, are fully captured by hotels, given the dominance of OTAs and aggregators of travellers' reviews. There are essentially two reasons to expect that complementarity exists. First, hotels with favourable reviews might obtain more favourable intermediation fees in their bargaining with OTAs. Second, engaging in one activity may diminish the cost of engaging in the other. Thus, there can be significant economies of scope related to "sharing" the labour costs required to manage one dimension of online visibility (i.e., the presence on multiple OTAs) on the other (i.e., attracting favourable reviews) [16].

3.1 Complementarity between online reputation and a multiple presence on OTAs

There are compelling reasons to expect that hotels can reduce their relational dependence on the two types of providers of online visibility by exploiting a complementary effect between the reputation gained through travellers' reviews and their distribution through multiple OTAs. From the benefit point of view, hotels that are able to build a good reputation on review aggregators can use such reviews to promote trust and loyalty in online transactions and can generate more Internet traffic towards OTAs [12].

The resource dependence theory suggests that since hotels with a high travellers' score may have a reputational advantage, their bargaining power with OTAs increases. Not showing market leaders in Internet searches would make users question the OTAs' credibility [18]. In other words, according to Pfeffer and Salancik [2], a good reputation, stemming from user-generated reviews, puts hotels and OTAs in a situation of mutual dependence, especially if an OTA wants to continue having a supply of high-quality hotels in a given geographical area. Therefore, OTAs may need to include hotels with a more favourable reputational track on TripAdvisor in order to sustain their market credibility. Moreover, hotels with a reputational advantage can count on a more loyal base of customers and higher repurchase rates. These two factors may lead travellers to book a hotel directly on the telephone or on the hotel's own web site instead of passing through an OTA to make a reservation [19]. This might put the hotel in a more favourable bargaining

position with OTAs, and allow the hotel to decide whether to be listed on multiple OTAs in order to avoid a situation of small-number bargaining [13]. This implies that a good reputation and the presence on multiple OTAs are conditions of access to external visibility that, on their own, lead to limited benefits.

In short, there are arguments in favour of complementarity between the online visibility mechanisms considered in this study. We therefore hypothesise the following relationship.

H1. A good online reputation achieved through travellers' review scores and the presence on multiple OTAs are complementary conditions for a hotel's profitability.

3.2 Complementarity and diminishing marginal effects due to visibility on multiple OTAs

The complementarity between being visible on multiple OTAs and having a good reputation, gained through travellers' reviews, may be characterised by diminishing marginal returns, due to the number of OTAs on which a hotel is visible and sells its rooms. The resource dependence theory suggests two types of arguments to explain this expected effect.

First, developing relationships and a distribution agreement with a further OTA when a hotel already sells rooms on a few OTAs entails an additional deployment of the hotel's internal resources for their selling and administrative activities. This can be critical in a situation of limited resources, like the one faced by small non-branded hotels. For example, more decisions have to be taken each week about pricing and the number of rooms to be sold on each OTA. This dimension of complexity may lead hotels to face new types of service costs, since their intention of balancing their online presence on multiple OTAs might lead them to invest in software-based channel management services that recommend how to adjust prices and the capacity sold on each OTA dynamically, depending on the forecasted demand. In the same vein, internal labour costs can increase, because a hotel's presence on multiple OTAs implies a redundant effort in periodically updating contents related to novelty in the amenities offered on each of the multiple OTAs on which it is listed. This increase in costs can be avoided by limiting the presence on OTAs to a certain number of providers. This is relatively more feasible when hotels have a good reputation created through travellers' reviews. In fact, in a bargaining situation of "small numbers" [13], a hotel with a reputational advantage can simply have a higher bargaining power with OTAs than a hotel without such an advantage. Hence, in such a situation, hotels may not need to reduce their asymmetric dependence on OTAs to the same extent as those hotels that suffer from a poor reputation. In other words, even with visibility for selling rooms on just one single OTA, the bargaining position of such hotels may be strong, in the case of a reputational advantage from user-generated reviews, since such an advantage leads the OTA and the hotel to a situation of close to mutual dependence.

Second, paying more attention to distribution on a larger number of OTAs may imply fewer investments and less managerial attention being devoted by hotels to differentiate their market position on their official web site. From the resource dependence theory perspective, the presence of a weak firm on multiple Internet retail portals leads to risks of generating rigidity in the capabilities of this weak firm of cultivating alternative types of distribution strategies, including the option of developing a more vertical integrated approach that bypasses the needs of accessing external resources controlled by powerful providers. In the specific case of hotels, a more vertical integrated approach implies that the hotel regularly provides comprehensive information and

visual aids (in the form of videos and pictures) about its rooms and amenities on its web site. This approach can help hotels remove the information asymmetry between them and travellers that occurs when a traveller is about to finalise an online reservation. The effectiveness of these informational tools, made available on a hotel's web site, can be augmented through the "quality certification" mechanisms that originate from travellers' reviews, for example, TripAdvisor badges and certificates, which hotels can post on their website. However, building an effective informational web site requires additional costs, due to the complexity of setting up web sites that are visible, easy to use, and equipped with comprehensive and updated information. In this vein, cultivating multiple relationships with OTAs to reduce the asymmetric dependence a hotel has on this type of distributor can cannibalise the resources a hotel could otherwise use to develop its online visibility on its own web site.

Greater visibility on several OTAs can also divert managerial attention and the resources invested in the core operational assets of a hotel that may be crucial in order to apply vertical or horizontal differentiation strategies. Specifically, a strategy of differentiation requires hotels to invest significant resources in the fixed assets necessary to provide comfort and a broad range of amenities. Also, a great amount of resources is used for keeping an ongoing daily attention to the quality management and to the improvement of core operational processes as general housekeeping or serving breakfast.

In short, these arguments suggest that an "optimal" mix of online visibility, built through different specialised providers, means hotels should not cultivate relationships with an excessively large number of OTAs when they already have the advantage of having a good online reputation. Thus, the following relationship can be expected.

Hypothesis 2. When the online reputation of a hotel is good, the relationship between the number of OTAs on which the hotel is listed and its profitability is curvilinear and characterised by diminishing marginal returns.

The supermodality argument does not clarify the type of effect that a hotel might suffer from as a result of a weak reputation when it increases its efforts to balance its relational dependence on multiple OTAs. In fact, the supermodality argument states that when a hotel cannot rely on a good online reputation, the effect of increasing the number of OTAs is less salient than the one at a play in situations in which it can rely on such a condition (Figure 1a). Thus, in theory, when a hotel suffers from a poor reputation, its profitability may not change according to the number of OTAs over which it decides to be listed (Figure 1b), and its profitability could even decrease (Figure 1c). According to the resource dependence theory, the arguments in favour of this second situation might prevail.

--- Figure 1a, 1b and 1c around here ---

The first reason why the profitability of hotels with a weak reputation can suffer more when they are visible on different OTAs is due to an amplification effect of reputation crises. Such an amplification of negative comments expressed by travellers may be reinforced by the above-mentioned fact that many OTAs (for example, Hotels.com) show the reviews a hotel has received on TripAdvisor. A second reason is that the presence on multiple OTAs may impede a hotel from

easily entering into new partnerships with alternative distribution channels, such as travel bloggers, tour operators, or aggregators of “smart boxes”, which can mitigate the effects of negative online reviews by directing customers towards hotels via alternative means. Such means are less transparent than the ones offered by the “wisdom of the crowd” that is exploited by TripAdvisor and other aggregators of travellers’ reviews and consist in “smart boxes” or bundle of services aggregated by traditional tour operators. Third, in the case of an over-commitment of its internal resources, a hotel, in order to be effectively visible on OTAs, may find it difficult to redirect its resources towards alternative channels that can promptly allow the hotel to overturn its weak reputation. For example, negative reviews make it necessary for hoteliers to answer such reviews in order to discredit the travellers that formulated them or to show prospective customers their responsiveness to clients when something accidentally goes wrong when serving a customer. This becomes more complicated when negative reviews appear on several OTAs. Furthermore, outside the hospitality industry, other studies have shown that negative reviews do not reduce sales when the products have a strong brand and a pre-existing positive reputation [20]. A similar mechanism could be at play for hotels, and may imply that when hotels are able to take better care of their web site as an informational and sales channel, they are less vulnerable to the effects of negative reviews. However, as mentioned earlier, this attention towards an informational web site might be less likely for those hotels that try to balance their dependence on OTAs by being listed on many of them.

Finally, a hotel’s attempt to lessen the asymmetric dependence on OTAs can make it more vulnerable to their market power in situations in which channel conflicts lead to OTAs retaliating against the hotel. This occurs since, if a hotel increases the number of OTAs over which it is listed, then the probability of conflicts with OTAs about deciding the fee to apply for the rooms arises [21]. In a situation of power imbalance, a hotel’s capability of negotiating lower fees and lower room prices on some OTAs can lead those OTAs that have more market power to retaliate against the hotel by excluding it from the portal or by giving it less visibility in its ranking. A hotel that suffers from such retaliation may in turn suffer from a drop in sales. Retaliation is more likely when hotels receive negative reviews, since they are farer from a bargaining condition of mutual dependence with OTAs.

These considerations, in terms of the resource dependence theory, indicate that cultivating a balanced dependence on a high number of OTAs increases a hotel’s vulnerability when things go wrong about how travellers rate their services on aggregators of online reviews. This happens because strategies aimed at reducing asymmetric dependence on OTAs, oriented towards accessing substitute online visibility resources, are harder to follow.

In short, these arguments suggest that when the online reputation of a hotel is low, balancing its presence on a high number of OTAs may lead to more negative effects on profitability than for those hotels that opt to keep an asymmetric dependence on just a few OTAs. Thus, we may expect the following relationship.

Hypothesis 3. When the online reputation of a hotel is weak, the higher the number of OTAs on which it is visible is, the lower its profitability.

4. Methodology

4.1 Research settings

We chose the setting of small and medium-sized Italian hotels since it offers some unique points of interest. Italy has already been analysed in other studies on Internet visibility in the hospitality industry, and this offers an avenue of comparability with our results. Moreover, this country is the fifth largest international tourism destination [22], and the structure of its local hospitality industry is dominated by small hotels as well as bed and breakfast structures with weak brands. Such hotels are thus in a situation of high relational dependence on TripAdvisor and OTAs, as far as gaining customers through the online visibility provided by these intermediaries is concerned.

4.2 Sample and data collection

Our data collection involved a random selection of 276 small and medium-sized and non-branded Italian hotels. A confidence level of 95% and a confidence interval of 5.5% were chosen for statistical power. These hotels were extracted from a population of 2,862 small and medium-sized Italian hotels. The hotels had fewer than 250 employees, in line with the European Union's definition of small and medium-sized enterprises. The selected hotels are all listed in the AIDA public database (distributed by Bureau Van Dijk), which is the main compendium of financial information pertaining to firms in Italy. Beginning with the population of small and medium-sized hotels listed in AIDA, we randomly extracted 276 hotels.

Considering the financial information available for the 276 selected hotels, we built a panel dataset that spanned the period between 2012 and 2014, which collected the number of OTAs for each year over which the hotels were visible, and the score of the reviews at the end of each year.

Overall, hotels in the sample were visible on 13 OTAs, which represent and include the main online distributors of hotel rooms investigated in previous studies [3,23,24]. The profitability and revenue data of each hotel were taken from the AIDA database. The final dataset contained 828 firm-level observations.

4.3 Measures

4.3.1 Online visibility

Number of OTAs (Multiplicity of OTAs). This variable represents the number of OTAs on which a hotel is listed and sells rooms, considering a list of 13 players that deal with Italian hotels¹. This list covers both well-known brands, such as Expedia and Booking, which sell many different kinds of travel-related contents, and players that are more focused on either a particular geographical area of touristic inflows or just on hotel reservations. Through data available on TripAdvisor, we could retrieve information on whether each hotel was available on 13 different OTAs. Thus, we built a variable that counted the number of OTAs over which a hotel was visible and sold rooms with reference to a whole solar year. This type of observation allows two ways

¹ Agoda.com, Booking.com, Budgetplaces.com, e-Dreams, Expedia.com, Hostel World, Hotel.info, Hotels.com, hotelsclick.com, Opodo, Orbitz, TravelRepublic and Venere.com.

through which a hotel can reduce its asymmetric dependence on OTAs to be captured: 1) by being visible on different OTAs at the same time and 2) by being listed on no more than one single OTA in a given period (e.g. a month) and by rotating the OTAs on which rooms are sold with a given periodicity.

Online Reputation (Review score). The online reputation variable was operationalised through the review score of a hotel on TripAdvisor. This variable represents the average cumulative online rating for each year for each hotel written on TripAdvisor by travellers. The travellers' rate was established on a five-point scale, where the scores were "terrible", "poor", "average", "very good" and "excellent". We chose a review score instead of the volumes of reviews since most of the earlier studies had found that the former is the dimension of a hotel's visibility on TripAdvisor that has the most impact on sales [7] and profitability [27].

Hotel visibility on their official web site. We checked the dimensions of a hotel's visibility on its official web site and we operationalised a variable that considered seven visibility mechanisms enacted by the hotel on its website. Such mechanisms have already been described in seminal studies on the visibility of small and medium-sized enterprises on their web sites (Otero, 2014). In other words, we took into account seven source attributes of website improvements : 1) visibility pertaining to the number of visual aids added to the website (for example, the number of images and videos of a hotel's amenities), 2) the updating frequency of the available content, 3) the presence of information about room prices, 4) the number of reservation systems, including reservation by telephone, by email, by fax, by website or by any online form, 5) the number of systems used to enable customer retention, including the relationship with the final customer through newsletters, through the availability of the FAQ section, through a registration system on the website, through the usage of a real-time chat, through the possibility of communicating with the hotel in real-time using Skype or through WhatsApp, 6) the number of languages used to provide information on the website, and 7) the number of links to TripAdvisor's website or OTA websites from the hotel website. Each of these variables was standardised for each hotel and a variable was operationalised considering the sum of these standardised variables. As it was only possible to observe these variables for 2016, they were not included in the regression model specifications used to validate our hypotheses. However, we controlled for the correlation between this variable and the number of OTAs on which hotels are visible to assess whether a balanced presence on multiple OTAs could be considered a substitutive mechanism for the visibility of a hotel on its own web site.

4.3.2 Dependent variable

Hotel profitability. We measured the impact of visibility on profitability by considering the returns on assets (ROA) as the dependent variable. Being a measure of the operating profitability, the ROA takes into consideration sales revenues minus all the operational expenses, including the intermediation fees paid to OTAs and TripAdvisor. Revenues capture whether hotels are able to extract sufficient economic value from online visibility on OTAs and a good reputation on review aggregators by applying vertical or horizontal differentiation strategies (which may lead to a premium price being paid by travellers), and through higher occupancy rates of their rooms.

4.3.3 Control variables

Revenues. The value of the logarithmic form of revenues was included, where appropriate, in the models to control for a hotel's size (revenues is a proxy of the hotel size). It was also included as an instrumental variable (the reasons are explained hereafter) to test H2 and H3.

Management response. This variable considers the number of replies provided by a hotelier to online customer reviews in a given year. Previous literature has demonstrated that the number of management responses influences the hotel's performance, since they denote a higher responsiveness to issues raised by customers in their reviews [24].

4.4 Econometric approach

Several steps were followed to test the complementarity between a hotel's online reputation on TripAdvisor and its visibility on OTAs in order to verify Hypothesis 1. First, we tested whether these two dimensions of visibility were positively correlated. If two variables are complementary, we expect to see a positive and significant correlation [26]. Thus, firms that have a good online reputation are expected to be visible on multiple OTAs, and vice versa. In order to verify this aspect, we computed the correlation coefficient between the two variables.

Second, we tested for the complementarity effect of the review score and multiplicity of OTAs on a hotel's profitability by estimating a model that links ROA with four exclusive dummy variables that depict the four possible states stemming from combining low or high values in reference to review score and number of OTAs over which hotels sell their rooms.

If the review score and multiplicity of OTAs are complementary, we expect the parameter estimate of the combination between the two variables (High review score & High Multiplicity of OTAs) to be positive and significant. Moreover, we expect the Milgrom and Roberts [16] complementarity test to be satisfied (Equation 1):

$$\text{Profitability (High Review score \& High Multiplicity of OTAs)} - \text{Profitability (Only High Review score)} \geq \text{Profitability (Only High Multiplicity of OTAs)} - \text{Profitability (Low Review score \& Low Multiplicity of OTAs)}$$

(Equation 1)

In order to test Hypothesis 1 accurately, we needed to account for possible endogeneity issues in our model. Following our arguments for which a balanced dependence on multiple OTAs require higher expenses for internal resources dedicated to manage relationships with multiple suppliers, hotels who have high profitability might be more likely to be listed on more OTAs.

We followed several steps to address this potential problem of endogeneity. We took advantage of the panel structure of our data and used a fixed effects model, which is able to account for time-invariant unobserved firm heterogeneity. We chose a fixed effects model over a random effects specification to handle the unobserved factors, because the fixed effects model allows us to account for the unobserved firm-specific characteristics that are constant over time, such as managerial capabilities. It was reasonable to assume that such firm-specific effects were related to the decisions the firms took (multiplicity of OTAs, in our case).

Next, to account for the presence of a serial correlation, we used a fixed effects model with an AR(1) process for the errors. This approach was needed since online reputation and a multiplicity of OTAs are affected by serial correlation, showing some persistence over time. To cope with problem, we replicated the approach used by Cassiman and Veugelers (2006) [28] to assess complementarity between online reputation and OTA multiplicity. Specifically, we used a multinomial probit regression model as a first stage to estimate the probabilities associated to the four different combinations of high and low scores in online reputation and OTA multiplicity. The regressors used in this first stage were hotels' sales revenue, the number of management responses to customers' reviews, and the lagged values of review score and the number of OTAs used by hotels. The dependent variable in this first stage was coded in this way: 1 (Low review score & Low Multiplicity of OTAs), 2 (High review score), 3 (High Multiplicity of OTAs) and 4 (High review score & High Multiplicity of OTAs). We then used these predicted probabilities for the online reputation and OTA multiplicity combinations in the second stage of the regression.

Third, we also estimated two fixed effects regression models to test the direct positive effect of the review score on the multiplicity of OTAs, and vice versa. We conducted this regression because if two variables are complementary, they could be expected to be positively correlated, but the relationship between the two variables may still have needed additional controls.

In order to verify Hypothesis 2, we included the number of OTAs and its squared term for the case of a high review score, whose effects are tested by means of Equation 2, in the model:

$$ROA_{it} = a_1 + b_1 \text{Number_of_OTAs}_{it} + b_2 \text{Number_of_OTAs}_{it}^2 + b_3 \text{Management_response}_{it} + \varepsilon_{it}$$

(Equation 2)

To discriminate high from low review score, we split the sample by using the median value as a threshold, while the term "low review score" refers to a lower or equal review score value to the median value of the review score.

In order to verify Hypothesis 3, we tested the effects of the number of OTAs on profitability for the case of a low review score. In order to verify Hypothesis H3, we tested Equation 3 on the subsample of hotels that had low review score levels:

$$ROA_{it} = a_2 + b_4 \text{Number_of_OTAs}_{it} + b_5 \text{Management_response}_{it} + \varepsilon_{it}$$

(Equation 3)

Possible endogeneity issues could affect also the accurate estimations of equations 2 and 3. To account for such endogeneity, we chose fixed effects models for the same above-mentioned reasons. We also used instrumental variables and two-stage least squares for panel-data models [29]. We chose hotel's annual turnover (expressed as the logarithmic form of the revenues) as an instrument, since higher sales revenues reflects larger room capacity. Hotels' with larger room capacity are more likely to sell their rooms on more OTAs in an attempt to cover their higher fixed cost. However, higher sales revenues (and larger room capacity) are not necessarily associated with superior profitability, which can be the outcome of how hoteliers are able to manage a variety of factors, including their room capacity and the online visibility.

In order to verify whether a regression estimated via instrumental variables (IV) was required in our case instead of an OLS estimation, we first computed the Durbin–Wu–Hausman test for endogeneity by conducting a regression estimated via instrumental variables (IV), where the null hypothesis states that an ordinary least squares (OLS) estimator of the same equation would

yield consistent estimates. This means that any endogeneity of the regressors would not have had any deleterious effects on the OLS estimates. A rejection of the null hypothesis indicates that the effects of the endogenous regressors on the estimates are meaningful, and instrumental variable techniques are required. After the evaluation of the appropriateness of the instrumental variables, we tested the appropriateness of the instrument. Specifically, it was required that the instrument did not suffer from problems of under-identification and weak identification. In order to test for the existence of these problems, the tests of under-identification and of weak identification developed by Kleibergen–Paap were conducted.

The lagged values of the variables that referred to the multiplicity of OTAs and the online reputation of a hotel were included in all the models, in order to provide an additional control of endogeneity.

5 Findings

5.1 Descriptive statistics

The descriptive statistics (Table 2) provide some useful indications about how online visibility generally works for hotels on external and proprietary channels. The correlations were found to be as expected. The number of OTAs was positively and significantly correlated with the review score.

--- Table 2 around here ---

Second, the number of OTAs was found to be significantly and positively correlated with the sales revenues of a hotel, thus highlighting that those hotels that choose to be on a greater number of OTAs are usually larger in size. Finally, it was found that time influences online visibility. The number of OTAs was significantly and positively correlated to the year variable, thus highlighting that, over the years, hotels have expanded their presence on multiple OTAs. In 2012, the hotels in the sample were on average visible on 2.380 OTAs, while in 2014 they were on average visible on 5.325 OTAs. A total of 29 hotels (10.5% of the sample) had no visibility on any OTA. The review score increased over time and variance decreased, as shown in Table 3. The hotel with the lowest score in the sample had an annual average score of 1.206. The review score median was close to 4 points in each of the three years under analysis, thus pointing out a high skewness in the distribution of the scores assigned by travellers to hotels. The quartiles show that 50% of the average scores received by hotels in a year range from about 4 to 4.1, thus indicating that the majority of travellers express an evaluation which is “average”, “good” or “excellent”. The interquartile difference in the review score did not show any significant change over the years, thus showing that the discriminatory power of the reviews did not change over the years (Table 3).

--- Table 3 around here ---

When considering the characteristics of the hotels, in relation to the way they manage their online visibility on their official website, we found that those that paid more attention to the visibility of their services and amenities on their websites were those with a more limited presence on OTAs or those with a better reputation on TripAdvisor. This result shows that hotels tend to use their official web site as a substitute mechanism of their visibility on OTAs. This result was supported by the correlation values. The correlation between a hotel’s visibility on its official website and

the number of OTAs was equal to -0.075 (a lower p-value than 10%), and the correlation between a hotel's visibility on its official website and the reputation on TripAdvisor was equal to 0.111 (a lower p-value than 10%). However, on average, hotels were found to pay limited attention to generating and organising contents on their own official websites that could attract visitors to their web site and therefore to their premises. For example, in 2016, only 28% of the hotels in the sample had videos on their websites about their services and rooms. As far as the updating frequency is concerned, 48% of the hotels in the sample had not updated their websites over an observation period of 61 days, and only 8.34% of the hotels had updated their websites more than 10 times over the observed 61 days. Finally, the hotels had on average taken very few actions on their web sites to facilitate their interaction with online visitors. For example, only 25.29% of the observed hotels provided the possibility of online chatting in real-time, and only 10.06% of the hotels had a section on frequently asked questions.

5.2 Validation of the hypotheses

Before validating the hypotheses, Hausman specification tests were conducted to establish the appropriateness of a fixed effects model over a random effects model. The results highlighted the suitability of the fixed effects model. We then computed the VIFs in order to understand any potential multicollinearity problems that may have arisen due to correlations between the visibility variables. Since the variables had adequate VIFs (between 1.014 and 1.158), that is, well below the suggested threshold of 10 [30], multicollinearity was not considered a problematic issue for these analyses.

We started by estimating the models that tested the complementarity of online reputation and multiplicity of OTAs (Hypothesis 1). To account for endogeneity, we adopted a two-stage model. We regressed the ROA on the lagged value of the exclusive combinations of online reputation and multiplicity of OTAs, together with the control variables that could influence the profitability of a hotel (Table 5). We included three cases as independent variables: hotels with a high review score, hotels with high levels of multiplicity on OTAs, and hotels with a high review score and high levels of multiplicity of OTAs at the same time. The omitted, or base case, was a hotel with low levels of both the considered variables. Table 5 (Model 4) shows the results of the fixed effect model with AR(1) estimated using a two-stage model, while Table 4 lists the results of the multinomial probit regression that modelled the antecedents of review score and the levels of multiplicity on OTAs (first stage) (see Model 1, Model 2 and Model 3). The results of the first stage highlight that larger hotels, and hotels with higher levels of management response, have higher levels of review score (thanks to their continuous online exchange with customers) and, at the same time, distribute their rooms through multiple distributor channels.

The results of the second stage, where the predicted values, estimated with the multinomial probit model, of the combinations of the three cases of "high review score", "hotels with high levels of multiplicity on OTAs" and "hotels with high review score and high levels of multiplicity of OTAs" were used as input, are reported in Table 5 (Model 4). The coefficient for the "High Review score and High Multiplicity of OTAs" is positive and significant (p-value<0.01). Consistent with the complementarity between online reputation and the multiplicity of OTAs the "High Review score & High Multiplicity of OTAs" coefficients are highly significant and large, while the other coefficients are less significant and smaller. Furthermore, the "Profitability (High

Review score & High Multiplicity of OTAs) – Profitability (Only High Review score) \geq Profitability (Only High Multiplicity of OTAs) – Profitability (Low Review score & Low Multiplicity of OTAs)” inequality is supported with an F statistic equal to 3.39, and accepted at a 5% level of significance. Accordingly, this test confirmed the complementarity between online reputation and the multiplicity of OTAs.

We then proceeded to estimate the two fixed effects regression models in order to test the direct positive effect of the review score on the multiplicity of OTAs, and vice versa, so as to provide further support to the complementarity between the two investigated variables (Table 6, Model 5 and Model 6). The obtained results emphasised that the review score was positively and significantly related to the multiplicity of OTAs, and vice versa. This is consistent with the existence of complementarity and provides further support for Hypothesis 1.

---Table 4, Table 5 and Table 6 around here ---

In Hypothesis H2, we posited the existence of a curvilinear relationship linking the number of OTAs used by hotels and profitability in case of high review scores. Model 7 (Table 7) showed a significant and negative effect of the quadratic value of the number of OTAs on the profitability of a hotel. The Durbin–Wu–Hausman test for endogeneity supported the appropriateness of the used IV regression model. Furthermore, the instrument does not suffer from any problems of under-identification or weak identification, since the results of the under-identification “Kleibergen–Paap rk LM statistic” test were statistically significant, and the results of the weak identification “Kleibergen–Paap rk Wald F statistic” test for instrumental variables were higher than the established threshold of 10. Overall, these results support Hypothesis H2.

Hypothesis 3 posited that when a hotel’s online reputation is weak, its presence on a higher number of OTAs has a negative effect on profitability. Model 8 (Table 7) supports this hypothesis, since the effect of the number of OTAs on hotel profitability is negative and significant. Again in this case, the results demonstrate the appropriateness of the IV regression model, and the absence of under-identification and weak identification of the instrumental variables.

--- Table 7 around here ---

6 Discussion and conclusions

Online visibility has increasingly become a factor of success in a variety of industries, and has been stimulating a growing body of research dedicated to examining its value implications for firms [e.g. 31]. We here contribute to this line of inquiry by presenting one of the relatively few studies that have specifically focused on how hotels should balance their dependence on different categories of online visibility providers, namely aggregation portals of user-generated reviews and distribution portals such as OTAs. Theoretically, we integrated the resource dependency theory with a perspective on complementarity of the different dimensions of online visibility to incorporate how the reputation of a firm, stemming from user-generated reviews and a balanced dependence of multiple retail platforms, can affect its profitability. We empirically examined the hospitality sector, where online visibility is of utmost importance, and where the dimensions of visibility under analysis are managed by firms with a different type of specialisation in the value chain.

We have theorised and found that the travellers' review score on TripAdvisor – which is critical for the online reputation of a hotel and its ranking on this platform – and its listing on a variety of OTAs – where hotels can sell their rooms – are two complementary conditions of online visibility that reinforce each other when their effect on profitability is estimated. The reason for this complementarity lies in the fact that hotels with a positive reputational track record secure a stronger bargaining position with OTAs when they balance their presence on a few of them rather than being asymmetrically dependent on only one of them. Our empirical analyses have shown diminishing returns due to the high number of OTAs over which a hotel sells its rooms. This is consistent with the increased deployment of internal resources in sales and administrative processes that the presence on multiple OTAs requires of a hotel. Furthermore, we have theorised and shown empirical evidence that any attempt by hotels to mitigate their asymmetric dependence on OTAs makes them more rigid in developing their visibility on their web sites.

Finally, our results suggest that when hotels have achieved a negative reputational track record from user-generated reviews, expanding the number of OTAs over which they are listed, in order to reduce their asymmetric dependence, has negative effects on their profitability.

6.1 Theoretical implications

These results offer a new contribution to the resource dependence theory as they present new insights on how firms can reduce their relational dependence on providers of critical resources in the online world, by balancing their efforts across different categories of providers, namely, aggregators of traveller-generated reviews and Internet portals where firms can sell their products. In a context like that of hospitality, these providers occupy distinct specialisation stages of the value chain related to offering hotels online visibility that can be converted into sales. Our results help to enrich a relatively new stream of studies [18] that has used the resource dependence theory to analyse the impact on profitability as a result of online visibility. The use of this theoretical approach was motivated by the fact that online visibility is a resource that is inherently distributed asymmetrically in the online world, with portals controlling firms with offline business model access to such a resource. Hence, our contribution to the resource dependence theory is related to the fact that, in situations of power imbalance, online reputation, stemming from user-generated reviews, serves firms to balance their dependence on retail portals since it puts such firms in a closer bargaining condition to a situation of mutual dependence with such portals [32]. However, our results also confirm and contextualise the thesis formulated by Pfeffer (1987) that attempts to control how external interdependencies may produce new patterns of dependence. The fact that a good online reputation only increases the advantage of reducing the asymmetric dependence on dominant Internet portals up to a certain number of OTAs, over which hotels distribute their rooms, mainly seems to be due to the difficulties hotels undergo in cultivating alternative strategies aimed at mitigating resource dependence. We have theorised that such a capability of reconfiguring interdependencies with Internet portals, or of becoming more autonomous in managing online visibility on their proprietary channels, becomes more critical for profitability when hotels suffer from a weak reputation due to negative traveller-generated reviews.

6.2 Managerial implications

Our findings are also of practical significance. First, we believe that managers should be informed about the existence of two specialisation stages, with limited overlapping areas in the value chain, that provide firms with online visibility opportunities. At the firm level, the existence of these two stages implies a complementarity effect, which we have documented, between online reputation and visibility on multiple OTAs. Such a complementarity requires managerial attention being paid to the importance of “balancing” efforts over different online visibility mechanisms in order to attract customers and to prevent the economic value from slipping away into the hands of online distributors. As such, our study suggests that one online visibility mechanism on its own – either a hotel’s reputation built through user-generated reviews or the number of distributors over which its products/services are sold – leads to fewer benefits than when a firm’s visibility is built on balancing its attention and investments over reputation enhancing mechanisms and its presence on multiple third-party channels.

However, we here provide managers with two caveats about how their firms should balance their dependence on multiple external providers of online visibility. First, the diminishing marginal returns, due to the number of OTAs over which hotels are listed, help to inform managers that, from a certain extent, their efforts to reduce balanced dependence are worthless and risky. As such, when their firms are visible and sell their services on a few Internet portals, managers should prioritise their attention and budgets towards mechanisms that improve and preserve their online reputation rather than trying to further balance their dependence on OTAs by being listed on some others. Moreover, our results suggest that the higher the number of Internet portals over which firms sell their services, the higher the impact on profitability, due to a reputational crisis, as a result of a drop in the rates expressed online by users. However, when firms are in a situation of asymmetric dependence on one or a few OTAs, profitability is less sensitive to a possible worsening of their reputation. As far as hotels are concerned, this point is relevant to the extent to which a reputational crisis, due to fake reviews, becomes more likely and seems to afflict more non-branded hotels [33]. Our evidence and arguments in this regard echo Carr’s thesis [34] in which it is stated that the vulnerability of a firm to operational risks becomes higher when the firm bases a great part of its operations on the Internet. In our specific case, the profitability of hotels has been found to be more vulnerable to negative reviews, irrespective of their authenticity, the more they sell their rooms on a large number of OTAs.

The second caveat by which our research attempts to inform managers is related to the trade-off between the attempt to lessen dependence on a particular provider of critical resources by cultivating relationships with its competitors and the risk of becoming stuck in the interdependencies between that type of provider. This point is particularly relevant in the specific case of online visibility, due to the dynamism in the type of intermediaries and tools through which firms can manage online visibility and monetise it in superior sales and profits. For the specific case of hotels, such social media as Instagram and trusted traveller bloggers represent an example of alternative mechanisms to traveller-generated reviews and OTAs.

6.3 Limitations and further research

Although this study has endeavoured to advance a theory on resource dependence in a context related to online visibility of small and medium-sized firms, the findings should be considered in light of their limitations. Empirical tests are necessary to assess whether complementarity effects also exist in relation to the activities undertaken by firms to reduce their relational dependence on

the providers of online visibility through the promotion and selling of their services on their official web sites. We have identified some arguments in favour of complementarity between the reputation built through user-generated reviews and the promotional activities performed on proprietary web channels. Moreover, it is plausible to believe that hotels that are particularly active in promoting and delivering their services on their official web sites could be more resilient and less vulnerable to the online reputational crises that occur because of a momentary failure to provide high quality standards, or because of malicious attacks from competitors or from other actors. In a similar direction, future studies on vulnerability, due to online visibility and a reputational crisis in small and medium-sized firms, such as hotels that are not members of international groups, could help to assess whether activities aimed at managing online visibility divert resources from core physical operations. Financial constraints could be considered as a predictor of this risk.

A second type of limitation is related to the fact that we were not able to discriminate between the different types of strategies through which hotels attempt to balance their dependence on OTAs. Applying a periodic rotation of multiple OTAs, while maintaining visibility on just one or on just a very few of them at the same time, can in fact lead to different performance outcomes from a strategy based on being visible on a high number of OTAs at the same time.

Finally, our results are hard to generalise to sectors in which distribution portals also aggregate and control user-generated reviews about the products and services sold. We have seen that, in the hospitality industry, review aggregation and online sales tend to be separated into specialised stages, and this can offer hotels a lever that can be used to bargain with such providers. In sectors where this separation is less evident, the relational dependence of firms on providers of Internet visibility could be higher and more difficult to balance across different providers.

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Study	Industry	Dependent variable	Type of independent variable		Moderating variable
			User-generated reviews	Presence on multiple Internet portals	
[12]	Beer	Sales	X		
[35]	Books	Sales	X		
[36]	Consumer electronics & video games	Sales	X		
[37]	Films	Sales	X		
[38]	Films	Sales	X		
[31]	Films	Sales	X		
[39]	Hotels	Sales	X		
[19]	Hotels	Percentage of online sales		X	
[40]	Hotels	Price Occupancy rate	X		
[41]	Restaurants	Sales Guest counts Price	X		Excellence certificate on TripAdvisor
[42]	Hotels	Price Sales	X		
[43]	Hotels	Pricing strategy		X	
[4]	Hotels	Sales Profitability	X		Market positioning (star rating of the hotel, local competition, niche hotel)
[44]	Hotels	Price Profitability	X		Branded chain hotel
[25]	Hotels	Sales Profitability	X	X	
Total number of studies that use the type of independent variable specified in the corresponding column			13	3	
Total number of studies that investigate the impact of the two types on independent variables specified in the corresponding column separately			1		
Total number of studies that investigate to what extent a balanced dependence on multiple Internet portal channels, such as OTAs, is complementary with the reputation gained on web sites by aggregating user-generated reviews			0		

Table 1. A summary of studies that have investigated the relationship between online reviews, presence on Internet portals and firm's performance

No.	Variable	1	2	3	4	5	6	7
1	Revenues	1.000						
2	Return on assets	0.173***	1.000					
3	Year	0.054	0.134***	1.000				
4	Review score	0.174***	0.121**	0.160*	1.000			
5	Multiplicity of OTAs	0.199***	0.031	0.123*	0.139*	1.000		

Note: n.a.: *** p -value < 0.1%; ** p < 1%; * p < 5%.

Table 2. Spearman correlation matrix

Year	Mean of the review score	Review variance	First quartile of the review score	Second quartile of the review score	Third quartile of the review score	Difference between the third and first quartiles of the review score	First quartile of the number of OTAs	Mean of the number of OTAs	Third quartile of the number of OTAs
2012	3.943	0.605	3.667	4.005	4.360	0.693	1	2.380	4
2013	3.908	0.569	3.674	4.053	4.390	0.716	2	3.433	5
2014	4.008	0.528	3.741	4.101	4.400	0.659	4	5.325	7

Table 3. Review of the score, review of the variance and number of OTAs over time

Dependent variable Independent variables	Only High Review Score (t)	Only High Multiplicity of OTAs (t)	High Review Score & High Multiplicity of OTAs (t)
<i>Model</i>	M1	M2	M3
Review score (t-1)	4.053*** (0.209)	0.325* (0.137)	4.486*** (0.248)
Multiplicity of OTAs (t-1)	0.015 (0.143)	2.884*** (0.158)	2.872*** (0.163)
Revenues (log)	0.081 (0.083)	-0.045 (0.093)	0.170 [†] (0.095)
Management response (log)	0.360** (0.107)	0.231* (0.111)	0.405*** (0.111)
Intercept	-17.976*** (0.999)	-1.382 (0.907)	-25.612*** (1.498)
Year fixed effects	Included	Included	Included
Wald Chi Squared	973.82***		
N. observations per year	52	76	82

Note: Prob > chi2=0.000; ***p-value < 0.1%; ** p < 1%; * p < 5%; [†]<10%; standard error adjusted in parenthesis

Table 4. Multinomial probit model (first stage model for the validation of Hypothesis H1)

Independent variables	Dependent variable	ROA_t
	<i>Model</i>	M4
	<i>Hypothesis</i>	H1
<i>Direct effects</i>		
Only High Review Score (t-1)		1.322 (2.067)
Only High Multiplicity of OTAs (t-1)		-0.391 (1.363)
High Review Score & High Multiplicity of OTAs (t-1)		5.148** (1.780)
<i>Control variables</i>		
Revenues (log)		-0.550 (0.952)
Management response (log)		0.225 (0.272)
Year fixed effects		Included
<i>Fit indexes</i>		
Constant		2.287 (6.351)
Complementarity test (F statistic): <i>Profitability (High Review Score & High Multiplicity of OTAs) – Profitability (Only High Review Score) ≥ Profitability (Only High Multiplicity of OTAs) – Profitability (Low Review Score & Low Multiplicity of OTAs)</i>		3.39*
F statistic of the model		3.32**
N. observations per year		276

Note: ****p*-value < 0.1%; ** *p* < 1%; * *p* < 5%; † < 10%; standard error adjusted in parenthesis.

Table 5. Validation of Hypothesis 1: Fixed effect model and predicted values from multinomial probit model (second stage)

Independent variables	Dependent variable	Review score	Number of OTAs
	<i>Model</i>	M5	M6
<i>Direct effects</i>			
Review score (t-1)		...	0.285** (0.094)
Number of OTAs (t-1)		0.020* (0.009)
Years			
<i>Control variables</i>			
Revenues (log)		0.029* (0.011)	0.084† (0.047)
Management response (log)		0.070*** (0.010)	0.748*** (0.034)
Year fixed effects		Included	Included
<i>Fit indexes</i>			
Constant		3.559*** (0.084)	1.492** (0.477)
R-squared		6.09%	25.88%
F statistic of the model		35.60***	181.94***
N. of observations per year		276	276

Note: *** p -value < 0.1%; ** p < 1%; * p < 5%; † < 10%.

Table 6. Validation of Hypothesis 1: Fixed effects models with review score and number of OTAs as dependent variables (standard error in parentheses)

Dependent variable	ROA _t	ROA _t
Independent variables		
<i>Model</i>	M7 High review score	M8 Low review score
<i>Hypothesis</i>	H2	H3
<i>Direct effects</i>		
Number of OTAs (t-1)	8.949* (3.729)	-12.905* (5.803)
Number of OTAs squared (t-1)	-0.946* (0.399)	...
<i>Control variables</i>		
Management response (log)	-1.025 [†] (0.543)	17.218 (11.186)
Year fixed effects	Included	Included
<i>Fit indexes</i>		
F statistic	4.01***	2.92*
Durbin–Wu–Hausman test (endogeneity test)	15.313***	6.081*
Underidentification test (Kleibergen-Paap rk LM statistic)	7.890***	7.650**
Weak identification test (Kleibergen-Paap rk Wald F statistic)*	10.921	12.273
Number of observations per year	160	116

Note: ***p-value < 0.1%; ** p < 1%; * p < 5%; [†] <10%; instrumental variable: Revenues (log).

Table 7. Validation of Hypotheses 2 and 3: Fixed effects regression models with instrumental variable in case of high and low review score

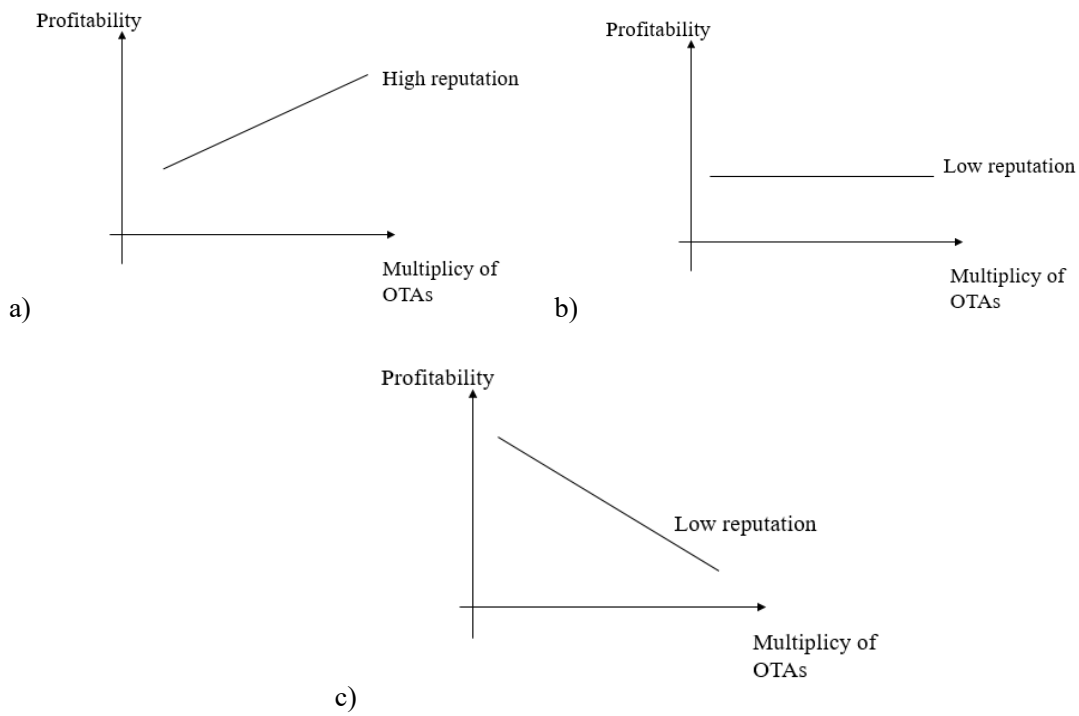


Figure 1. Possible relationship patterns between profitability, multiplicity of OTAs and reputation levels according to the hypotheses