



Sharing economy and quality competition among traditional service providers

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ARTICLE INFO

Keywords:

Sharing economy
Peer-to-peer platforms
Quality competition
Service operations

ABSTRACT

We investigate the impact of the sharing economy on the quality of service offered by traditional businesses in the hospitality industry, on their profitability, and on societal welfare. We conduct the investigation in a market consisting of two different quality class hotels (high and low) prior to the entry of a peer-to-peer lodging platform and a population of consumers having different income levels. We find that for relatively poor economies, the sharing economy leads to higher prices, quality, and profits for both low and high class hotels. In contrast, the sharing economy may be detrimental to both hotels for relatively rich economies. In other cases, the sharing economy may introduce different effects on the behavior and fortunes of different classes of incumbent lodging suppliers. For instance, price and quality of low class accommodations may decline, whereas, interestingly, the price of high class accommodations may rise upon the emergence of a sharing platform, in spite of a decrease in quality. Moreover, while the sharing economy unambiguously increases aggregate consumer welfare, there are instances when consumers choosing high class accommodations are worse off after the entry of the sharing platform. Finally, we find that the total societal welfare does not always increase.

1. Introduction

In recent years, technological developments in mobile communications and increasing social concerns about the (un)sustainability of a consumerist society have contributed to the rise of Internet-enabled peer-to-peer platforms and a new economy model, popularized as sharing economy (Jiang and Tian 2018; Spulber 2019; Sundararajan 2016; Zervas et al. 2017; Kauffman and Naldi, 2020). Under this new paradigm users can make collaborative sharing of underutilized resources (e.g., products, assets) on a massive scale upon payment (Jiang and Tian 2018). By leveraging on a multitude of geographically distributed individuals that can make their resources available with near-zero additional costs, the sharing economy can offer very competitive prices (Roma et al. 2019; Zervas et al. 2017). As a result, sharing economy platforms have emerged as an alternative channel to access goods and services traditionally provided by long-established

industries (Sundararajan 2016).

For instance, the sharing economy has had significant impact in the hospitality industry (Guttentag and Smith 2017; Gal-Or, 2018; Farro-nato and Fradkin, 2022). The entry of Airbnb and similar platforms has been initially downplayed by incumbents, with major hotel chains claiming that Airbnb would not threaten their business as it targets different segments (Tsang, 2017). However, Airbnb has experienced tremendous growth in less than a decade, reaching valuations comparable to market capitalization of giant hotel chains such as Hyatt, Marriott, and Hilton (Tsang, 2017).¹ This rapid growth has forced market players to consider sharing economy platforms such as Airbnb a serious substitute with which to contend (Tsang, 2017).

The growth of the sharing economy gives rise to two important questions: (i) how do incumbents strategically react to the growing presence of sharing economy players? (ii) how does the strategic interaction between the two types of players shape market competition and

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¹ The economic crisis due to the COVID-19 pandemic has become a stress test for sharing economy players, including Airbnb and Uber, forcing them to experiment with different solutions to enable re-conversion of underutilized resources in order to maintain their business model (Proserpio 2020). Nevertheless, by taking advantage of the intrinsic flexibility and scalability of their business model, these companies have been able to survive the pandemic and started growing again (Yohn 2020).

outcomes?

The focus of most existing literature in addressing the above questions has been on manufactured products (e.g., [Abhishek et al. 2021](#); [Jiang and Tian 2018](#)), where the existence of traditional manufacturers is essential for the operation of the sharing economy. There has not been much attention paid in the analytical literature to the economic and welfare implications of sharing economy platforms on traditional businesses in service industries such as hospitality, where the sharing economy (e.g., Airbnb) constitutes a clear substitute to traditional incumbents. Substitution may be weaker in the case of manufactured products, as the viability of the platform depends on traditional manufacturers producing the physical product. Hence, investigating the effect of the sharing economy on traditional businesses in service industries (e.g., the effect on lodging providers of a peer-to-peer platform enabling hospitality sharing) may lead to very different predictions than the effect of the sharing economy in manufacturing industries (e.g., the effect on car manufacturers of a peer-to-peer platform enabling car sharing).

Some recent analytical studies have started to investigate the profit and welfare implications of the sharing economy in the hospitality industry (e.g., [Einav et al. 2016](#); [Gal-Or, 2018, 2021](#); [Weber 2014](#)). While the existing literature focuses primarily on price competition, the present paper extends the investigation by endogenizing also the quality dimension to the competition between a sharing economy platform and traditional lodging companies. Service quality decisions are crucial weapons in hospitality, with hotels differentiating their service level to attract different consumer segments ([Akbaba 2006](#); [Becerra et al. 2013](#)). Consistent with the reality that the hospitality industry is highly competitive even in the absence of a peer-to-peer competitor ([Baum and Mezias 1992](#); [Becerra et al. 2013](#)), our model incorporates quality competition between hotels both before and after the entry of the sharing platform.

We consider a duopoly where one hotel offers low class lodging service and the other one offers high class lodging service to a population of consumers who have different levels of income (and correlated housing capacity.) This environment characterized by low-class and high-class hotels reflects the reality that some hotel chains tend to offer mostly luxury services (e.g., Four Seasons), whereas others target mainly more price conscious segments of consumers (e.g., Wyndham). We first consider the traditional environment, before the entry of the sharing platform, when individuals in the population can act only as consumers. We derive equilibrium prices, lodging capacities, quality levels, profits, and consumer and societal welfare in this initial investigation. We then derive the equilibrium outcomes after the platform's entry, which allows consumers to become peer suppliers of lodging (in addition to being demanders, as vacationers.).

Our main findings can be summarized as follows:

- First, we show that the entry of the platform has an ambiguous effect on the prices and quality levels of both low and high class hotels. The reason for the ambiguity stems from two counteracting forces of the sharing economy. The added supply offered by peer suppliers leads to intensified competition and downward pressure on prices, but the higher income of peer suppliers raises their willingness to pay for vacationing. The first force tends to dominate in markets where individuals have relatively high income before the entry of the platform and sufficiently large housing capacity to supply through the platform. The second force tends to dominate in markets where individuals have relatively low income. As a result, in the first case, both hotels reduce price and quality levels after the platform entry, whereas in the second case they both raise them. Interestingly, for intermediate levels of income, it is even possible that the high class hotel raises its price while lowering its service quality.
- Second, we show that the entry of the platform decreases the number of non-vacationers, increases the demand for low class lodging (either from peers or the low class incumbent), but may or may not increase the demand for high class lodging.

- Third, we show that the sharing economy is not necessarily detrimental to the incumbents, as both incumbents earn higher profit following the platform entry in markets characterized by relatively low income of individuals. The opposite is the case in richer economies, when the income of individuals is relatively high, and they can offer a small portion of their housing capacity (e.g., due to cultural or structural reasons.) In this case, the sharing economy is indeed detrimental to both classes of hotels. In other cases (e.g., intermediate levels of income), only the high class hotel may be able to benefit from the entry of a sharing economy platform.
- Fourth, we show that although the sharing economy always raises aggregate consumer welfare, it might adversely affect some segments of the population. Both consumers who vacation in high class accommodations before and after the entry of the platform and those who switch from low to high class accommodations after the entry of the platform may be worse off.
- Fifth, the sharing economy is likely to raise total societal welfare, which includes consumer surplus and hotels' and platform's profits, except in markets where vacationing is not particularly important or in rich markets where there is high cost of hosting or low level of peer supply offered to the platform (e.g., due to cultural or structural reasons.)

To the best of our knowledge, this is the first paper that investigates the effects of the sharing economy on quality competition in the hospitality industry. We reveal non-trivial effects on incumbents' profitability and consumers. In particular, while sharing economy platforms have always advocated their beneficial role for consumers, we point out that their emergence may have unintended negative consequences on consumers of high class lodging. This is quite surprising because high class hotels are typically less affected by the competition generated from the sharing economy. More generally, we highlight the importance that incumbents and regulators carefully examine the characteristics of markets where the sharing economy emerges (e.g., wealthier or poorer economies or individuals' propensity to supply housing capacity) to better understand the consequences of the rise of sharing economy platforms.

The remainder of the paper is organized as follows. In §2, we review the relevant literature. In §3, we set up the model, whereas in §4, we solve the model before the entry of the sharing economy platform. In §5, we solve the model after the platform entry and in §6 we analyze the effects of such entry on demand, price, quality, and incumbents' profits. In §7, we analyze the effects of the platform entry on consumer surplus and total welfare. Finally, in §8, we discuss the implications of our findings and conclude.

2. Literature review

The body of literature on the sharing economy relevant to our study can be broadly divided into two major streams: a) studies analyzing the strategic interactions and the dynamics internal to sharing economy platforms, and b) studies examining the economic impact of the sharing economy on traditional industries. The hospitality industry has been considered as one of the two main industries (the other being car transportation service) in both streams of literature. [Hu \(2021\)](#) and [Zou et al. \(2023\)](#) discuss some of the most relevant issues related to the sharing economy.

The first stream of literature focuses on the behavior of supply and demand side users of sharing economy platforms, on platforms' decisions, and on the profitability of users and platforms themselves. For instance, a number of studies examine pricing, dynamic supply–demand matching, quality incentives, multihoming, endogenous side decisions, screening, learning, user behavior, and other issues internal to sharing economy platforms ([Bimpikis et al. 2019](#); [Bryan and Gans, 2019](#); [Dong and Ibrahim 2020](#); [Guda and Subramanian 2019](#); [Basili and Rossi 2020](#)). More closely related to our study, [Benjafaar et al. \(2019\)](#) examine

product usage and ownership as well as consumer surplus under the sharing economy. They show that consumers always benefit from collaborative consumption and that the effect of the sharing economy on ownership is ambiguous. Filippas et al. (2020) obtain similar results when considering both short-run and long-run effects of collaborative consumption. Our study differs from this stream of literature by focusing on the competitive interaction of the sharing economy with traditional incumbents, and by evaluating the consequences of such interaction on profits and societal welfare.

The second stream recognizes that the sharing economy has disrupted traditional incumbents in the hospitality and transportation industries (Cramer and Krueger 2016; Guo et al. 2020), and evaluates the effect of such disruption on profits, employment, consumer surplus, and total welfare. Numerous studies in this stream investigate the effects on manufacturers of (physical) products (e.g., cars) when a sharing platform can support peer-to-peer product sharing (Abhishek et al. 2021; Chomachaei et al., 2024; Guo et al., 2019; Jiang and Tian 2018; Schmidt 2020; Tian and Jiang 2018; Razeghian and Weber 2019; Tian et al. 2021). For instance, Jiang and Tian (2018) show that, while demand for ownership may decrease, product price increases because consumers who buy the product anticipate the added income the product offers when renting its services to others. Jiang and Tian (2018) find that sharing of high marginal cost products is a win-win situation for both manufacturers and consumers, whereas sharing of low marginal cost products can be a lose-lose situation. Other studies investigate an environment where the manufacturer competes with the sharing economy platform by launching its own product sharing platform (Pei et al. 2020; Tian et al. 2021). Given our focus on the hospitality industry, which is a service industry, our study differs from the above studies that focus on the response of manufacturers of physical products. In our setting, the sharing economy platform is a clear alternative to traditional incumbents, whereas in the above studies the presence of a manufacturer producing the physical product is necessary for the sharing economy platform to exist. Yu et al. (2020) consider various regulatory, policy, or intervention measures related to ride-sharing services, which is also a service industry. However, the features of these service industries differ greatly from the hospitality industry. Moreover, while their focus is mostly on regulation, we evaluate the strategic interaction between the sharing economy and traditional incumbents, and evaluate the impact of such interaction on quality, price, profits, and welfare.

Our study belongs to the second stream of literature that examines the economic impact of the sharing economy on traditional industries. In the hospitality industry, most studies are empirical or conceptual (Alyakooob and Rahman 2022; Akbar and Tracogna 2018; Barron et al. 2021; Blal et al 2018; Cao et al., 2021; Chang and Sokol, 2022; Han et al. 2022; Huang et al. 2020; Li and Srinivasan 2019; Roma et al. 2019; Zervas et al. 2017). For instance, Zervas et al. (2017) demonstrate empirically that hotel revenues in Texas have decreased significantly due to the growth of Airbnb, especially in periods characterized by high demand. Li and Srinivasan (2019) suggest that the impact of Airbnb on hotels' sales and their strategic response depend on several market conditions, including seasonality patterns, hotel quality, and Airbnb supply elasticity. Berger et al. (2018) investigate similar questions in the taxi industry, showing a decline in the earnings of traditional taxi services. On the other hand, Farronato and Fradkin (2022) empirically find that the entry of sharing economy in the hospitality industry is associated with a welfare increase in certain US cities when hotels' capacity is constrained. Other studies investigate the relationship between the sharing economy and market expansion (Cao et al., 2021), employment (Alyakooob and Rahman 2022; Hagi and Wright, 2019; Huang et al. 2020), crime rates (Han et al. 2022), and house prices and rents (Barron et al 2021). There have been recently a few theoretical studies that model the effects of the sharing economy on traditional businesses in the hospitality industry (Einav et al. 2016; Gal-Or 2018, 2021; Weber 2014). Whereas these studies focus primarily on the effect of the sharing economy on prices, we depart by incorporating quality competition both

before and after the entry of the sharing economy platform.

3. The model

The market consists of two hotels, each offering different quality of service to customers (high class and low class) and a sharing platform that offers lodging capacity supplied by individuals in the economy. We assume that the quality of lodging capacity offered by the platform is the same as the quality offered by the low class hotel. This implies that, to attract customers, individuals active in the platform will essentially adjust their quality level to match the quality offered by the low class hotel. This assumption is consistent with empirical evidence documented by prior literature (e.g., Chang and Sokol, 2022; Roma et al., 2019; Zervas et al. 2017), which observes that, on average, Airbnb offerings display similar quality to that of low class hotels, thus leading to fierce price competition between Airbnb and this type of hotels. In contrast, high class hotels exhibit significantly higher quality, repositioning themselves by increasing product differentiation. Therefore, we assume that the lodging capacity of both low class hotel and Airbnb offerings sells for the same price s_L per unit, whereas that offered by the high class hotel sells for higher price s_H per unit.²

Individuals differ in the size of their house(s). Housing capacity x is uniformly distributed in the population over the interval $[0, 1]$. Let $I(x) = ix$ denote the income of an individual who owns a house of size x , where $i > 0$ measures the income per unit of housing capacity. This specification essentially assumes that individuals who earn higher income own a bigger house (Gal-Or, 2018).³ However, it is important to note that the housing capacity x can be interpreted more broadly. For instance, it could be interpreted as measure of the house value determined by number of rooms/amenities or by the location of the house (e.g., an apartment located in Manhattan vs. a house in a small town). In this respect, being the house value measurable in dollars (or other currencies), we can reasonably use continuous values, rather than integer values, for the variable x , which allows analytical tractability. We abstract away from inefficiencies in credit and/or housing markets, i.e., the possibility that part of the population does not own any housing capacity is for simplicity ruled out of the model. The same qualitative results hold if we relax this assumption (the analysis is available upon request).

We assume that each individual can offer a certain percentage γ of her housing size by means of the platform, with $0 \leq \gamma < \bar{\gamma}$, in order to increase her income. Let $\bar{\gamma}, \bar{\gamma} > 0$, be the biggest portion of her housing capacity that an individual can make available through the sharing platform. The platform collects a percentage d , $0 < d < 1$ of the price s_L as service fee and the customer receives the net price $s_L(1-d)$ per unit of capacity supplied through the platform. We designate by m_L the quality offered by the low class hotel and by $c(m_L)$ the unit cost an individual incurs when hosting guests, where $c'(m_L) > 0$. It follows that, in case the individual offers γx units of accommodation capacity to the platform, her income increases by $\gamma x[s_L(1-d) - c(m_L)]$ over the initial income ix , i.e., $I_s(x) = ix + \gamma x[s_L(1-d) - c(m_L)]$. Hence, as the low class hotel offers higher quality service, peer suppliers have to offer higher quality as well, thus incurring higher cost of serving each guest.

Following Gal-Or (2018), we assume that the utility derived by an individual can originate from three different sources. First, if an

² Indeed, the original objective of peer-to-peer lodging platforms such as Airbnb to offer basic accommodation at competitive prices, thus lowering entry barriers and allowing individuals to generate extra-income (Roma et al. 2019; Tsang 2017; Zervas et al. 2017). In fact, the great majority of Airbnb offerings can hardly match the amenities offered by some high class hotels, such as St. Regis or Four Seasons. In addition, the COVID-19 pandemic has led players such as Airbnb to refocus on their core business of offering budget home rentals (Yohn 2020), going back to compete on price with low class traditional lodging providers.

³ We use the term *income* to reflect the overall wealth of the individual.

individual with a housing capacity x decides to offer a portion γ of her house to the platform, the utility she derives from using the remaining capacity for her personal use is $kx(1 - \gamma)$, where $k, k > 0$, measures the utility per unit of housing capacity consumed. Second, if an individual opts for vacationing, she needs to procure $\rho, \rho > 0$, units of accommodation capacity either from one of the hotels or from the sharing platform. Following prior literature (e.g., Gal-Or, 2021), we assume that the utility the individual derives from vacationing is an increasing function of her income level and of the quality of the accommodation capacity she chooses. This assumption implies that vacationing is a normal good and, therefore, the willingness to pay for it increases with income (Gal-Or, 2021).⁴ There is abundance of empirical literature in economics supporting this standard assumption (Clark et al., 2005; Clark et al., 2008; Fajgelbaum et al., 2011; Ferrer-i-Carbonell and Frijters, 2004; Ferrer-i-Carbonell, 2005; Frijters et al., 2004a, Frijters et al., 2004b; Jappelli and Pistaferri 2010; Shields and Wheatley Price, 2005; Wu and Zhu, 2011). We designate by m_H the quality of the high class hotel, where $m_H > m_L$. Note that m_H and m_L reflect the service quality level chosen by each type of hotel. In the hospitality industry, the quality level can be viewed as a comprehensive index taking into account a number of critical quality factors, such as cleanliness, comfort, amenities, location, staff service, safety, etc., which can be in turn measured via the most disparate variables such as, time spent cleaning per room, bedding and furniture rating, number of amenities, WiFi speed, number of incidents, average response time to guest requests, etc. (e.g., Akbaba, 2006; Guttentag and Smith, 2017, Ju et al. 2019; Priporas et al., 2017). The utility from vacationing is equal to $\alpha m_L I_s(x)$, if the individual procures vacationing capacity from either the low class hotel or through the platform, and it is equal to $\alpha m_H I_s(x)$, if she procures vacationing capacity from the high class hotel. The parameter $\alpha, \alpha > 0$, measures the utility per unit of income spent on vacationing while procuring accommodation capacity of given quality. Finally, an individual derives utility $\beta, \beta > 0$, from each unit of general consumption. The consumption level of all other goods is captured by introducing a numeraire good. If the individual opts for vacationing, the number of units of the numeraire good that she can buy is $I_s(x) - \rho s_L$ if she procures capacity from the low class hotel or through the platform, and $I_s(x) - \rho s_H$, if she procures capacity from the high class hotel. If she chooses not to vacation, she can consume the quantity $I_s(x)$ of all other goods. Hence, the utility from consumption of all other goods is $\beta(I_s(x) - \rho s_i), i = L, H$, if vacationing, and $\beta I_s(x)$ if choosing not to vacation.

The choice of individuals of whether to participate in the sharing economy critically depends on all the above three components of the

⁴ It is possible to modify our model to allow individuals to endogenously choose the level of lodging capacity when vacationing, instead of the fixed capacity ρ we assume. With such a modification, the utility from vacationing would directly depend on the purchased units of lodging ρ . Yet, at optimum, it is possible to show that higher income individuals would choose bigger lodging capacity while vacationing, and consistent with our assumption, would obtain higher utility when vacationing. For example, following Gal-Or (2021), we could assume the utility from vacationing at the low class lodging service as a concave function of the units of lodging capacity ρ net of the price s_L paid to purchase those units, i.e., $\alpha m_L I_s(x) \rho - \frac{\rho^2}{2} - s_L \rho$. For an individual vacationing at the low class lodging service, optimizing in ρ would yield a net utility from vacationing equal to $\frac{\alpha m_L I_s(x) - s_L}{2}$, which would be again increasing in the income $I_s(x)$ (note that $\alpha m_L I_s(x) - s_L$ must be positive to ensure nonnegative utility). A similar derivation, i.e., $\frac{\alpha m_H I_s(x) - s_H}{2}$ would be obtained also for the high class lodging service. Therefore, even after endogenizing the decision of the level of lodging capacity, the utility from vacationing would still increase with the income, as we assume. However, under the endogenous decision, these quadratic expressions would significantly increase the complexity of the derivations without changing the qualitative results. For this reason, we use the linear expressions, i.e., $\alpha m_L I_s(x)$ and $\alpha m_H I_s(x)$, which help maintain the analysis tractable.

utility. Individuals face a clear tradeoff between using their own houses and offering them through the sharing economy, which can generate additional income to be used for consumption, including vacationing. The total utility of an individual of type x depends on her decision on whether to offer a portion of her house to the sharing platform and whether to purchase accommodation services when vacationing. We can write such utility as:

$$U(x) = kx(1 - \gamma) + \alpha m_L x [i + \gamma [s_L(1 - d) - c(m_L)]] + \beta \{x [i + \gamma [s_L(1 - d) - c(m_L)]] - \rho s_L\} \tag{1}$$

if choosing to participate in the hospitality market both as housing provider and as consumer, while procuring vacationing capacity either from the low class hotel or from the platform (we refer to (1) as the case of “Utility from housing provision and low class lodging service consumption”);

$$U(x) = kx(1 - \gamma) + \alpha m_H x [i + \gamma [s_L(1 - d) - c(m_L)]] + \beta \{x [i + \gamma [s_L(1 - d) - c(m_L)]] - \rho s_H\} \tag{2}$$

if choosing to participate in the hospitality market both as housing provider and as consumer, while procuring vacationing capacity from the high class hotel (we refer to (2) as the case of “Utility from housing provision and high class lodging service consumption”);

$$U(x) = kx(1 - \gamma) + \beta x [i + \gamma [s_L(1 - d) - c(m_L)]] \tag{3}$$

if choosing to participate in the hospitality market only as a housing provider (we refer to (3) as the case of “Utility from housing provision”); and

$$U(x) = kx + \beta x i \tag{4}$$

if choosing to neither supply nor demand lodging services (we refer to (4) as the case of “Utility from neither provision nor lodging service consumption”).⁵

As the utility expressions in equations 1–4 are linear functions of γ (i.e., the portion of the housing capacity an individual offers through the platform), the optimal decision for each individual is to offer the maximum amount $\bar{\gamma}$ of housing capacity feasible or to offer no capacity at all.⁶

Before characterizing equilibria in the presence of the sharing economy lodging platform, we examine the case where there is no platform and the two hotels are the only available providers of lodging capacity in the market. This represents the traditional market scenario existing before the rise of sharing economy, where supply and demand sides are separated. This benchmark is necessary to assess the consequences of the entry of the platform into the market.

⁵ The two remaining cases can be disregarded because they never arise at equilibrium. These excluded cases are: (i) an individual choosing to purchase low class lodging (act as a demander and procure vacationing capacity either from the low class hotel or from the lodging sharing platform) without offering any capacity, with her utility being $U(x) = kx + \alpha m_L ix + \beta \{ix - \rho s_L\}$; and (ii) an individual choosing to purchase high class lodging (procure vacationing capacity from the high class hotel) without offering any capacity, with her utility being $U(x) = kx + \alpha m_H ix + \beta \{ix - \rho s_H\}$. The proof is similar to that of Gal-Or (2018), and in the interest of length, can be made available upon request.

⁶ Alternatively, if we assumed that the utility of individuals is concave in γ (for instance, if the utility from self-consumption of housing is $kx(1 - \gamma^2)$), we would obtain an interior solution for γ . However, the qualitative results would remain the same as those derived in this paper.

4. Hotels act as a duopoly

When the hotels are the only suppliers in the market, individuals in the population do not supply any lodging capacity. They only participate on the demand side of the market. If an individual chooses to vacation, she can procure lodging capacity either from the low class hotel or from the high class hotel. We model the environment as a two-stage game. In the first stage, the hotels choose their level of lodging capacity and related quality, $y_i, m_i, i = L, H$. In the second stage, consumers decide whether to vacation and from which hotel to vacation, and prices are determined to clear the market.

Given that the utility from vacationing satisfies the “single crossing property”,⁷ the population can be segmented into at most three segments. An upper segment of individuals who own relatively large size houses, an intermediate segment of individuals who own intermediate size houses, and a lower segment of individuals who own relatively small houses. The upper segment chooses to vacation at the high class hotel, the intermediate segment chooses to vacation at the low class hotel, and the lower segment chooses against vacationing. Note that in the absence of the sharing economy lodging platform the income of individuals is $I_s(x) = ix$ because consumers cannot offer housing capacity. We designate by \hat{x}_L the individual who is indifferent between foregoing vacationing altogether and vacationing at the low class hotel, and by \hat{x}_H the individual who is indifferent between vacationing at the low class hotel and vacationing at the high class hotel. The two types of indifferent individuals satisfy the following two equations.

$$k\hat{x}_L + am_L I_s(\hat{x}_L) + \beta(I_s(\hat{x}_L) - \rho s_L) = k\hat{x}_L + \beta I_s(\hat{x}_L) \quad (5)$$

$$k\hat{x}_H + am_H I_s(\hat{x}_H) + \beta(I_s(\hat{x}_H) - \rho s_L) = k\hat{x}_H + am_H I_s(\hat{x}_H) + \beta(I_s(\hat{x}_H) - \rho s_H) \quad (6)$$

If an individual of type \hat{x}_L does not vacation she can consume the monetary quantity $I_s(\hat{x}_L)$ of all other goods and if she chooses to vacation at the low class hotel she can consume the monetary quantity $(I_s(\hat{x}_L) - \rho s_L)$ of all other goods. This explains the indifference relationship expressed in equation (5). When an individual of type \hat{x}_H compares the options of vacationing at the low class versus the high class hotel she weighs the added benefit that the higher quality hotel offers (i.e., $am_H I_s(\hat{x}_H)$ versus $am_L I_s(\hat{x}_H)$) against the added cost of the higher quality hotel, which reduces consumption of other goods from $I_s(\hat{x}_H) - \rho s_L$ to $I_s(\hat{x}_H) - \rho s_H$. This explains the indifference relationship (6). Solving for \hat{x}_L and \hat{x}_H from (5) and (6), yields that $\hat{x}_L = \frac{\beta \rho s_L}{\alpha m_L}$ and $\hat{x}_H = \frac{\beta \rho (s_H - s_L)}{\alpha (m_H - m_L)}$. To ensure that all three segments exist, it is necessary that $\hat{x}_H > \hat{x}_L$ and that $\hat{x}_H < 1$. These conditions imply that $(m_L/s_L) > (m_H/s_H)$ and that $\frac{\beta \rho (s_H - s_L)}{\alpha (m_H - m_L)} < 1$. Because we are interested in an equilibrium where both hotels provide lodging service, we ensure that these two inequalities hold. Note the first inequality implies that the per dollar value of the low class hotel is higher than per dollar value of the high class hotel. Each vacationing individual demands ρ units of lodging, implying that the total demand facing the high class hotel is $D_H = \rho(1 - \hat{x}_H)$ and that facing the low class hotel is $D_L = \rho(\hat{x}_H - \hat{x}_L)$. Fig. 1 depicts the segmentation of the population.

To clear the market, the quantity demanded of each type of hotel must equalize the quantity supplied. We express the prices as a function of the level of capacities supplied by the hotels, y_L and y_H :

⁷ Our utility formulation implies that $\frac{\partial^2 U}{\partial m_i \partial x} = \alpha > 0$. As a result, if an individual of type \hat{x} prefers the high class hotel over the low class hotel, then all $x > \hat{x}$ will also exhibit this preference. Similarly, if an individual of type \tilde{x} prefers vacationing over nonvacationing, then all individuals of type $x > \tilde{x}$ will also exhibit this preference. This implies that the population can be segmented into at most three segments. Individuals with high x values choose to demand high quality, those with intermediate x values choose to demand low quality, and those with low x values choose not to demand capacity at all.

$$s_H = \frac{\alpha i (m_H(\rho - y_H) - m_L y_L)}{\beta \rho^2}, s_L = \frac{\alpha i (m_L(\rho - y_H - y_L) - m_L y_L)}{\beta \rho^2} \quad (7)$$

As it may become increasingly more difficult for the hotels to raise the quality of services offered, we follow the assumption commonly made in the literature that the unit cost facing each hotel is a quadratic and increasing function of the quality of service it offers (e.g., Motta 1993). The assumption is rooted in the economic principle that marginal costs of quality enhancements often rise, as initial improvements may be easy to achieve, but further refinements require disproportionately greater resources. Numerous empirical studies in the hospitality industry (both hotels and Airbnb accommodations) confirm that improving quality often results in more-than-proportional increases in costs (Mattila and O'Neill, 2003; Barros 2005; Tsai et al., 2010; Assaf and Agbola 2011; Guttentag et al. 2018). Accordingly, for tractability reasons, we specify this unit cost as $C(m_i) = \frac{1}{2}m_i^2$, where m_i is the quality level offered by the hotel $i = L, H$.

In the first stage, hotels choose their levels of lodging capacity, y_L and y_H (e.g., Gal-Or 2018) and their qualities, m_H and m_L . The maximization problems of the hotels can be formulated as follows:

$$\max_{y_H, m_H} \pi_H = y_H \frac{\alpha i (m_H(\rho - y_H) - m_L y_L)}{\beta \rho^2} - \frac{1}{2} y_H m_H^2 \quad (8)$$

$$\max_{y_L, m_L} \pi_L = y_L \frac{\alpha i (m_L(\rho - y_H - y_L) - m_L y_L)}{\beta \rho^2} - \frac{1}{2} y_L m_L^2 \quad (9)$$

where π_H (π_L) is the profit of high (low) class hotel. Solving the hotels' maximization problems yields the results reported in Table 1 (the superscript ^{NS} designates equilibrium values when the sharing platform does not exist.)

According to the entries of Table 1, less than half of the population of consumers participate in the market. While the high class hotel offers higher quality (fifty percent higher), the low class hotel covers a bigger segment of the market. In addition, both the quality level and the profit of each hotel increase with α and decrease with β . As the utility derived from vacation is higher or as the utility derived from general consumption is lower, hotels have greater incentive to improve quality and by doing so increase their profits.

Table 1 includes also the expression for the aggregate consumer surplus, derived as the sum of the surpluses gained by three segments of consumers, namely the surplus of the segment that withdraws from the market, CS_W , that of the segment that purchases lodging from the low class hotel, CS_L , and that of the segment that purchases lodging from the high class hotel, CS_H . The consumer surplus expressions of these segments are calculated as follows:

$$CS_W = \int_0^{\hat{x}_L} kx + \beta x dx \quad (10)$$

$$CS_L = \int_{\hat{x}_L}^{\hat{x}_H} kx + am_L x + \beta \{x - \rho s_L\} dx \quad (11)$$

$$CS_H = \int_{\hat{x}_H}^1 kx + am_H x + \beta \{x - \rho s_H\} dx \quad (12)$$

$$CS = CS_W + CS_L + CS_H \quad (13)$$

In the absence of the sharing economy platform, the total welfare is defined as the sum of hotels' profits and consumer surplus as follows:

$$W = CS + \pi_L + \pi_H \quad (14)$$

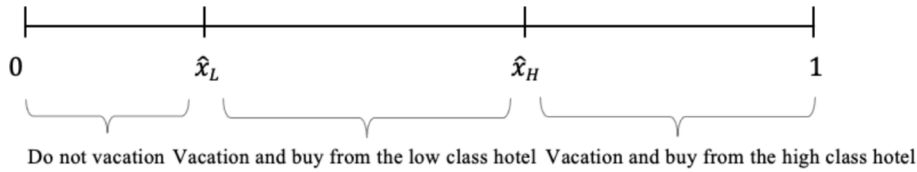


Fig. 1. Consumer segments when hotels act as a duopoly.

Table 1
Hotels act as a duopoly – equilibrium values.

	Low class hotel	High class hotel
Threshold consumer	$\hat{x}_L^{NS} = \frac{12}{23}$	$\hat{x}_H^{NS} = \frac{18}{23}$
Price	$s_L^{NS} = \frac{144\alpha^2 i^2}{529\beta^2 \rho^2}$	$s_H^{NS} = \frac{252\alpha^2 i^2}{529\beta^2 \rho^2}$
Lodging capacity (quantity)	$y_L^{NS} = \frac{6\rho}{23}$	$y_H^{NS} = \frac{5\rho}{23}$
Quality Level	$m_L^{NS} = \frac{12\alpha i}{23\beta\rho}$	$m_H^{NS} = \frac{18\alpha i}{23\beta\rho}$
Profit	$\pi_L^{NS} = \frac{432\alpha^2 i^2}{12167\beta^2 \rho^2}$	$\pi_H^{NS} = \frac{450\alpha^2 i^2}{12167\beta^2 \rho^2}$
Aggregate consumer surplus	$\frac{(k+i\beta)}{2} + \frac{801i^2\alpha^2}{12167\beta\rho}$	

5. The sharing economy platform competes against the hotels

We now consider the case where the entry of the peer-to-peer lodging sharing platform allows individuals in the population to supply lodging capacity, in addition to that provided by hotels. As discussed earlier, consistent with the original objective of peer-to-peer lodging platforms such as Airbnb, as well as the post-COVID-19 trends (Yohn 2020), we simplify the analysis by assuming that the quality level of the lodging capacity offered by individuals via the platform is the same as the quality offered by the low class hotel. Given that the quality is endogenously chosen by the low class hotel, this implies that individuals will essentially adjust their quality level to match the quality offered by the low class hotel.⁸

We model the environment as a three-stage game. In the first stage, the hotels choose their level of lodging capacity and their quality level. In the second stage, the platform chooses its service fee. In the third stage, individuals in the economy choose whether to participate in the sharing economy as suppliers (choose whether to supply $\bar{\gamma}$ or nothing), whether to vacation, and if they choose to vacation, which type of capacity to demand. As before, at this stage, lodging prices are determined to clear the market.

In our analysis, we focus on the case that the service fee set by the platform is sufficiently low to attract capacity from every individual in the population. That is, even if an individual chooses against vacationing, she still finds it optimal to offer capacity to the platform. We refer to this environment as an equilibrium where the peer-to-peer supply side of the market is fully covered. Considering less than full coverage on the supply side significantly complicates the analysis without providing much in terms of additional insights.⁹

Because of the “single crossing property” of the utility function, we still obtain the result that the population of consumers is divided into three segments. Individuals who own relatively small houses do not vacation but offer housing capacity through the platform, individuals who own intermediate size houses vacation at the low class hotel or at

the peer-to-peer lodging and offer housing capacity through the platform, and individuals who own relatively big houses vacation at the high class hotel and offer housing capacity through the platform. Fig. 2 depicts this segmentation.

We designate by \hat{x}_L the individual who is indifferent between foregoing vacationing altogether and vacationing at a low class accommodation (hotel or peer-to-peer accommodation), and by \hat{x}_H the individual who is indifferent between vacationing at a low class accommodation and vacationing at the high class hotel. Given our focus on an environment where all consumers are incentivized to supply capacity and the fact that the utility expressions (1)-(4) are linear functions of γ , it follows that all individuals choose to offer the maximum feasible amount $\bar{\gamma}$ of housing capacity, as long as it is profitable for them to do so. Therefore, the indifferent threshold consumers \hat{x}_L and \hat{x}_H satisfy the following two equations:

$$k\hat{x}_L(1 - \bar{\gamma}) + \alpha m_L I_s(\hat{x}_L) + \beta(I_s(\hat{x}_L) - \rho s_L) = k\hat{x}_L(1 - \bar{\gamma}) + \beta I_s(\hat{x}_L) \tag{15}$$

$$k\hat{x}_H(1 - \bar{\gamma}) + \alpha m_H I_s(\hat{x}_H) + \beta(I_s(\hat{x}_H) - \rho s_H) = k\hat{x}_H(1 - \bar{\gamma}) + \alpha m_H I_s(\hat{x}_H) + \beta(I_s(\hat{x}_H) - \rho s_H), \tag{16}$$

where $I_s(\hat{x}_i) = \hat{x}_i i + \bar{\gamma} \hat{x}_i [s_i(1 - d) - c(m_i)]$, and subscript $i = L, H$.

Solving from (15) and (16) for the threshold levels \hat{x}_L and \hat{x}_H in terms of the prices of lodging s_L and s_H yields $\hat{x}_L = \frac{\beta \rho s_L}{\alpha m_L (i + \bar{\gamma} [s_L(1 - d) - c(m_L)])}$ and $\hat{x}_H = \frac{\beta \rho (s_H - s_L)}{\alpha (m_H - m_L) (i + \bar{\gamma} [s_L(1 - d) - c(m_L)])}$. To ensure that demand for both high and low class lodging is positive, $\hat{x}_L < \hat{x}_H < 1$, thus yielding that $(m_L/s_L) > (m_H/s_H)$ and $\frac{\beta \rho (s_H - s_L)}{\alpha (m_H - m_L) (i + \bar{\gamma} [s_L(1 - d) - c(m_L)])} < 1$.¹⁰ The demand functions facing the two class types of lodging capacity are, therefore, $D_H = \rho(1 - \hat{x}_H)$ and $D_L = \rho(\hat{x}_H - \hat{x}_L)$.

Upon inspection of the expressions for \hat{x}_L and \hat{x}_H , it follows that for fixed lodging prices, the demand facing the high class lodging capacity is an increasing function of the portion of the house that an individual offers to the platform $\bar{\gamma}$, her income i , and the quality level of the high class lodging capacity m_H . It is a decreasing function of the quality level of the low class capacity m_L . These variables have the opposite effect on the demand facing low class lodging (either from the low class hotel or peer-to-peer accommodation.) For fixed lodging prices, when $\bar{\gamma}$ and i increase, the income of an individual increases. The higher income boosts the utility individuals derive from vacationing, and especially the utility derived from high class vacationing. This raises the demand for the high class hotel at the expense of the demand for low class lodging. The demand for the high class hotel increases also when its quality increases and that of low class lodging decreases. Table 2 summarizes these comparative statics results for fixed prices.

We can use the expressions derived for \hat{x}_L and \hat{x}_H to derive the prices of lodging as a function of the service fee charged by the platform, as follows:

$$s_L = \frac{\alpha m_L \hat{x}_L [i - \bar{\gamma} c(m_L)]}{\beta \rho - \alpha m_L \hat{x}_L \bar{\gamma} (1 - d)}, \quad s_H = s_L + \frac{\alpha (m_H - m_L) \hat{x}_H (i + \bar{\gamma} [s_L(1 - d) - c(m_L)])}{\beta \rho} \tag{17}$$

⁸ Allowing individuals active in the platform to choose quality different from that offered by the low class hotel would complicate the analysis without changing the qualitative results.

⁹ A numerical analysis of an environment with partial coverage on the supply side can be provided by the authors upon request.

¹⁰ The inequality $(m_L/s_L) > (m_H/s_H)$ guarantees that $\hat{x}_L < \hat{x}_H$.

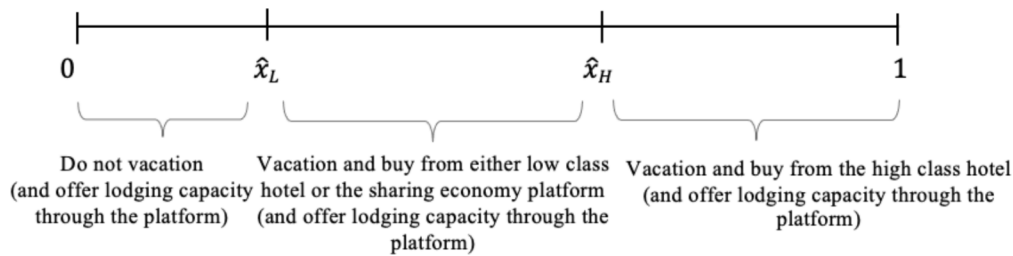


Fig. 2. Consumer segments when hotels compete with the sharing economy platform.

Table 2

The effect of $\bar{\gamma}$, i , and quality levels on demand functions for lodging capacity – fixed prices.

Effect of $\bar{\gamma}$	$\frac{\partial \hat{x}_L}{\partial \bar{\gamma}} < 0$ and $\frac{\partial \hat{x}_H}{\partial \bar{\gamma}} < 0$	$\frac{\partial(\rho(1 - \hat{x}_H))}{\partial \bar{\gamma}} > 0$ and $\frac{\partial(\rho(\hat{x}_H - \hat{x}_L))}{\partial \bar{\gamma}} < 0$
Effect of i	$\frac{\partial \hat{x}_L}{\partial i} < 0$ and $\frac{\partial \hat{x}_H}{\partial i} < 0$	$\frac{\partial(\rho(1 - \hat{x}_H))}{\partial i} > 0$ and $\frac{\partial(\rho(\hat{x}_H - \hat{x}_L))}{\partial i} < 0$
Effect of m_H	$\frac{\partial \hat{x}_L}{\partial m_H} = 0$ and $\frac{\partial \hat{x}_H}{\partial m_H} < 0$	$\frac{\partial(\rho(1 - \hat{x}_H))}{\partial m_H} > 0$ and $\frac{\partial(\rho(\hat{x}_H - \hat{x}_L))}{\partial m_H} < 0$
Effect of m_L	$\frac{\partial \hat{x}_L}{\partial m_L} < 0$ and $\frac{\partial \hat{x}_H}{\partial m_L} > 0$	$\frac{\partial(\rho(1 - \hat{x}_H))}{\partial m_L} < 0$ and $\frac{\partial(\rho(\hat{x}_H - \hat{x}_L))}{\partial m_L} > 0$

In order to support a positive price for low class lodging capacity, the denominator of s_L in (17) must be positive, implying that $\beta\rho > am_L\bar{\gamma}(1-d)$. Essentially, when $\beta\rho < am_L\bar{\gamma}(1-d)$, the positive effect of a higher price for low class lodging capacity, i.e., the implied higher income and willingness to pay of individuals for vacationing, dominates its negative effect, i.e., the implied renunciation to all other goods at the rate $\beta\rho$.

The per-unit price of low class lodging capacity, s_L , nontrivially shapes the utility of vacationers. Indeed, an increase in s_L essentially raises their cost of vacation, which also implies lowering their consumption of all other goods. At the same time, however, an increase in s_L raises vacationers' total income as they are also lodging capacity providers.

As before, prices are set to clear the market. Hence, if the hotels choose capacity levels y_L and y_H , respectively, prices are set so that $\rho(1 - \hat{x}_H) = y_H$ and $\rho(\hat{x}_H - \hat{x}_L) = y_L + \bar{\gamma}\mu_x$, where μ_x is the average size of housing capacity in the population, and therefore, $\bar{\gamma}\mu_x$ is the low class capacity offered by individuals through the lodging sharing platform. Given our assumption of a uniform distribution of house sizes in the population, individuals offer, cumulatively, lodging capacity at a level equal to $\bar{\gamma}/2$ to the platform. Note that we do not make any assumption regarding the order in which the low class demand is satisfied. The equilibrium price simply ensures that the quantity demanded of the low class lodging service is equal to the quantity supplied. Solving for the prices in terms of the capacity levels chosen by the hotels and the service fee charged by the platform yields:

$$s_H = \frac{\alpha[\bar{i} - \bar{\gamma}c(m_L)](m_H(\rho - y_H) - m_L(y_L + \bar{\gamma}\mu_x))}{\beta\rho^2 - am_L(1-d)\bar{\gamma}(\rho - y_H - y_L - \bar{\gamma}\mu_x)}, \tag{18}$$

$$s_L = \frac{\alpha[\bar{i} - \bar{\gamma}c(m_L)]m_L(\rho - y_H - y_L - \bar{\gamma}\mu_x)}{\beta\rho^2 - am_L(1-d)\bar{\gamma}(\rho - y_H - y_L - \bar{\gamma}\mu_x)}$$

Moving back to the second stage of the game, the platform chooses the service fee d to maximize its profit function:

$$\max_d \pi_p = \bar{\gamma}\mu_x ds_L \tag{19}$$

where s_L satisfies equation (18). Essentially, the platform accrues a portion d of the total revenues generated by the peer-to-peer lodging service, which are equal to $\bar{\gamma}\mu_x s_L$. Taking the first derivative of (19) with respect to d reveals that the platform's profit monotonically increases

with d . Recall that in our setting the service fee is set sufficiently low to ensure that individuals in the range $x < \hat{x}_L$ (i.e., individuals who would act as lodging providers, but not as vacationers) will actually participate to the sharing economy offering capacity. To ensure this, the coefficient of γ in their utility function needs to be positive, which implies imposing the constraint $\beta[s_L(1-d) - c(m_L)] - k \geq 0$ on the platform's service fee. Combining this constraint with the fact that the platform's profit strictly increases with d , the platform selects the highest possible value of d satisfying the constraint, that is

$$d = 1 - \frac{k}{\beta s_L} - \frac{c(m_L)}{s_L} \tag{20}$$

Substituting this value of d into equilibrium prices in (18) yields the following expressions for prices as a function of the capacity levels and quality levels chosen by the hotels:

$$s_H = \frac{\alpha(\beta\bar{i} + \bar{\gamma}k)(m_H(\rho - y_H) - m_L(y_L + \bar{\gamma}\mu_x))}{\beta^2\rho^2}$$

$$s_L = \frac{\alpha(\beta\bar{i} + \bar{\gamma}k)m_L(\rho - y_H - y_L - \bar{\gamma}\mu_x)}{\beta^2\rho^2} \tag{21}$$

It is important to note that hotels' prices in (21) do not depend on peer-suppliers' cost $c(m_L)$. From (20), any increase in the cost incurred by peer suppliers forces the platform to fully absorb the increase by lowering its service fee. As a result, the segmentation of the consumer population is not affected, and therefore, the expressions for prices as a function of the capacity and quality decisions of the hotels are the same. As we show later, this result leads to the same equilibrium behavior of the hotels and to the same consumer welfare, irrespective of the value of $c(m_L)$. The only effect of higher cost incurred by peer suppliers is to reduce the profits of the platform.

Moving to the first stage of the game, the hotels choose their capacities and quality levels to maximize their profits, as follows:

$$\max_{y_H, m_H} \pi_H = y_H \frac{\alpha(\beta\bar{i} + \bar{\gamma}k)(m_H(\rho - y_H) - m_L(y_L + \bar{\gamma}\mu_x))}{\beta^2\rho^2} - \frac{1}{2}y_H m_H^2 \tag{22}$$

$$\max_{y_L, m_L} \pi_L = y_L \frac{\alpha(\beta\bar{i} + \bar{\gamma}k)m_L(\rho - y_H - y_L - \bar{\gamma}\mu_x)}{\beta^2\rho^2} - \frac{1}{2}y_L m_L^2 \tag{23}$$

Solving the above maximization problems yields the results reported in Table 3 (the superscript * designates equilibrium values when hotels compete against each other and the sharing economy platform).

Table 3 also includes the expressions for consumer surplus. As before, we designate the aggregate consumer surplus, CS , as the sum of the surpluses derived by individuals in the three segments of the population: the surplus of individuals who choose to participate in the lodging market just as suppliers, CS_s , the surplus of individuals who choose to be peer-suppliers and consume the low class lodging service as demanders while on vacation, CS_L , and the surplus of individuals who choose to be peer-suppliers and consume the high class lodging service

Table 3
Competition among hotels and the sharing platform – equilibrium values.

	Low class hotel	High class hotel
Price	$s_L^* = \frac{2\alpha^2(\beta i + \bar{\gamma}k)^2}{529\beta^3 \rho^4} (6\rho - 7\bar{\gamma} + 2\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})^2$	$s_H^* = \frac{\alpha^2(\beta i + \bar{\gamma}k)^2}{529\beta^3 \rho^4} (126\rho^2 + 22\bar{\gamma}\rho^2 + 5\bar{\gamma}\rho + 2(21\rho - 3\bar{\gamma}k)\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})$
Lodging capacity (quantity)	$y_L^* = \frac{1}{46} (6\rho - 7\bar{\gamma} + 2\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})$	$y_H^* = \frac{1}{23} (14\rho - \bar{\gamma} - 3\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})$
Quality level	$m_L^* = \frac{\alpha(\beta i + \bar{\gamma}k)}{23\beta^2 \rho^2} (6\rho - 7\bar{\gamma} + 2\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})$	$m_H^* = \frac{\alpha(\beta i + \bar{\gamma}k)}{23\beta^2 \rho^2} (9\rho + \bar{\gamma} + 3\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})$
Profit	$\pi_L^* = \frac{\alpha^2(\beta i + \bar{\gamma}k)^2}{48668\beta^3 \rho^4} (6\rho - 7\bar{\gamma} + 2\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})^2 (6\rho + 63\bar{\gamma} + 2\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})$	$\pi_H^* = \frac{\alpha^2(\beta i + \bar{\gamma}k)^2}{12167\beta^3 \rho^4} (14\rho - \bar{\gamma} - 3\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2}) (45\rho^2 + 44\bar{\gamma}\rho - 13\bar{\gamma}\rho + (15\rho - 6\bar{\gamma})\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})$
Platform fee and profit	$d^* = 1 - \frac{529(\frac{k}{\beta} + c(m_L^*))^4}{\alpha^2(\beta i + \bar{\gamma}k)^2 (6\rho - 7\bar{\gamma} + 2\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2})^2} \frac{2\beta^3 \rho^4}{\alpha^2(\beta i + \bar{\gamma}k)^2} = \bar{\gamma}k \cdot d^* \cdot s_L^*$	
Aggregate consumer surplus	$\frac{(k + \beta d^*)}{2} + \frac{\alpha^2(\beta i + \bar{\gamma}k)^2}{24334\beta^3 \rho^4} \left((-305\bar{\gamma}^3 - 760\bar{\gamma}^2\rho + 497\bar{\gamma}\rho^2 + 801\rho^3) + (258\bar{\gamma}^2 + 136\bar{\gamma}\rho + 267\rho^2)\sqrt{9\rho^2 + 2\bar{\gamma}\rho - 5\bar{\gamma}^2} \right)$	

as demanders while on vacation, CS_H .

These surpluses are derived as follows¹¹:

$$CS_S = \int_0^{\bar{x}_L} kx(1 - \gamma) + \beta x[i + \gamma[s_L(1 - d) - c(m_L)]] dx \tag{24}$$

$$CS_L = \int_{\bar{x}_L}^{\bar{x}_H} kx(1 - \gamma) + \alpha m_L x[i + \gamma s_L(1 - d) - \gamma c(m_L)] + \beta \{x[i + \gamma s_L(1 - d) - \gamma c(m_L)] - \rho s_L\} dx \tag{25}$$

$$CS_H = \int_{\bar{x}_H}^1 kx(1 - \gamma) + \alpha m_H x[i + \gamma s_L(1 - d) - \gamma c(m_L)] + \beta \{x[i + \gamma s_L(1 - d) - \gamma c(m_L)] - \rho s_H\} dx \tag{26}$$

where, as discussed earlier, $\gamma = \bar{\gamma}$ at the equilibrium. The total societal welfare is the sum of hotels' and platform's profits and the aggregate surplus of consumers.

6. The effect of the platform entry on demand, prices, quality levels, and profits

To reduce complexity and focus on the role of the key parameters $\bar{\gamma}$, i , and α that reflect the emergence of the sharing economy, we normalize all other parameters of the model to 1, namely $\beta = \rho = k = 1$. The parameters of the sharing economy capture the added supply of the sharing platform ($\bar{\gamma}$), the wealth of individuals in the economy (i), and the importance of vacationing/lodging for individuals (α).¹² We start by conducting comparative statics of equilibrium prices and qualities when the platform competes against the hotels. The results of such comparative statics indicate the effect of the platform entry on prices and quality levels.

Lemma 1. *(The effect of i) When the peer-to-peer lodging sharing platform is active in the market, an increase in the value of i leads to the following changes:*

- i. *The quality and the per-unit price of lodging capacity offered by either hotels or the sharing platform always increase, i.e., $\frac{\partial m_H^*}{\partial i} > 0$, $\frac{\partial m_L^*}{\partial i} > 0$, $\frac{\partial s_H^*}{\partial i} > 0$, and $\frac{\partial s_L^*}{\partial i} > 0$.*
- ii. *The extent of quality differentiation and the gap in per-unit prices between high class and low class lodging capacities always increase, i.e., $\frac{\partial(m_H^* - m_L^*)}{\partial i} > 0$ and $\frac{\partial(s_H^* - s_L^*)}{\partial i} > 0$.*

When the income per unit of housing capacity i increases, consumers' willingness to pay for vacation increases, with the increase in willingness to pay for high class vacationing rising faster than the increase for low class vacationing. As a result, an increase in i leads to higher lodging prices and higher quality of lodging overall. However, the extent of quality differentiation and the extent of price disparity between the two types of lodging is bigger because of the greater appreciation for quality that an increase in i suggests. Similar to **Lemma**

¹¹ At the equilibrium, $c(m_L)$ cancels out in any consumer surplus expression because $s_L(1 - d) - c(m_L)$ simply reduces to $\frac{k}{\beta}$. This obviously holds also for the expressions derived later in Table A2 in the Appendix, where we present the surplus of different consumer segments, contingent upon their vacation status before and after the entry of the platform.

¹² The results remain qualitatively the same in the absence of such a normalization.

1, the comparative statics of prices and quality levels with respect to α are straightforward, as from Table 3, an increase in the importance of vacationing/lodging always raises prices and quality levels of both low and high class types of lodging. The effect of $\bar{\gamma}$ on these variables is instead nontrivial, as shown in the next Lemma 2.

Lemma 2. (The effect of $\bar{\gamma}$) When the peer-to-peer lodging sharing platform is active in the market, an increase in the value of $\bar{\gamma}$ leads to the following changes:

i. When $\bar{\gamma} < \bar{\gamma}_1$ and $i < i_1(\bar{\gamma})$ the quality and the per-unit price of low class lodging capacity increase, i.e., $\frac{\partial m_L^*}{\partial \bar{\gamma}} > 0$ and $\frac{\partial s_L^*}{\partial \bar{\gamma}} > 0$, otherwise they decrease.

ii. a) When $\bar{\gamma} < \frac{2}{5}$ the quality and the per-unit price of the high class lodging capacity increase, i.e., $\frac{\partial m_H^*}{\partial \bar{\gamma}} > 0$ and $\frac{\partial s_H^*}{\partial \bar{\gamma}} > 0$.

b) When $i < i_2(\bar{\gamma})$ the quality of the high class lodging capacity increases, i.e., $\frac{\partial s_H^*}{\partial \bar{\gamma}} > 0$. When $i < i_3(\bar{\gamma})$ the per-unit price of high class lodging capacity increases, i.e., $\frac{\partial m_H^*}{\partial \bar{\gamma}} > 0$. When $\bar{\gamma} > \frac{2}{5}$, $i_3(\bar{\gamma}) < i_2(\bar{\gamma})$ implying that increasing $\bar{\gamma}$ is more likely to raise quality than to raise price of high class lodging capacity.

When the above conditions necessary to ensure that m_H^* and s_H^* increase with $\bar{\gamma}$ are not satisfied, these variables decrease with $\bar{\gamma}$.

iii. The extent of quality differentiation and the gap in per-unit prices between high class and low class lodging capacities always increase, i.e., $\frac{\partial(m_H^* - m_L^*)}{\partial \bar{\gamma}} > 0$ and $\frac{\partial(s_H^* - s_L^*)}{\partial \bar{\gamma}} > 0$.

The threshold levels introduced to characterize the regions of the parameters in all the Lemmas and Propositions are defined in their proofs, included in the Appendix. An increase in the value of the parameter $\bar{\gamma}$ has two counteracting effects on the income of peer suppliers. On the one hand, when peer suppliers can offer a bigger portion of their house to the platform they can generate more income because the platform compensates them on a bigger number of lodging units. On the other hand, when individuals supply more capacity to the platform, there is downward pressure on the price of lodging and the per unit price of low class lodging declines, implying that the per-unit compensation of peer suppliers is lower. These two counteracting effects explain why an increase in $\bar{\gamma}$ does not have the same unambiguous effect that an increase in i has. Specifically, for the low (high) class hotel, an increase in $\bar{\gamma}$ leads to higher quality of lodging and to higher prices if the maximum portion of the house $\bar{\gamma}$ that individual can offer and (or) her per-unit income i are relatively small, respectively. In these cases, the downward pressure on the price of low class accommodation is relatively small in comparison to the fact that individuals have the ability to expand their supply. As a result, the overall compensation of peer suppliers is higher when $\bar{\gamma}$ increases, and their willingness to pay for higher quality increases. Nevertheless, similar to the result reported in Lemma 1, part iii of Lemma 2 shows that the extent of quality differentiation and the extent of price disparity between the two types of lodging are bigger when $\bar{\gamma}$ increases because the high class hotel always has higher powered incentive to invest in improved quality than the low class hotel.

In the next Proposition, we report how the entry of the platform affects demand, lodging prices, and quality levels of the two classes of lodging.

Proposition 1. The entry of the peer-to-peer lodging sharing platform leads to a bigger number of vacationers, namely $x_L^* < x_L^{NS}$. In addition, $x_L^{NS} < x_H^*$ implying that new vacationers (some of those who were non-vacationers before the entry of the platform) choose low class lodging after the entry of the platform. The demand for low class lodging always increases, i.e., $(x_H^* - x_L^*) > (x_H^{NS} - x_L^{NS})$, whereas the demand for high class lodging increases, i.e., $(1 - x_H^*) > (1 - x_H^{NS})$ if and only if $\bar{\gamma} > \frac{18}{23}$. The effect of the platform entry on lodging prices and quality levels can be summarized as follows:

i. When $i < i_4(\bar{\gamma})$, both hotels increase per-unit price of lodging and quality level, i.e., $m_H^* > m_H^{NS}$, $m_L^* > m_L^{NS}$, $s_H^* > s_H^{NS}$, $s_L^* > s_L^{NS}$.

ii. When $i_4(\bar{\gamma}) < i < i_5(\bar{\gamma})$ and $\bar{\gamma} > \frac{18}{23}$, the high class hotel increases both per-unit price of lodging and quality level, while the low class hotel decreases both per-unit price of lodging and quality level, i.e., $m_H^* > m_H^{NS}$, $m_L^* < m_L^{NS}$, $s_H^* > s_H^{NS}$, $s_L^* < s_L^{NS}$. The same result holds also when $i > i_4(\bar{\gamma})$ and $\bar{\gamma} < \frac{18}{23}$.

iii. When $i_5(\bar{\gamma}) < i < i_6(\bar{\gamma})$ and $\bar{\gamma} > \frac{18}{23}$, the high class hotel increases per-unit price of lodging and decreases quality level, while the low class hotel decreases both per-unit price of lodging and quality level, i.e., $m_H^* < m_H^{NS}$, $m_L^* < m_L^{NS}$, $s_H^* > s_H^{NS}$, $s_L^* < s_L^{NS}$.

iv. When $i > i_6(\bar{\gamma})$ and $\bar{\gamma} > \frac{18}{23}$, both hotels decrease per-unit price of lodging and quality level, i.e., $m_H^* < m_H^{NS}$, $m_L^* < m_L^{NS}$, $s_H^* < s_H^{NS}$, $s_L^* < s_L^{NS}$.

with $i_6(\bar{\gamma}) > i_5(\bar{\gamma}) > i_4(\bar{\gamma})$ as long as $\bar{\gamma} > \frac{18}{23}$, namely when the demand for high class lodging increases as a result of the platform entry.

According to Proposition 1, the sharing economy increases the number of vacationers. However, while this always translates into higher demand for low class lodging given that the supply for this quality level increases after the platform entry, it may not lead to higher demand for high class lodging. When $\bar{\gamma}$ is relatively small (i.e., $\bar{\gamma} < \frac{18}{23}$), the demand for high class lodging actually shrinks. The reason for the latter result is that when $\bar{\gamma}$ is relatively small the entry of the platform acts to reduce the price of low class lodging more than it acts to reduce the price of high class lodging, thus incentivizing some vacationers who chose high class lodging prior to the entry of the platform to switch to low class lodging due to a better price-quality trade-off. In contrast, when $\bar{\gamma}$ is relatively big (i.e., $\bar{\gamma} > \frac{18}{23}$) there is higher demand for the high class hotel after the entry of the platform, with some vacationers who previously used low class switching to high class lodging. This is because the large added supply intensifies price and quality competition facing the high class hotel, thus raising the value it offers to consumers relative to the low class accommodation.

As for the price and quality comparison, the entry of the platform has two counteracting effects on these two variables. On the one hand, the entry of the platform adds supply to the lodging market, thus putting downward pressure on lodging prices, and therefore, on the incentives of the hotels to invest in improved quality. On the other hand, the entry of the platform can boost the income of individuals in the population, thus raising their willingness to pay for vacationing, and especially for high quality vacationing. The former effect dominates for relatively big values of $\bar{\gamma}$ and i (part iv of the Proposition) because the supply increases significantly in this case and the population is already wealthy before the entry of the sharing economy, implying that the added income is not particularly beneficial. On the other hand, the added income effect dominates for relatively small values of i (part i of the Proposition). As a result, in part iv of the Proposition both class types of lodging offer lower quality and sell for lower prices after the platform entry, whereas in part i of the Proposition both class types of lodging offer higher quality and sell for higher prices. For all other regions of i and $\bar{\gamma}$ (parts ii and iii of the Proposition), neither effect clearly dominates, thus generating different incentives for the two types of hotels with regard to price and quality. In these cases, the low class hotel is forced to reduce both price and quality given the direct competition this type of hotel faces from the platform. In contrast, the high class hotel, which does not face the same direct competition from the platform, may choose to intensify the extent of differentiation in the services provided by raising quality, and as a result, its price as well (part ii). Part iii of the Proposition reports the surprising result that the high class hotel may be able to raise price after the platform entry, in spite of offering lower quality. Hence, the switch of some vacationers to high class accommodation because of their additional income allows the high class hotel to raise price even when its quality is lower. This last result suggests that the existing consumers of the high class hotel will be certainly worse off because of the entry of the platform when the economy is characterized by the range of parameter

values given in part iii of the Proposition. Specifically, for moderately wealthy economies ($i_5(\bar{\gamma}) < i < i_6(\bar{\gamma})$) and large added housing capacity facilitated by the platform ($\bar{\gamma} > \frac{18}{23}$). Fig. 3 exemplifies the ranges of the parameters that support the four possibilities reported in Proposition 1.

Using the results of Proposition 1, in Proposition 2 we show that the entry of the sharing economy always raises the extent of differentiation between high and low class hotels.

Proposition 2. *Following the entry of the peer-to-peer lodging sharing platform, the quality difference between high class hotel and low class hotel increases, namely $m_H^* - m_L^* > m_H^{NS} - m_L^{NS}$.*

This result is implied by the fact that the low class hotel faces more direct competition from the sharing platform than the high class hotel, thus depressing its price, and therefore, its willingness to invest in quality relative to the high class hotel. The same reasoning explains also the results reported in Proposition 3 regarding the effect of the sharing economy on the profits of the two types of hotels.

Proposition 3. *The entry of the peer-to-peer lodging sharing platform leads to the following effects on the profits of the hotels:*

- i. When $i < i_7(\bar{\gamma})$ both classes of hotel earn higher profits, i.e., $\pi_H^* > \pi_H^{NS}$, $\pi_L^* > \pi_L^{NS}$.
 - ii. When $i_7(\bar{\gamma}) < i < i_8(\bar{\gamma})$ and $\bar{\gamma} < \frac{18}{23}$ the high class hotel earns higher profit, and the low class hotel earns lower profit, i.e., $\pi_H^* > \pi_H^{NS}$, $\pi_L^* < \pi_L^{NS}$. The same result holds also when $i > i_7(\bar{\gamma})$ and $\bar{\gamma} > \frac{18}{23}$.
 - iii. When $i > i_8(\bar{\gamma})$ and $\bar{\gamma} < \frac{18}{23}$, both classes of hotel earn lower profits, i.e., $\pi_H^* < \pi_H^{NS}$, $\pi_L^* < \pi_L^{NS}$;
- $i_8(\bar{\gamma}) > i_7(\bar{\gamma})$

The impact of the platform entry on the profits of the hotels depends, once again, on the added income and increased competition effects of the sharing economy. When i is sufficiently small, the entry of the platform boosts demand for vacationing more than it boosts the supply of lodging because the added income of individuals is significant relative to the initial wealth of individuals prior to the entry of the platform. The relatively higher boost to the demand leads to both types of hotel benefitting from higher profits (part i of Proposition 3.) For bigger values of i , the low class hotel always earns lower profits but the high class hotel can sometime benefit from the entry of the platform. In particular, if the supply of lodging increases significantly after the entry of the platform (i.e., $\bar{\gamma}$ large), the profits of the high class hotel rise as this type of hotel can count on higher demand from consumers switching from low class to the high class service (part ii of Proposition 3.) However, when the increase in the supply of lodging is relatively small and income becomes very large (part iii of Proposition 3), the lower demand for high class accommodation translates into lower profits for the high class hotel as well after the platform entry. Fig. 4 illustrates the regions of the parameters, which support the three cases reported in Proposition 3.

7. The effect of the platform entry on consumer surplus and societal welfare

In this section, we investigate the impact of the sharing economy on consumer surplus and total welfare. In Proposition 4, we investigate the effect of the sharing economy both on the aggregate consumer surplus and on the surplus of different consumer segments, contingent upon their vacation status before and after the entry of the platform. To help understand Proposition 4, Table A2 in the Appendix reports the derivations of the surplus for each consumer segment before and after the platform entry.

Proposition 4. *The entry of the platform leads to an overall increase of consumer surplus, namely $CS^* - CS^{NS} > 0$. However, when the overall*

demand for the services of the high class hotel rises after the entry of the platform (i.e., when $\bar{\gamma} > \frac{18}{23}$) and the income level i is sufficiently large, the entry of the platform may hurt two groups of consumers: those who were vacationing at the low class hotel before the entry of the platform and now switch to the high class hotel (i.e., those in (x_H^, x_H^{NS}) ¹³) and those who were vacationing at the high class hotel before the entry of the platform and continue to do so (i.e., those in $(x_H^{NS}, 1)$). All remaining groups of consumers are at least as well off after the entry of the platform.*

Proposition 4 suggests that the sharing economy enhances the overall welfare of consumers. However, in markets characterized by high income levels and large housing capacity offered by peer suppliers ($\bar{\gamma} > \frac{18}{23}$), some consumers may be worse off after the entry of the platform. In these markets, the higher income of peer suppliers incentivizes some of them to switch from vacationing at the low class hotel to vacationing at the high class hotel, and not vice versa. In this case, the high class hotel may be able to raise price in spite of offering lower quality to customers (Proposition 1 part iii). Or, even if the high class hotel increases quality, the increase in price may outpace the increase in quality, thus adversely affecting the welfare of consumers who switch from the low class to the high class hotel and those who continue to choose the high class hotel.

Next, we examine the economic impact of the sharing economy on total welfare by summing hotels' profits, the platform's profit, and total consumer surplus. Because the per unit cost of hosting, $c(m_L)$, incurred by peer suppliers reduces the profits of the platform (without affecting hotels' profits and consumer surplus), total welfare monotonically declines as the cost of hosting incurred by peer suppliers rises. For simplicity, in the comparison of total welfare that we conduct in Proposition 5, we normalize $c(m_L)$ to zero. With this normalization, we show that, after the entry of the platform, total welfare increases over a certain region of the model parameters. The introduction of positive hosting costs for peer suppliers will trivially shrink this region.

Proposition 5. *The entry of the peer-to-peer lodging sharing platform leads to an increase of total welfare ($W_H^* - W_H^{NS} > 0$) for sufficiently big values of α , while: a) either $\bar{\gamma}$ is extremely large, b) or i is relatively small. Otherwise, the emergence of the sharing economy reduces total welfare.*

Proposition 5 states that, differently from the unambiguous increase of aggregate consumer surplus, the entry of the platform may have an ambiguous effect on total welfare because the possible decline of industry profits may exceed the gain in consumer surplus. Relatively big values of α are likely to enhance the profits of the hotels and platform, as consumers' valuation of vacationing is relatively high in comparison to their valuation of self-consumption of housing and/or general consumption (recall that k and β are normalized to 1.) As we report in Proposition 3, higher profits are also more likely when i is relatively small. While our previous derivations indicate that the role of $\bar{\gamma}$ in affecting profits of the two hotels is ambiguous, Proposition 5 asserts that total welfare is more likely to rise when peer suppliers can offer more housing capacity. The role of i reported in the Proposition indicates that economies characterized by relatively low levels of income are more likely to benefit from the emergence of the sharing economy.

8. Discussion and conclusion

We investigated how the entry of a sharing economy platform affects decisions of competing incumbents in the hospitality industry regarding lodging capacity, service quality level, and pricing. Our analysis allowed us to predict how such decisions affect incumbents' profitability and societal welfare. We found that the platform entry raises the demand for low class accommodation, but has an ambiguous effect on the demand

¹³ $x_H^* < x_H^{NS}$ when $\bar{\gamma} > \frac{18}{23}$.

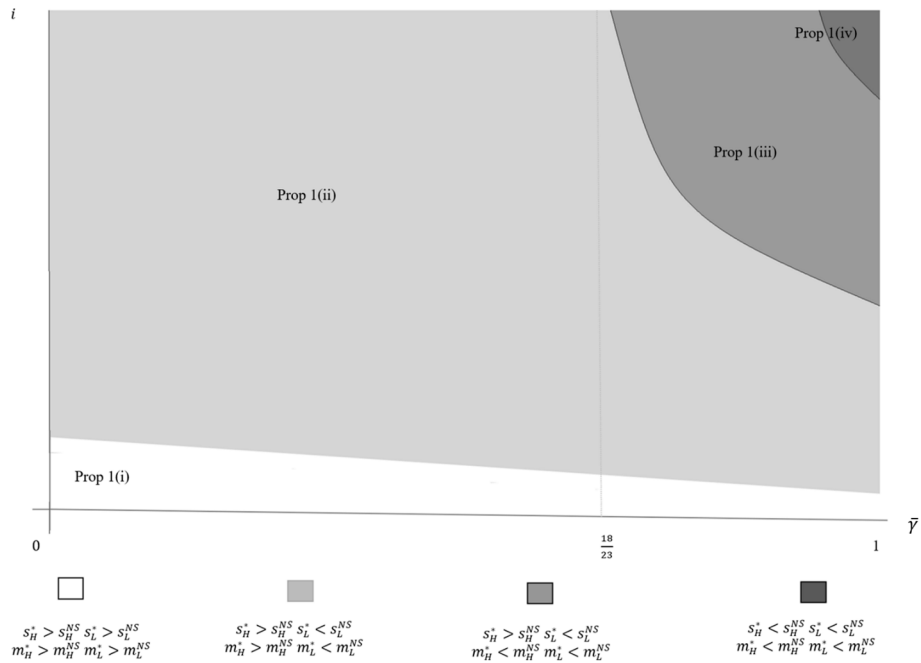


Fig. 3. Comparison of incumbents' price and quality levels before and after the platform entry, as in Proposition 1.

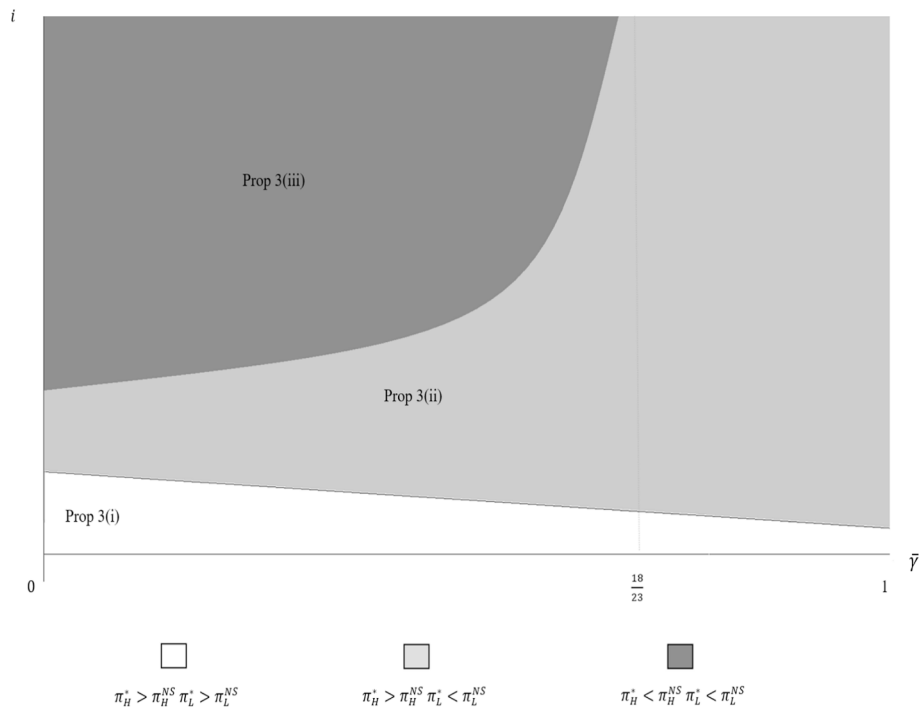


Fig. 4. Comparison of incumbents' profits before and after the platform entry, as in Proposition 3.

for the high class accommodation. Demand for high class accommodation rises only when peer suppliers can offer large lodging capacity to the sharing platform. In this case, the sharing economy significantly increases the income of individuals, and therefore, their interest in using higher class services when vacationing. The opposite is the case when the supply of peer suppliers is relatively modest.

The effect of the sharing economy platform on prices and quality levels depends on the relative wealth of the economy and may be different for the two types of accommodations. For relatively poor economies, the sharing economy leads to higher prices and quality levels

for both low and high class accommodations. With relatively low income before the entry of the sharing platform, the additional income individuals obtain as peer suppliers has a significant effect on their interest in vacationing, and especially on their interest in higher quality vacationing. With higher willingness to pay for vacationing of consumers, hotels can raise their prices, which motivates them also to increase investments in improved quality. This leads to higher profits earned by both types of incumbent lodging providers. In contrast, in relatively rich economies the added capacity offered by peer suppliers has a more significant effect on intensifying price competition than on

raising the willingness to pay of consumers for vacationing, thus possibly leading to lower profits for both types of accommodations, or at least for the low class hotel, which faces more direct competition from the sharing economy. In some cases, the sharing economy may introduce different effects on the behavior and fortunes of different classes of incumbent lodging suppliers. For instance, when peer suppliers can offer large lodging capacity and individuals have intermediate income levels, the price and quality level of low class accommodations decline, whereas the price and, in some cases, the quality level of high class accommodation rise upon the emergence of a sharing economy platform. Quite interestingly, in this intermediate region, it is possible that the high class incumbent decreases the quality while still raising the price following the platform entry. That is, price and quality for the high class incumbent, after the platform entry, move in opposite directions.

Our results reveal a complex picture of how the sharing economy affects traditional businesses in the hospitality industry, given that it introduces two counteracting effects on prices. On the one hand, because peer suppliers increase their income by offering capacity to the platform, their willingness to pay for vacationing rises, thus allowing incumbents to raise prices. On the other hand, the additional capacity offered in the market creates downward pressure on prices. We show that the former effect is more likely to dominate in poorer economies and the latter effect is more likely to dominate in richer economies. As discussed, the ambiguous effect of the sharing economy on prices also creates ambiguity regarding the quality levels offered by incumbent providers and thus on their profitability after the entry of a sharing economy platform to the market. In contrast to the ambiguity regarding the effect on industry profits, the sharing economy unambiguously increases aggregate consumer welfare. However, surprisingly, even though overall consumer surplus is higher, some consumers of high class lodging may be worse off after the entry of the sharing economy platform. This is an interesting finding because of the fact that the sharing economy typically competes more directly in the low class service market rather than in the high class service market.

Our results suggest that regulators should be careful when intervening in markets where sharing economy platforms operate. They should assess the specific characteristics of the environment in determining whether intervention is beneficial. While there are circumstances where the sharing economy destroys societal welfare, mostly because it adversely affects incumbents' profits, in other circumstances the sharing economy should be welcomed. This is true in markets characterized by considerable importance of vacationing for consumers, relatively low wealth of the population, as well as low cost of hosting or large lodging capacity offered by peer suppliers to the platform.

Our modeling approach can be extended in several directions. First, we use a uniform distribution to model consumers' income. While in game-theoretical papers, using uniform distribution to model heterogeneity among economic agents is very common, even in the context of sharing economy (e.g., Filippas et al., 2020; Gal-Or, 2018), the uniform distribution may not necessarily reflect the business setting under observation. It is typically the case that the number of low-income individuals may be bigger than that of high-income individuals. However, we conjecture that relaxing the uniform distribution assumption would actually strengthen our findings, though leading to much more cumbersome derivations. If there are more low-income individuals in the population than high income individuals, the added income that the sharing economy facilitates for the lower tail of the distribution of income is likely to increase more significantly the number of new vacationers, and therefore, to lead to higher lodging prices and greater incentives on the part of traditional hotels to improve quality. In turn, this is likely to expand the region of the parameters over which the sharing economy is beneficial to all parties (consumers, hotels, and sharing platforms). Second, we consider a single sharing economy platform competing against incumbent service providers. With recent competition that Airbnb faces from platforms such as Vrbo, HomeToGo, or Tripping.com, it may be interesting to extend the study to an

environment with multiple sharing economy platforms competing against each other and traditional (competing) providers. Third, we assume that the sharing economy platform matches the quality level of the low class hotel and that its services are completely undifferentiated from those offered by this hotel. This assumption is consistent the fact that by focusing on offering budget house rentals Airbnb mostly compete on price with low class hotels (Chang and Sokol, 2022; Yohn, 2020). Therefore, our study focusing on price and quality decisions (i.e., vertical type of differentiation) is fully consistent with the main characteristics of the sharing economy. However, sharing economy platforms also promote unique features of their services, such as experience of living with locals and special guest–host relationships, to highlight their differentiation from traditional hotels. This suggests that incorporating a dimension of horizontal differentiation between the services offered by the platform and those offered by traditional hotels may enrich the model, making the investigation an interesting direction for future research. Finally, as sharing economy platforms have disrupted other industries besides the hospitality sector, it would be important to understand whether the results we obtain arise in other industries, such as the industry for car transportation services.

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

CRedit authorship contribution statement

Tiziana D'Alfonso: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Esther Gal-Or:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Paolo Roma:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.elerap.2025.101490>.

Data availability

No data was used for the research described in the article.

References

- Abhishek, V., Guajardo, J.A., Zhang, Z., 2021. Business models in the sharing economy: Manufacturing durable goods in the presence of peer-to-peer rental markets. *Inf. Syst. Res.* 32 (4), 1450–1469.
- Alyakoob, M., Rahman, M.S., 2022. Shared prosperity (or lack thereof) in the sharing economy. *Inf. Syst. Res.* 32 (2), 638–658.
- Akbaba, A., 2006. Measuring service quality in the hotel industry: A study in a business hotel in Turkey. *Int. J. Hosp. Manag.* 25 (2), 170–192.
- Akbar, Y.H., Tracogna, A., 2018. The sharing economy and the future of the hotel industry: Transaction cost theory and platform economics. *Int. J. Hosp. Manag.* 71, 91–101.
- Assaf, A.G., Agbola, F.W., 2011. Total productivity in the hotel industry: A global perspective. *J. Hosp. Tour. Res.* 35 (4), 397–416.
- Barron, K., Kung, E., Proserpio, D., 2021. The effect of home-sharing on house prices and rents: Evidence from Airbnb. *Mark. Sci.* 40 (1), 23–47.
- Barros, C.P., 2005. Efficiency in the hotel sector: A stochastic frontier approach. *Tour. Econ.* 11 (3), 373–386.
- Basili, M., Rossi, M.A., 2020. Platform-mediated reputation systems in the sharing economy and incentive to provide service quality: The case of ridesharing services. *Electron. Commer. Res. Appl.* 39, 100835.

- Baum, J.A.C., Mezias, S.J., 1992. Localized competition and organizational failure in the Manhattan hotel industry, 1898-1990. *Adm. Sci. Q.* 37 (4), 580-604.
- Becerra, M., Santaló, J., Silva, R., 2013. Being better vs. being different: Differentiation, competition, and pricing strategies in the Spanish hotel industry. *Tour. Manag.* 34, 71-79.
- Benjafaar, S., Kong, G., Li, X., Courcoubetis, C., 2019. Peer-to-peer product sharing: Implications for ownership, usage and social welfare in the sharing economy. *Manag. Sci.* 65 (2), 477-493.
- Berger, T., Chen, C., Frey, C.B., 2018. Drivers of disruption? Estimating the Uber effect. *Eur. Econ. Rev.* 110, 197-210.
- Bimpikis, K., Candogan, O., Saban, D., 2019. Spatial pricing in ride-sharing networks. *Oper. Res.* 67 (3), 744-769.
- Blal, I., Singal, M., Templin, J., 2018. Airbnb's effect on hotel sales growth. *Int. J. Hosp. Manag.* 73, 85-92.
- Bryan, K.A., Gans, J.S., 2019. A theory of multihoming in rideshare competition. *J. Econ. Manag. Strateg.* 28 (1), 89-96.
- Cao, G., Jin, G.Z., Weng, X., Zhou, L.-A., 2021. Market-expanding or market-stealing? Competition with network effects in bike-sharing. *RAND J. Econ.* 52 (4), 788-814.
- Chang, H.H., Sokol, D.D., 2022. How incumbents respond to competition from innovative disruptors in the sharing economy—The impact of Airbnb on hotel performance. *Strateg. Manag. J.* 43 (3), 425-446.
- Chomachaei, F., Gal-Or, E., Letizia, P., Roma, P., 2024. The economic viability of the sharing economy business model and its environmental impact. *Eur. J. Oper. Res.* 315 (3), 1197-1209.
- Clark, A.E., Etil, F., Postel-Vinay, F., Senik, C., Van der Straeten, K., 2005. Heterogeneity in reported well-being: Evidence from twelve European countries. *Econ. J.* 115 (502), C118-C132.
- Clark, A.E., Frijters, P., Shields, M.A., 2008. Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles. *J. Econ. Lit.* 46 (1), 95-144.
- Cramer, J., Krueger, A.B., 2016. Disruptive change in the taxi business: The case of Uber. *Am. Econ. Rev.* 106 (5), 177-182.
- Dong, J., Ibrahim, R., 2020. Managing supply in the on-demand economy: Flexible workers, full-time employees, or both? *Oper. Res.* 68 (4), 1238-1264.
- Einav, L., Farronato, C., Levin, J., 2016. Peer-to-peer markets. *Annual Review of Economics* 8, 615-635.
- Fajgelbaum, P., Grossman, G.M., Helpman, E., 2011. Income distribution, product quality, and international trade. *J. Polit. Econ.* 119 (4), 721-765.
- Farronato, C., Fradkin, A., 2022. The welfare effects of peer entry: the case of Airbnb and the accommodation industry. *Am. Econ. Rev.* 112 (6), 1782-1817.
- Ferrer-i-Carbonell, A., Frijters, P., 2004. How important is methodology for the estimates of the determinants of happiness? *Econ. J.* 114 (497), 641-659.
- Ferrer-i-Carbonell, A., 2005. Income and well being: An empirical analysis of the comparison income effect. *J. Public Econ.* 89 (5-6), 997-1019.
- Filippas, A., Horton, J.J., Zeckhauser, R.J., 2020. Owning, using, and renting: Some simple economics of the "Sharing Economy". *Manag. Sci.* 66 (9), 4152-4172.
- Frijters, P., Haisken-DeNew, J.P., Shields, M.A., 2004a. Investigating the patterns and determinants of life satisfaction in Germany following reunification. *J. Hum. Resour.* 39 (3), 649-674.
- Frijters, P., Haisken-DeNew, J.P., Shields, M.A., 2004b. Money does matter! Evidence from increasing real income and life satisfaction in East Germany following reunification. *Am. Econ. Rev.* 94 (3), 730-740.
- Gal-Or, E., 2018. Peer-to-peer sharing in the lodging market: Evaluating the implications for social welfare and profitability. *J. Econ. Manag. Strateg.* 27 (4), 686-704.
- Gal-Or, E., 2021. How does competition among lodging sharing platforms affect welfare and profits? *J. Econ. Manag. Strateg.* 30 (1), 45-62.
- Guda, H., Subramanian, U., 2019. Your Uber is arriving: Managing on-demand workers through surge pricing, forecast communication, and worker incentives. *Manag. Sci.* 65 (5), 1995-2014.
- Guttentag, D.A., Smith, S.L.J., 2017. Assessing Airbnb as a disruptive innovation relative to hotels: substitution and comparative performance expectations. *Int. J. Hosp. Manag.* 64, 1-10.
- Guttentag, D., Smith, S., Potwarka, L., Havitz, M., 2018. Why tourists choose Airbnb: A motivation-based segmentation study. *Int. J. Hosp. Manag.* 70, 120-129.
- Guo, Y., Li, X., Zeng, X., 2019. Platform competition in the sharing economy: Understanding how ride-hailing services influence new car purchases. *J. Manag. Inf. Syst.* 36 (4), 1043-1070.
- Guo, Y., Xin, F., Li, X., 2020. The market impacts of sharing economy entrants: Evidence from USA and China. *Electron. Commer. Res.* 20 (3), 629-649.
- Hagiou, A., Wright, J., 2019. The status of workers and platforms in the sharing economy. *J. Econ. Manag. Strateg.* 28 (1), 97-108.
- Han, W., Wang, X., Ahsen, M.E., Wattal, S., 2022. The societal impact of sharing economy platform self-regulations - An empirical investigation. *Inf. Syst. Res.* 33 (4), 1303-1323.
- Hu, M., 2021. From the classics to new tunes: A neoclassical view on sharing economy and innovative marketplaces. *Prod. Oper. Manag.* 30 (6), 1668-1685.
- Huang, N., Burch, G., Hong, Y., Pavlou, P.A., 2020. Unemployment and worker participation in the gig economy: Evidence from an online labor market. *Inf. Syst. Res.* 31 (2), 431-448.
- Jappelli, T., Pistaferri, L., 2010. The consumption response to income changes. *Annual Review of Economics* 2 (1), 479-506.
- Jiang, B., Tian, L., 2018. Collaborative consumption: Strategic and economic implications of product sharing. *Manag. Sci.* 64 (3), 1171-1188.
- Ju, Y., Back, K.-J., Choi, Y., Lee, J.-S., 2019. Exploring Airbnb service quality attributes and their asymmetric effects on customer satisfaction. *Int. J. Hosp. Manag.* 77, 342-352.
- Kauffman, R.J., Naldi, M., 2020. Research directions for sharing economy issues. *Electron. Commer. Res. Appl.* 43, 100973.
- Li, H., Srinivasan, K., 2019. Competitive dynamics in the sharing economy: An analysis in the context of Airbnb and hotels. *Mark. Sci.* 38 (3), 365-391.
- Mattila, A.S., O'Neill, J.W., 2003. Relationships between hotel room pricing, occupancy, and guest satisfaction: A longitudinal case of a midscale hotel in the United States. *Cornell Hosp. Q.* 44 (1), 52-59.
- Motta, M., 1993. Endogenous quality choice: Price vs. quantity competition. *J. Ind. Econ.* 41 (2), 113-131.
- Pei, J., Yan, P., Kumar, S., Liu, X., 2020. How to react to internal and external sharing in B2C and C2C. *Prod. Oper. Manag.* 30 (1), 145-170.
- Priporas, C.-V., Stylos, N., Vedanthachari, L.N., Santiwatana, P., 2017. Service quality, satisfaction, and customer loyalty in Airbnb accommodation in Thailand. *Int. J. Tour. Res.* 19 (6), 693-704.
- Proserpio, D. (2020). What does the crisis mean for the sharing economy. The Entrepreneur, May 19. <https://www.entrepreneur.com/article/350481>. (Last time accessed July 11, 2023).
- Razeghian, M., Weber, T.A., 2019. The advent of the sharing culture and its effect on product pricing. *Electron. Commer. Res. Appl.* 33, 100801.
- Roma, P., Panniello, U., Lo Nigro, G., 2019. Sharing economy and incumbent's pricing strategy: The impact of Airbnb on the hospitality industry. *Int. J. Prod. Econ.* 214, 17-29.
- Schmidt, P., 2020. The effect of car sharing on car sales. *Int. J. Ind. Organiz.* 71, 102622.
- Shields, M.A., Wheatley Price, S., 2005. Exploring the economic and social determinants of psychological well-being and perceived social support in England. *Journal of the Royal Statistical Society: Series A* 168 (3), 513-537.
- Spulber, D.F., 2019. The economics of markets and platforms. *J. Econ. Manag. Strateg.* 28 (1), 159-172.
- Sundararajan, A., 2016. *The sharing economy: The end of employment and the rise of crowd-based capitalism*. MIT Press, USA, Cambridge.
- Tian, L., Jiang, B., 2018. Effects of consumer-to-consumer product sharing on distribution channel. *Prod. Oper. Manag.* 27 (2), 350-367.
- Tian, L., Jiang, B., Xu, Y., 2021. Manufacturer's entry in the product sharing market. *Manuf. Serv. Oper. Manag.* 23 (3), 553-568.
- Tsai, H., Song, H., Wong, K.K., 2010. Tourism and hotel competitiveness research. *J. Travel Res.* 49 (2), 168-179.
- Tsang, A. (2017). Morning Agenda: the Hotel Industry vs. Airbnb. New York Times, April 17. <https://www.nytimes.com/2017/04/17/business/dealbook/airbnb-hotels-ant-financial-moneygram.html> (Last time accessed July 11, 2023).
- Weber, T.A., 2014. Intermediation in a sharing economy: Insurance, moral hazard, and rent extraction. *J. Manag. Inf. Syst.* 31 (3), 35-71.
- Wu, B., Zhu, N., 2011. Income inequality, consumption, and social-status seeking: Evidence from Chinese urban households. *J. Comp. Econ.* 39 (2), 191-204.
- Yohn, D. L. (2020). How Airbnb survived the pandemic - And how you can too. Forbes, November 10. <https://www.forbes.com/sites/deniselyohn/2020/11/10/how-airbnb-survived-the-pandemic-and-how-you-can-too/?sh=e4d3f8093845> (Last time accessed July 11, 2023).
- Yu, J.J., Tang, C.S., Shen, Z.-J.-M., Chen, X.M., 2020. A balancing act of regulating on-demand ride services. *Manag. Sci.* 66 (7), 2975-2992.
- Zervas, G., Proserpio, D., Byers, J.W., 2017. The rise of the sharing economy: Estimating the impact of Airbnb on the hotel industry. *J. Mark. Res.* 54, 687-705.
- Zou, L., Wu, J., Gong, Y., Chen, M., Xia, M., 2023. Operations research on the sharing economy: A bibliometric analysis and literature review. *Electron. Commer. Res. Appl.* 59, 101265.