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PRICE PARITY CLAUSES FOR HOTEL ROOM BOOKING: EMPIRICAL EVIDENCE FROM REGULATORY CHANGE

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JEL Classification: K21, L14, L42, L81

Keywords: Price Parity Clause, Most favored nation, Most favored customer, Hotel Industry, Impact Evaluation, Online Travel Agency, Digital Platforms

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Price Parity Clauses for Hotel Room Booking: Empirical Evidence from Regulatory Change*

Sean Ennis†, Marc Ivaldi‡ and Vicente Lagos¥

May 14, 2020

Abstract

This paper examines the impact of most favored nation (MFN) clauses on retail prices, taking advantage of two natural experiments that changed vertical contracting between hotels and major digital platforms. The broad E.U. intervention narrowed the breadth of "price parity" obligations between hotels and major Online Travel Agencies (OTAs). Direct sales by hotels to customers subsequently became relatively cheaper. Comparisons with hotel pricing outside the E.U. confirm the reduction in prices for mid-level and luxury hotels. France and Germany went further and eliminated all price-parity agreements. This stronger intervention was associated solely with a significant additional price-reducing effect for mid-level hotels in Germany. Overall, wide MFNs are associated with higher retail prices. Regulating MFNs reduced prices with primary effects coming either from the narrow price-parity intervention or, perhaps, from direct sales becoming cheaper than OTAs in both E.U. and non-E.U. countries, and, interestingly, not from complete elimination of MFNs.

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1. Introduction

Online Travel Agencies (OTAs) have gained considerable importance as a distribution channel for independent hotels and hotel chains around the world. OTAs provide many benefits to consumers in facilitating a wide search and comparison of hotels.[1] In principle, this can translate into fiercer competition across hotels. Additionally, OTAs may help independent and new hotels to enter the market or to operate on a larger scale, which may also be beneficial for consumers. On the other hand, OTAs represent one of the most expensive booking channels for hotels accounting for about 10%-20% of a night's room rate.[2] Thus, a higher fraction of sales flowing through this distribution channel may end up increasing hotels' operating costs and prices faced by travelers.

In this context, OTAs and hotels instituted "wide" most-favored nation (MFN) clauses that ensured hotels and other OTAs could not set rates for hotel rooms that were below those of an OTA. In the hotel industry, these are called Price Parity Clauses (PPCs) The wide-PPC that became the industry standard reportedly required hotels to offer the same or a better room price on a given OTA than the prices offered on competing sales channels, including other OTAs and the hotels' own direct online channels. This practice can reduce free-riding behavior from other distribution channels and, in this way, would promote OTAs' investments and would avoid direct price charges to final users. (See Ezrachi, 2016, Wang and Wright, 2020.) Absent the PPC clauses, a hotel could have an incentive to advertise its rooms on a given OTA, and then offer lower prices for the same products on its own website, thereby avoiding the payment of commission fees. Note that, to our knowledge, there is no empirical evidence of the actual relevance and magnitudes of free-riding behavior.

However, potentially undesired anticompetitive effects could emerge from the establishment of such clauses. One theory is based on the impossibility for hotels to respond to an increase in commission fees of a given OTA, by setting higher retail prices in this OTA in comparison to other channels. This restriction for hotels to divert sales to cheaper channels

[1] OTAs play an important role in online reputations of hotels through their reviews and ratings, which in turn receive management attention and hotel response. (See Proserpio and Zerbas, 2017.)

[2] See the following online article titled "Pillow Fight: Hotels vs. Online Travel Agencies", June 23th 2016. Article retrieved on August 7th 2017 from the following link: https://www.morganstanley.com/ideas/hotels-vs-online-travel-agencies

may create the incentives for competing OTAs to simultaneously increase commission fees in equilibrium, resulting in higher distribution costs for hotels and in higher retail prices for travelers. In this vein, Boik and Corts (2016) develop a theoretical model in which platform most-favored-nation (PMFN) clauses may indeed result in both higher commission fees charged by intermediary platforms and in higher retail prices.[3,4] In another approach, Edelman and Wright (2015) suggest that retail prices may be inflated because intermediaries who deliver a value to buyers can raise demand for their services by preventing buyers from paying higher amounts for intermediary purchases, leading to inflated prices and excessive adoption of intermediary services, over-investment by intermediaries and reduced consumer surplus.

Some theoretical research points out ambiguities in the implications of MFNs for consumers. Wang and Wright (2020) suggest that prevention of showrooming effects is an important element of MFN clauses, among platforms that lower search costs. They suggest that, while wide price-parity clauses are bad for consumers, that narrow MFNs have ambiguous effects and could improve consumer surplus.[5] The ambiguity may be particularly important in comparison to completely eliminating PPCs. Johansen and Vergé (2017) suggest that even wide PPCs can have ambiguous effects to the extent that sellers' participation constraints prevent a guaranteed high commission.

MFNs may be linked to other mechanism for inducing price uniformity. Similarly, price uniformity is not necessarily harmful. Akman and Sokol (2017) argue that online resale prince maintenance (RPM) can resemble online MFNs. Fletcher and Hviid (2017) explain the manner in which some aspects of MFNs may bear substantial similarity to the worst horizontal element of RPM, and could yield, as Ezrachi (2015) notes, price uniformity effects. As a potential benefit of price uniformity, Sridhar and Winter (2006) suggest that price matching guarantees can signal to uninformed consumers that a firm has low prices.

[3] In a different theoretical model, Johnson (2017) also finds that under an agency model between sellers and intermediaries (i.e., sellers determine retail prices, and pay a per-transaction commission fee to intermediaries), PMFNs raise commission fees and retail prices.

[4] A second theory of harm is linked to the fact that wide-PPCs have the potential to act as entry barriers. Indeed, under a PPC regime, it is more difficult for a new OTA to enter or expand its market share via the offer of lower commission rates in exchange for hotels offering lower retail prices for their rooms. In line with this intuition, Boik and Corts (2016) show that under certain conditions, PPCs can indeed act as entry deterrents.

[5] Wals and Schinkel (2018) have pointed out one respect in which the ambiguity disappears, namely when narrow PPCs are combined with best price guarantees.

Potential economic and legal concerns over OTA market power and PPC clauses have led to a regulatory response, particularly with respect to wide PPCs that would apply to all of a hotel's transactions. In 2015, competition authorities from France, Italy and Sweden adopted parallel decisions accepting identical commitments from their market-leading OTA, Booking.com. In particular, Booking.com committed itself to switch from wide-PPCs to narrow-PPCs in its contracts with hotels located in E.U. countries. In practice, this switch translates into the possibility for hotels to offer lower prices on alternative OTAs and on their own direct channels, provided that these latter discounts are part of a loyalty program (and thus not directly advertised to the general public). The second largest OTA in the market, i.e., Expedia, also committed itself to switch to narrow-PPCs in the E.U. during the year 2015.

Nevertheless, the European Commission (EC) also suggested concerns could arise regarding the presence of narrow-PPCs.[6] The hypothesis is that this type of clause is related to the existence of reduced incentives for hotels to offer differentiated prices on different OTAs. Specifically, under a narrow-PPC regime, retail prices posted on the direct channel cannot be lower than retail prices posted on the most-expensive OTA.[7] Therefore, offering low retail prices on a low-cost OTA (in order to divert sales to cheaper channels) would necessarily cannibalize the sales of the hotel direct channel. For this reason, hotels' incentives to price differentiate across OTAs would be reduced.

With the purpose of evaluating the impact of the regulatory natural experiment, we empirically assess the impact of the switch from wide-PPC to narrow-PPC on online booking prices in the E.U. using data from a group of hotel chains. Indeed, on the one hand, the lower incentives to price differentiate across channels potentially induced by narrow-PPCs should be particularly stronger for hotel chains because the direct channel represents a relevant substitute for OTAs (and thus the potential cannibalization of own sales should be a real concern). However, on the other hand, hotel chains are also more likely to hold a loyalty program, which could allow them to undercut prices posted on OTAs. In this latter scenario, the theory of harm associated to narrow-PPCs should not necessarily hold.

[6] See Paragraph 3 of the report on the monitoring exercise of the online booking sector carried out by the EC, available at the following link: http://ec.europa.eu/competition/ecn/hotel_monitoring_report_en.pdf

[7] This reasoning holds under the assumption that narrow-PPCs clauses are widely adopted by OTAs, or at least by the major OTAs in the market.

Using proprietary hotel-level data from different hotel chains that operate in European countries and also from hotels operating in a number of countries around the world, we carry out a simple reduced form analysis to test whether price differentiation across channels increased after the regulation change. This analysis represents an empirical test of the theory of harm associated to narrow-PPCs. Specifically, we compare average booking prices posted by these chains on the two largest OTAs of the market and on their own online direct channels, during years 2014 and 2016 for hotels located in the E.U. and in a group of non-E.U. countries. In other words, before-after and difference-in-differences analyses are performed using data from multiple hotel chains. The idea is to test whether the switch to narrow-PPCs has had an impact on the price differential between OTAs and the direct channel. Under the theory of harm postulated by the EC, the impact of the PPC switch on this price differential should not be significant.

Results from the before-after analysis suggest that, following the switch to narrow-PPC in the EU, average retail prices offered on the direct channel are more likely to be cheaper than average prices posted on OTAs. This result is robust to the comparison with retail prices posted in hotels located outside the E.U. (i.e., from a difference-in-differences analysis), but only for mid-level and luxury hotels. However, the difference-in-differences estimator shows no significant effects in France, and a significant effect in Germany but only for the mid-level hotels' segment. In these two countries, MFC clauses (including narrow-PPCs) between OTAs and hotels have been totally or partially banned. These latter results can be interpreted in two different ways. First, they may cast doubt on the effectiveness of the policy intervention, as no significant effect is observed in these countries compared to the average effect on non-EC countries. Second, they may be caused by the fact that the direct channel could have become relatively cheaper than OTAs in both E.U. and non-E.U. countries. For instance, retail reservation prices paid by EC citizens for hotel rooms located outside the E.U. may have also been influenced by the policy change.

This paper adds substantially to existing work on PPC clauses. Hunold *et al*. (2018) use data on posted prices for hotel rooms on OTAs (for instance, Booking.com and Expedia) and hotels' direct channels, during the period January-2016 to January-2017. The data was collected from the metasearch website Kayak.com. Taking advantage of the fact that Booking.com was prohibited to use narrow PPCs in Germany since February 2016, they

compare changes in some relevant outcomes in this country with respect to changes in other European countries. Results suggest that the abolition of the narrow-PPC increased the use of both Booking.com and the direct channel by hotels. With respect to pricing, in line with our results, they find that hotel chains establish their direct channels more often as a cheaper channel relative to major OTAs and as the cheapest online channel available.

Mantovani *et al*. (2017) analyze retail prices listed on Booking.com during the period 2014-2016 in three touristic regions of France, Italy and Spain. Their results suggest that prices decreased in 2015 and bounced back in 2016. In addition, it is shown that the 2014-2015 price reduction was sharper in France and Italy, compared to Spain, and that the posterior 2015-2016 price increase was less intense in these countries. The paper claims that these asymmetric changes across countries may be related to different intensities of antitrust enforcement, with France and Italy being more active than Spain in this regard. Finally, the paper suggests that the posterior 2016 price increase may be explained by demand shocks and/or technology improvements implemented by Booking.com (e.g., a better revenue management system).

The European Commission reportedly collected room price data posted on major metasearch websites and on the largest OTAs of the market. The main specification applied was a difference-in-differences approach using pricing data provided by metasearch websites and using hotels located in Canada as control group. Price differentiation was defined as a binary variable that takes the value of one when the price posted on one OTA differs by at least five percent from prices posted on other OTAs. The results of this analysis suggested a significant increase in price differentiation across OTAs because of the switch from wide to narrow-PPCs and as a result of the additional prohibitions set by France and Germany. This dataset was limited, however, as it did not consist of actual transaction data and could not include non-observed direct prices.[8]

[8] Further, in 2016 a group of ten E.U. competition authorities carried out a coordinated monitoring exercise of the online hotel booking sector. The purpose of this exercise was to measure the effects of the recent changes in PPCs contracts introduced by the major OTAs in the market. According to survey responses from September 2016, the main changes observed by respondents as a result to the switch to narrow-PPCs were (i) 21% - 31% of hotels said that they have differentiated across OTAs in terms of prices and room availability, respectively, (ii) 40% of hotels said that they have undercut prices posted on OTAs (via lower prices posted on their direct channels), (iii) 30% of hotels said that at least on certain periods they have chosen to make rooms available exclusively on their own direct channels and not on OTAs, (iv) approximately 50% of the hotels said that sales through their loyalty programs have increased, and (v) 90% of hotels said that there were no changes in terms of OTAs' commission fees.

The main distinguishing feature of this paper in comparison with previous empirical literature is that we rely on actual transaction prices. In addition, our dataset covers pre and post PPC removal periods (i.e., years 2014 and 2016), and it covers countries located both in and out of the EU, thus providing a substantial improvement in the empirical analysis of the existing theories of pricing behavior in the pricing parity, or MFN, literature. More generally, this paper contributes to evaluating these theories for the case of hotel chains and more broadly contributes to the literature on MFN clauses and price parity.

Similar questions to those for hotels and OTAs arise, for example, in the no discount policies present in contracts between payment card platforms and retailers. Payment cards typically do not allow retailers to charge a lower price for a cash purchase than for a card purchase. This has the effect of ensuring consumers do not choose between card and cash by taking into account the merchant fees that are present on card transactions, much like the fees or commissions that may exist on OTA transactions.

The rest of the paper is organized as follows. Section 2 briefly describes the evolution of PPC regulations in Europe. Section 3 presents the data and some basic summary statistics. Section 4 displays the results of an econometric assessment of the impact of the wide-PPC removal on booking prices. Finally, Section 5 summarizes our main conclusions.

2. Price parity clauses in the E.U.

In April 2015, in response to several antitrust concerns, competition authorities from France, Italy and Sweden, adopted parallel decisions accepting identical commitments from a market-leading OTA, Booking.com.[9] Specifically, these commitments are:[10]

i. Booking.com cannot prevent hotels from offering better or equal room prices via competing OTAs (but not via the direct channel);

ii. Booking.com cannot prevent hotels from offering discounted room prices provided that these are not marketed or made available to the general public online. In other

[9] For more details, see the following press release: https://webgate.ec.europa.eu/multisite/ecn-brief/en/content/french-italian-and-swedish-competition-authorities-accept-commitments-offered-bookingcom#_ftn

[10] The commitments were proposed by Booking.com on December 2014, and they had to be mandatorily executed no later than July-2015. See the summary of the decision by the French Competition Authority, available at: https://www.autoritedelaconcurrence.fr/en/communiques-de-presse/21-april-2015-online-hotel-booking-sector

words, discounted prices can be offered online to members of a hotel's loyalty program and/or via offline channels.

These commitments were, in practice, extended by Booking.com and Expedia across the EU. Hence, these countries moved from a scenario with wide-PPCs to one with narrow-PPCs. As mentioned before, a wide-PPC requires hotels to offer a given OTA the most favored prices in comparison to any other distribution channel, while a narrow-PPC allows a hotel to offer better prices through competing OTAs and through its own direct channel, provided that these latter discounts are part of a loyalty program.

According to these competition authorities, the adoption of narrow PPCs should generate a reduction in Booking.com commission rates and/or in an improvement of its quality of service, which will ultimately lead to lower room prices and/or better services for final consumers. Moreover, the commitments should also make it easier for new OTAs to enter the market or to expand their operations.

Some countries have not even accepted narrow-PPCs. For instance, in July 2015 the French parliament passed a law that prohibits PPCs. Similarly, in December 2015, the German competition authority prohibited the narrow PPC clauses of Booking.com.[11] During the second half of 2016 the Austrian government also banned PPCs in contracts between hotels and OTAs and Italy followed suit in mid-2017.[12] Table 1 summarizes National Competition Authority (NCA) decisions regarding PPCs in Europe.

[11] See Hunold *et al*. (2018) for an evaluation of the effects of the ban of Booking.com`s PPCs in this case.

[12] For more details, see the following online article: http://hotelanalyst.co.uk/2016/08/01/austria-moves-on-rate-parity/

Table 1 – Summary of NCA and legal decisions concerning PPCs (2013-2017)

Country	Date	Decision	Observations
Germany	December-2013	Prohibition of PPCs used by HRS (major OTA in Germany)	
France, Italy, Sweden	April-2015	Commitments by Booking to switch from wide-PPCs to narrow-PPCs	Booking and Expedia commit to narrow PPCs in all E.U. countries starting in July-2015 and in August-2015, respectively.
France	August-2015	*Loi Macron* voids all OTAs' PPCs	
Germany	December-2015	Prohibition of Booking narrow-PPCs	Expedia continues to apply narrow-PPCs in Germany
Austria	November 20116	All PPCs are rendered null	
Italy	August 2017	Rate parity clauses are banned	

Source: Report on the Monitoring Exercise Carried Out in the Online Hotel Booking Sector by E.U. Competition Authorities in 2016, Article 1 (166) of Annual Competition Law of Italy.

3. Data

Our dataset contains proprietary hotel-level data, for every Tuesday of years 2014 (pre-wide-PPC removal) and 2016 (post-wide-PPC removal), for different hotel chains that operate across a large number of countries in the E.U. and the rest of the world. We classified hotels in three different groups, namely (i) budget hotels, (ii) mid-level hotels, and (iii) luxury hotels. In all, we have information on hotels located in and out of the EU, accounting for approximately 1.6 million bookings per year.[13,14]

Every observation in the sample contains information of the number of room-nights sold and revenues (net of loyalty discounts) for bookings made through different channels:

[13] We do not consider chain-country combinations for which there is only information of only one year (either only 2014 or only 2016). Thus, under this criterion we dropped 0.26% of observations from sample of hotels in Europe. Similarly, we dropped 0.5% of observations from the sample of hotels located outside Europe.

[14] Hotels located in 13 different countries account for almost 80% of the observations in the sample of hotels located outside Europe.

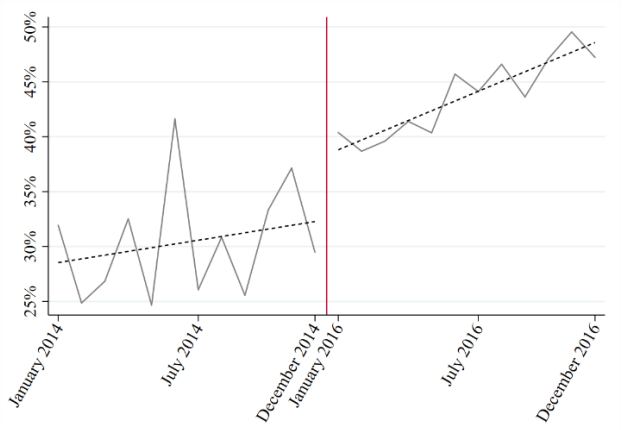
the hotels' own websites and two major OTAs. For instance, for the case of the E.U., these three channels account for almost 90% of the rooms booked online during the period covered for the sample. Table 2 exhibits basic summary statistics of booking prices of hotels located in the E.U. for the three different types of hotel (i.e., budget, mid-level and luxury) with prices normalized by the average price of the rooms sold in 2014 by hotel type.

Table 2 – Summary statistics on booking prices

Hotel Type	Var.	Booking Year	
		2014	2016
Budget	Bookings	904,046	1,087,017
	Mean	1.0000	1.0009
	Std. Dev.	0.3808	0.3977
	Min.	0.0000	0.0000
	Mac.	4.8997	5.1351
Mid-level	Bookings	419,454	555,098
	Mean	1.0000	1.0183
	Std. Dev.	0.3886	0.3778
	Min.	0.0000	0.0000
	Mac.	6.9746	5.4637
Luxury	Bookings	109,842	130,730
	Mean	1.0000	1.0780
	Std. Dev.	0.4970	0.4646
	Min.	0.0000	0.0000
	Mac.	15.6365	5.1451

Notes: For each hotel type, all prices have been normalized by the average retail price of 2014. In addition, all prices are net of loyalty discounts given to customers.

Figure 1 – Comparison of retail prices on direct channels and OTAs



Notes: The graph shows the percentage of mid-level hotels in E.U. countries for which the direct channel is on average cheaper than OTAs by at least 5%. In addition, each hotel-month observation has been weighed by the number of rooms booked on the direct channel (in order to compute a weighted average). The time at which the regulatory change happened is indicated by the vertical line.

Figure 1 displays the percentage of cases for which the average retail price for the direct channel was cheaper than the average retail price for OTAs. As shown in the graph, this percentage substantially increased after the regulation change (represented by the vertical line in the graph).[15]

4. Empirical analysis

The adoption of OTAs' commitments in the E.U. represents an exogenous variation of the contractual relationships between these platforms and hotels. This new regulation provides a structural change similar to a natural experiment that allows us to measure the impact of the switch from wide to narrow PPCs (or removal of PPCs in the cases of France and Germany) on different outcomes of interest. The idea is to compare the evolution of booking prices, before and after the adoption of the commitments by major OTAs, and across countries impacted and not impacted by the change in policy (as displayed in Table 1). Thus, a reduced form before-after analysis and a difference-in-differences approach are implemented in order to test the impact of this new policy on booking prices.

4.1 Estimating the impact of the policy change for the E.U. countries

The adoption of narrow-PPCs allows hotels to offer discounted retail prices, provided that these discounts are offered to the members of their loyalty programs. Therefore, thanks to these devices, one should expect the actual prices paid by travelers on the direct channel to be lower in 2016 than in 2014, compared to prices paid by travelers on OTAs.[16] In order to test this hypothesis we estimate the following reduced-form Linear Probability Model:

[15] Note that average retail price is across all room types reserved by clients. Our conjecture is that higher quality rooms may be more likely to be booked via the direct channel than standard room types, suggesting that the average price for direct channels would be somewhat higher than the average price for indirect channels, even if room prices are identical across channels for the same room type.

[16] Based on a nested-logit model of demand, we test whether channel substitution is relevant from the point of view of consumers, as reported in the Appendix. If this is indeed the case, then any contractual clause affecting the relative retail prices posted on different channels is likely to have an impact on the degree of competition across channels. Results from the demand estimation suggest that channel substitution is indeed relevant, with travelers being more likely to substitute among channels (for a given hotel-type), rather than to substitute among hotel-types. The presence of multiple channels (including the direct channel) may play an important role in disciplining the behavior of major OTAs and in mitigating any potential form of market power exploitation at the retail level.

$$DC_{i,t}^{\delta} = \alpha \times narrow\_ppc_t + X_{i,t} \times \beta + \mu_{i,t}, \quad (1)$$

where $DC_{i,t}^{\delta}$ is a binary variable that takes the value of one if the average retail price of the direct channel for hotel i at date t is cheaper than the average retail price posted on OTAs, by more than δ%.[17] The idea is to capture whether the probability of the direct channel being cheaper than OTAs on a given date has increased after the switch to narrow-PPCs. The variable $narrow\_ppc_t$ is a binary variable that takes the value of one if the booking date belongs to year 2016, the period after the switch to narrow-PPCs. In addition, $X_{i,t}$ is a vector of observable hotel characteristics which, in this case, considers the average length of stay for the three different channels (i.e., the two OTAs and the direct channel) of the reservations booked on a given date t. We use clustered standard errors at the city level. The coefficient of interest α represents a before-after estimator of the impact of the switch to narrow-PPC in the EU.

Results are displayed in Table 3, considering values for δ of 2.5% (Columns 1 to 3), 5% (Columns 4 to 6) and 10% (Columns 7 to 9). In turn, the lengths of stay variables are classified into direct channel (DC), and OTA_1 and OTA_2. As seen in the table, there is a significant increase in the probability of the direct channel being on average cheaper than OTAs post-switch to narrow-PPC, for all the values of δ and for all hotel types. However, the magnitude of the coefficients is larger for the most expensive hotel types (i.e., mid-level and luxury). These results are robust to the introduction of hotel fixed effects.[18]

In addition, the fact that consumers are sensitive to price differences between channels may suggest that any restriction on the ability of hotels to offer differentiated prices across online distribution channels can result in negative consequences for travelers' welfare.

[17] A similar econometric approach is adopted by the report on the monitoring exercise of the online booking sector carried out by the EC, available at the following link: http://ec.europa.eu/competition/ecn/hotel_monitoring_report_en.pdf

[18] Note that in this case we do not introduce time-fixed effects because they are collinear with the variable $narrow\_ppc_t$.

Table 3 – Before-after analysis on E.U. countries

	Probability of the direct channel being on average cheaper than OTAs: $DC_{i,t}^{\delta}$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury
	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 10\%$	$\delta = 10\%$	$\delta = 10\%$
Narrow PPC	0.0398***	0.146***	0.158***	0.0317***	0.139***	0.129***	0.0177**	0.108***	0.0803***
	(0.00990)	(0.0109)	(0.0284)	(0.00970)	(0.0102)	(0.0268)	(0.00767)	(0.00866)	(0.0213)
Length of stay (OTA_1)	-0.0288***	0.00652*	0.0288**	-0.0231***	0.00857**	0.0324**	-0.0172***	0.00708**	0.0269**
	(0.00545)	(0.00367)	(0.0139)	(0.00549)	(0.00352)	(0.0141)	(0.00398)	(0.00349)	(0.0123)
Length of stay (OTA_2)	-0.00636**	-0.00355	-0.00892	-0.00403	-0.00190	-0.00728	0.000616	0.00146	1.47e-05
	(0.00286)	(0.00291)	(0.00909)	(0.00286)	(0.00274)	(0.00858)	(0.00250)	(0.00255)	(0.00762)
Length of stay (DC)	-0.0119**	-0.00838	-0.0164	-0.00846*	-0.00678	-0.0132	-0.00211	-0.00766*	-0.0143
	(0.00510)	(0.00534)	(0.0175)	(0.00476)	(0.00531)	(0.0152)	(0.00422)	(0.00436)	(0.0122)
Constant	0.535***	0.361***	0.238***	0.447***	0.309***	0.197***	0.273***	0.231***	0.116**
	(0.0175)	(0.0177)	(0.0667)	(0.0169)	(0.0179)	(0.0625)	(0.0141)	(0.0158)	(0.0504)
Observations	37,832	28,741	2,568	37,832	28,741	2,568	37,832	28,741	2,568
N. of Hotels	643	485	30	643	485	30	643	485	30
Month dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors in parenthesis (clustered at the city level), *** p<0.01, ** p<0.05, * p<0.1. The estimation of Equation (1) only considers hotels for which there is at least one online booking during both years 2014 and 2016.

In addition, in order to verify whether these results are robust to the comparison with the evolution of retail prices of hotels located outside the EU, we estimate the following Linear Probability Model:

$$DC_{i,t}^{\delta} = \alpha_1 \times narrow\_ppc_t + \alpha_2 \times eu_i + \alpha_3 \times narrow\_ppc_t \times eu_i + X_{i,t} \times \beta + \mu_{i,t}. \quad (2)$$

The dependent variable in Equation (2) is the same as in Equation (1). We include the binary variable eu_i which takes the value of one if hotel i is located in the EU. The interaction between $narrow\_ppc_t$ and eu_i captures differences between the evolutions of prices in the E.U. compared to hotels located in other continents, and differences between prices before and after the switch to narrow-PPC. Thus, the coefficient of interest α_3 represents a difference-in-differences estimator of the impact of the switch to narrow-PPC on the probability of the direct channel being cheaper than OTAs in the EU.

Results are reported in Table 4 and suggest that the probability of the direct channel being cheaper than OTAs has indeed increased in the E.U. compared to hotels located in other continents, but only for mid-level and luxury hotels. These results are robust to the introduction of hotel fixed effects and month fixed effects.

Table 4 – Difference-in-differences analysis on E.U. versus other continents

	Probability of the direct channel being on average cheaper than OTAs: $DC_{i,t}^{\delta}$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury
	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 10\%$	$\delta = 10\%$	$\delta = 10\%$
Narrow-PPC	0.0603***	0.0694***	0.0685***	0.0546***	0.0572***	0.0583**	0.0318**	0.0461***	0.0550**
	(0.0152)	(0.0141)	(0.0248)	(0.0133)	(0.0143)	(0.0244)	(0.0125)	(0.0133)	(0.0234)
EU	-0.0589***	-0.199***	-0.276***	-0.0392*	-0.197***	-0.266***	-0.0255	-0.174***	-0.234***
	(0.0225)	(0.0175)	(0.0391)	(0.0215)	(0.0178)	(0.0391)	(0.0181)	(0.0169)	(0.0346)
Narrow-PPC x EU	-0.0195	0.0760***	0.0884**	-0.0222	0.0814***	0.0683*	-0.0137	0.0620***	0.0234
	(0.0183)	(0.0178)	(0.0373)	(0.0166)	(0.0175)	(0.0362)	(0.0147)	(0.0158)	(0.0315)
Length of stay (OTA_1)	-0.0153***	0.00638**	0.00124	-0.0111***	0.00886***	0.00156	-0.00565*	0.0104***	0.00189
	(0.00382)	(0.00298)	(0.00619)	(0.00389)	(0.00289)	(0.00619)	(0.00315)	(0.00289)	(0.00573)
Length of stay (OTA_2)	-0.00587***	-0.00127	-0.0205***	-0.00339	-0.000234	-0.0189***	0.00133	0.00247	-0.0177***
	(0.00214)	(0.00236)	(0.00454)	(0.00218)	(0.00232)	(0.00401)	(0.00199)	(0.00212)	(0.00406)
Length of stay (DC)	-0.0119***	-0.0181***	-0.0270***	-0.00961***	-0.0165***	-0.0311***	-0.00848***	-0.0150***	-0.0276***
	(0.00344)	(0.00456)	(0.00928)	(0.00328)	(0.00454)	(0.00967)	(0.00314)	(0.00379)	(0.0104)
Constant	0.574***	0.585***	0.576***	0.469***	0.529***	0.545***	0.291***	0.420***	0.442***
	(0.0240)	(0.0228)	(0.0466)	(0.0237)	(0.0229)	(0.0482)	(0.0204)	(0.0212)	(0.0458)
Observations	49,694	36,769	6,576	49,694	36,769	6,576	49,694	36,769	6,576
N. of Hotels	916	656	102	916	656	102	916	656	102
Month dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors in parenthesis (clustered at the city level), *** p<0.01, ** p<0.05, * p<0.1. The estimation of Equation (2) only considers hotels for which there is at least one online booking during both years 2014 and 2016.

4.2 The case of France and Germany

One way to verify whether the increase in the probability of the direct channel being cheaper than OTAs is explained by the switch to narrow PPC (in E.U. countries), or by the ban of all kinds of PPCs (mainly in France and Germany), is to test whether there is a differentiated impact in France and Germany compared to the rest of E.U. countries. Tables 5 and 6 replicate the results displayed in Tables 3 and 4, respectively, but splitting the coefficient of interest (i.e., either the before-after coefficient in Table 3, or the difference-in-differences coefficient in Table 4) into three different dummy variables according to whether hotel i is located in France, Germany or another E.U. country.

Table 5 – Before-after analysis on E.U. countries with fixed effect for France and Germany

	Probability of the direct channel being on average cheaper than OTAs: $DC_{i,t}^{\delta}$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury
	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 10\%$	$\delta = 10\%$	$\delta = 10\%$
Narrow PPC x France	0.0312***	0.0490***	0.112***	0.0244***	0.0452***	0.0927***	0.00931	0.0269***	0.0709***
	(0.00858)	(0.0107)	(0.0210)	(0.00860)	(0.00924)	(0.0189)	(0.00758)	(0.00891)	(0.0231)
Narrow PPC x Germany	0.0225	0.237***	0.158**	0.0168	0.229***	0.144**	0.00968	0.202***	0.0800**
	(0.0171)	(0.0133)	(0.0655)	(0.0154)	(0.0139)	(0.0633)	(0.0133)	(0.0143)	(0.0392)
Narrow PPC x Other E.U. countries	0.0563***	0.195***	0.183***	0.0458**	0.186***	0.145***	0.0308**	0.140***	0.0861**
	(0.0190)	(0.0145)	(0.0399)	(0.0184)	(0.0150)	(0.0400)	(0.0140)	(0.0128)	(0.0346)
Length of stay (OTA_1)	-0.0290***	0.00672*	0.0300**	-0.0233***	0.00880**	0.0345**	-0.0174***	0.00770**	0.0294**
	(0.00544)	(0.00371)	(0.0140)	(0.00549)	(0.00354)	(0.0141)	(0.00397)	(0.00354)	(0.0122)
Length of stay (OTA_2)	-0.00663**	-0.00564*	-0.00812	-0.00427	-0.00378	-0.00588	0.000361	8.55e-05	0.00190
	(0.00288)	(0.00293)	(0.00892)	(0.00288)	(0.00275)	(0.00851)	(0.00253)	(0.00251)	(0.00766)
Length of stay (DC)	-0.0123**	-0.0110**	-0.0152	-0.00885*	-0.00906*	-0.0106	-0.00259	-0.00913**	-0.0102
	(0.00514)	(0.00541)	(0.0176)	(0.00478)	(0.00535)	(0.0162)	(0.00422)	(0.00433)	(0.0133)
Constant	0.537***	0.371***	0.234***	0.449***	0.318***	0.185***	0.275***	0.236***	0.0981*
	(0.0172)	(0.0174)	(0.0684)	(0.0165)	(0.0176)	(0.0664)	(0.0140)	(0.0155)	(0.0542)
Observations	37,832	28,741	2,568	37,832	28,741	2,568	37,832	28,741	2,568
N. of Hotels	643	485	30	643	485	30	643	485	30
Month dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors in parenthesis (clustered at the city level), *** p<0.01, ** p<0.05, * p<0.1. The estimation of Equation (1) only considers hotels for which there is at least one online booking during both years 2014 and 2016.

Results from the before-after estimations in Table 5 show that the coefficients for France are almost always positive and significant, but lower in magnitude compared to Germany and the rest of E.U. countries (on average), at least for the mid-level and luxury hotels. In turn, coefficients for Germany and the rest of E.U. countries are in general similar (except for budget hotels).

Results of the difference-in-differences estimations displayed in Table 6 suggest that there is no significant effect for France, and a positive and significant effect for Germany but only for the case of mid-level hotels. These results can be interpreted in two different ways. First, they may cast doubt on the effectiveness of the regulatory intervention that totally or partially banned PPCs on these countries, as no significant effect is observed compared to the average effect on non-EC countries. However, it must be noticed that the results for France could have been disrupted by the impact of the unmeasurable effects of terrorist attacks in Paris during this period. For Germany, note that in theory the narrow PPCban does not apply for other OTAs. Second, the lack of significance for these two countries compared to hotels located in non-E.U. countries (i.e., the non significativity of the difference-in-differences

coefficients), may reflect the fact that the regulatory change in the EC had effects on the booking prices paid for reservations in hotels located outside the EU. Indeed, as the before-after coefficient in all the regressions is positive and significant, it may be the case that the switch from narrow to wide PPC had an effect on the average booking prices paid in and out of the E.U. (i.e., the "Narrow-PPC" coefficient). For instance, prices paid by EC citizens for hotels located outside the E.U. could be also impacted by the switch to narrow-PPC or by the ban of PPCs; if the fraction of these type of reservations is significant in our sample, then it could be the case that the policy change had a significant impact in both E.U. and non-E.U. countries.

Table 6 –Difference-in-differences analysis on E.U. versus other continents with fixed effect for France and Germany

	Probability of the direct channel being on average cheaper than OTAs: $DC_{i,t}^{\delta}$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury	Budget	Mid-level	Luxury
	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 2.5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 5\%$	$\delta = 10\%$	$\delta = 10\%$	$\delta = 10\%$
Narrow-PPC	0.0603***	0.0699***	0.0686***	0.0546***	0.0579***	0.0585**	0.0317**	0.0467***	0.0550**
	(0.0152)	(0.0142)	(0.0248)	(0.0133)	(0.0144)	(0.0245)	(0.0125)	(0.0134)	(0.0234)
EU	-0.0578**	-0.197***	-0.274***	-0.0382*	-0.194***	-0.265***	-0.0245	-0.172***	-0.233***
	(0.0225)	(0.0175)	(0.0394)	(0.0214)	(0.0178)	(0.0394)	(0.0181)	(0.0169)	(0.0347)
Narrow-PPC x France	-0.0292*	-0.0198	0.0450	-0.0314*	-0.0109	0.0314	-0.0241	-0.0179	0.0163
	(0.0176)	(0.0176)	(0.0323)	(0.0161)	(0.0170)	(0.0315)	(0.0148)	(0.0160)	(0.0334)
Narrow-PPC x Germany	-0.0357	0.162***	0.0838	-0.0364*	0.165***	0.0662	-0.0223	0.150***	-0.00574
	(0.0226)	(0.0194)	(0.0642)	(0.0201)	(0.0199)	(0.0610)	(0.0180)	(0.0194)	(0.0342)
Narrow-PPC x Other E.U. countries	-0.00199	0.126***	0.113**	-0.00589	0.129***	0.0880*	0.00229	0.0942***	0.0349
	(0.0245)	(0.0201)	(0.0474)	(0.0229)	(0.0206)	(0.0471)	(0.0187)	(0.0183)	(0.0418)
Length of stay (OTA_1)	-0.0154***	0.00666**	0.00132	-0.0112***	0.00915***	0.00161	-0.00573*	0.0108***	0.00186
	(0.00382)	(0.00300)	(0.00620)	(0.00389)	(0.00289)	(0.00619)	(0.00314)	(0.00290)	(0.00573)
Length of stay (OTA_2)	-0.00603***	-0.00242	-0.0204***	-0.00354	-0.00126	-0.0188***	0.00118	0.00167	-0.0177***
	(0.00216)	(0.00241)	(0.00454)	(0.00219)	(0.00235)	(0.00402)	(0.00200)	(0.00212)	(0.00406)
Length of stay (DC)	-0.0121***	-0.0198***	-0.0271***	-0.00981***	-0.0180***	-0.0311***	-0.00870***	-0.0160***	-0.0276***
	(0.00345)	(0.00455)	(0.00929)	(0.00328)	(0.00453)	(0.00969)	(0.00313)	(0.00375)	(0.0104)
Constant	0.575***	0.590***	0.575***	0.470***	0.533***	0.545***	0.291***	0.422***	0.442***
	(0.0239)	(0.0228)	(0.0466)	(0.0236)	(0.0229)	(0.0483)	(0.0203)	(0.0212)	(0.0458)
Observations	49,694	36,769	6,576	49,694	36,769	6,576	49,694	36,769	6,576
N. of Hotels	916	656	102	916	656	102	916	656	102
Month dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors in parenthesis (clustered at the city level), *** p<0.01, ** p<0.05, * p<0.1. The estimation of Equation (2) only considers hotels for which there is at least one online booking during both years 2014 and 2016.

5. Conclusion

This paper is aimed at assessing the impact of the wide-PPC removal on online booking prices that resulted from the commitments adopted by the two largest OTAs of the market in Europe, during the year 2015. Results from both a set of before-after specifications and a set of differences-in-differences specifications suggest that following the wide-PPC removal in the EU, the probability of the direct channel being on average cheaper than OTAs has significantly increased at least for the groups of mid-level and luxury hotels. Thus, these results shed light on the potentially effects of PPCs on online booking prices. In particular, the evidence presented in this paper suggests that the presence of wide-PPCs between OTAs and hotel own direct channels could result in a softening of price-competition among these channels.

However, the difference-in-differences estimator shows no significant effect in France, and a significant effect in Germany but only for the mid-level hotels' segment. In these two countries, MFN clauses between OTAs and hotels have been totally or partially banned. These latter results can be interpreted in two different ways. First, they may cast doubt on the effectiveness of the policy intervention. However, it must be noticed that the results for France could have been disrupted by the impact of the unmeasurable effects of terrorist attacks in Paris in 2015, even though these were mostly outside the dates reviewed. For Germany, even if Booking.com is not allowed to engage in PPCs with hotels, this legal obligation does not necessarily apply to other OTAs. Second, they may be caused by the fact that the direct channel could have become relatively cheaper than OTAs in both E.U. and non-E.U. countries. Indeed, this could be the case if, for example, retail reservation prices paid by EC citizens for hotel rooms located outside the E.U. may be also influenced by the policy change. Indeed, as the before-after coefficient in Table 6 is always positive and significant, this may be the case.

Our results are relevant not only for the specific questions related to impacts of hotel and OTA PPC clauses, but also provide empirical evidence on the nature of MFN impacts. While we do not suggest the results are necessarily directly applicable to other industries, the results may provide information on default expectations when key industry characteristics are similar.

Future work could usefully develop a structural model of supply and demand for different channels and hotel types in order to understand the ways that MFN clauses affect

buyer and seller reactions. Such an extension could explore how substitution patterns affect outcomes and examine whether platform market power exists in the hotel sector.

Appendix - Channel substitution

Here, we build a discrete choice model of demand for online hotel booking channel using aggregated data. A product or service j is defined as a hotel-room booked in a certain channel-hotel-type combination. We consider for now three online channels: OTA_1, OTA_2 and the direct channel (own hotel websites). In addition, as in the previous section hotels are classified in three types: budget, mid-level and luxury. Moreover, a market is defined as a city-date combination. Using these definitions, the indirect utility that consumer i derives from booking a hotel-room offered by channel-hotel-type j is defined as follows (for the sake of exposition we omit the subscript m denoting a market):

$$u_{i,j} = \alpha p_j + x_j\beta + \xi_j + \varepsilon_{i,j}, \tag{5}$$

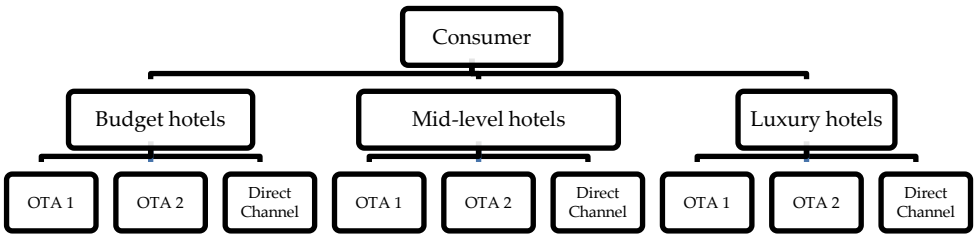
where p_j represents the average booking price of a hotel-room offered by channel-hotel-type j (for a given market). In turn, x_j is a vector of observable characteristics, which in this case only considers the average length of stay of reservations booked on a given date. The variable ξ_j corresponds to unobservable product characteristics, and $\varepsilon_{i,j}$ is a random utility term that represents an individual-specific taste parameter, and its assumed to be independently and identically distributed with a Type-I extreme-value distribution.

It is assumed that consumers` choice of channel is nested on the choice of type of hotel, which allows unobserved consumer heterogeneity in the valuation of the hotel-type dimension. (See Björnerstedt and Verboven, 2016.) This nesting structure is convenient for two reasons. First, it allows us to directly test whether substitution across channels is more likely than substitution across hotel-types. Indeed, the nested-logit structure accounts for the possibility of market segmentation, by allowing cross-price elasticities between channels (for a given hotel-type), to be greater than cross-price elasticities between different hotel-types.

Second, one feature of nested-logit models is that the Independence of Irrelevant Alternatives (IIA) assumption must be satisfied between products of the same nest, but not across products belonging to different nests. Thus, it seems more realistic to assume that the IIA assumption holds for channel choice, rather than for hotel-type choice.[19]

The nesting structure is illustrated in Figure A.1. In this diagram, travelers can choose between nine different products given by the different channel-hotel-type combinations.

Figure A.1 – Consumer`s choice of hotel-room



Following Berry (1994), this demand model can be estimated with aggregated market shares through the following equation:

$$\ln\left({}^{s_j}/_{s_0}\right) = x_j\beta + \alpha p_j + \sigma \ln\left(s_{j,g}\right) + \xi_j \qquad (6)$$

where s_j is the market share of channel-hotel-type j with respect to the size of the market, which we define as the number of air-passenger arrivals on a given city-month. In turn, s_0 is the market share of the outside option, and $s_{j,g}$ is the market share of channel-hotel-type j

[19] For instance, in an extreme scenario in which luxury hotels exit the market, it is very likely that travelers who prefer this type of hotels would switch to the closest option in terms of comfort (i.e., mid-level hotels), rather than switching to low-cost hotels. Thus, it is clear that the IIA assumption would not hold in such case, considering that IIA would require market shares of both budget and mid-level hotels to increase by the same proportions.

within each nest. The coefficient α is a measure of price-sensitivity of demand with respect to prices, and σ captures correlation in preferences for products that belong to the same nest (its value should satisfy $0 \leq \sigma \leq 1$). In other words, if σ is significantly different to zero, it would be an indicator that substitution within products of the same nest is more likely than substitution across products that belong to different nests. We also include product and time fixed effects.

Note that both p_j and $s_{j,g}$ in Equation (6) are endogenous. Following a similar approach to the one proposed by Björnerstedt and Verboven (2016), we use the number of competitors as instruments; the idea is to capture heterogeneous supply conditions across markets that may not be necessarily correlated with ξ_j in the short run (e.g., entry of new hotels motivated by long-run considerations). For a given product j, the following instruments are constructed: (i) number of competing hotels within the same channel and hotel-type, (ii) number of competing hotels within the same channel, but from different hotel-types, (iii) number of competing hotels from other channels, but within the same hotel-type, and (iv) number of competing hotels from other channels, and from different hotel-types.

Table A.1 exhibits basic summary statistics. Each observation in the sample is a combination of hotel-type, channel, city and date. Note that since the number of commercial air-passenger arrivals is used as proxy for market size, the table only considers observations for which there is a perfect match between the name of the city in which hotels and airports are located.[20] This reduces the size of the sample to one-fifth or our original sample.[21]

[20] Air-passenger transport, by main airports and countries are obtained from Eurostat (link: http://ec.europa.eu/eurostat/web/transport/data/database)

[21] In a future version of the paper, we expect to increase the number of cities included in this section, by considering matches between hotels and airports located in neighbor municipalities.

Table A.1 – Summary statistics (EU, booking-year 2016)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Price	25,610	1.4000	0.7296	0.1556	13.7301
Market share	25,610	0.0112	0.0232	0.0000	0.6789
Length of stay	25,610	1.7922	0.7794	1.0000	16.0000
Number of hotels:					
Same type, same channel	25,610	1.2246	3.1411	0.0000	31.0000
Same type, other channels	25,610	4.3115	6.2652	0.0000	64.0000
Other types, same channel	25,610	2.7834	5.7791	0.0000	63.0000
Other types, other channels	25,610	5.5426	11.4621	0.0000	121.0000

Table A.2 displays our demand estimates. The α coefficient has the expected negative sign in all specifications, and as it is usually the case in the estimation of demand models, the OLS coefficient underestimates its magnitude. The σ is significantly higher than zero, suggesting that travelers are indeed more likely to substitute across channels (for a given hotel-type), rather than to substitute across hotel-types. In specifications (3) and (6), we included city fixed-effects in order to capture market-specific characteristics that can be heterogeneous across cities, for instance, marketing expenditures.

Table A.2 – Nested logit estimates (EU, booking-year 2016)

	(1)	(2)	(3)	(4)	(5)	(6)
I	OLS	OLS	OLS	IV	IV	IV
VARIABLES	$\ln\left(s_j/s_0\right)$	$\ln\left(s_j/s_0\right)$	$\ln\left(s_j/s_0\right)$	$\ln\left(s_j/s_0\right)$	$\ln\left(s_j/s_0\right)$	$\ln\left(s_j/s_0\right)$
(α) Price	-0.0443***	-0.0201**	-0.0151***	-0.132***	-0.141***	-0.234***
	(0.00789)	(0.00718)	(0.00291)	(0.0227)	(0.0305)	(0.0550)
(σ) $\ln(s_{j,g})$	0.967***	0.961***	0.894***	0.898***	0.864***	0.796***
	(0.0691)	(0.0719)	(0.0335)	(0.0934)	(0.133)	(0.283)
Length of stay	-0.178***	-0.161***	0.157***	-0.142***	-0.135***	0.243**
	(0.0359)	(0.0347)	(0.0324)	(0.0320)	(0.0373)	(0.108)
Constant	-3.665***	-3.435***	-4.027***	-2.748***	-2.478***	-2.428***
	(0.210)	(0.152)	(0.136)	(0.261)	(0.357)	(0.695)
Observations	25,610	25,610	25,610	25,610	25,610	25,610
Number of products	9	9	9	9	9	9
Product F.E.	NO	YES	YES	NO	YES	YES
Month F.E.	NO	YES	YES	NO	YES	YES
City F.E.	NO	NO	TES	NO	NO	TES

Notes: Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

References

1. Akman, P. and D. Sokol (2017), "Online RPM and MFN under Antitrust Law and Economics", Review of Industrial Organization, 50(2), 133-151.
2. Autor, D. H. (2003), "Outsourcing at Will: The Contribution of Unjust Dismissal Doctrine to the Growth of Employment Outsourcing", Journal of Labor Economics, 2003, vol. 21, no. 1
3. Boik, A. and K.S. Corts (2016), "The Effects of Platform Most-Favored-Nation Clauses on Competition and Entry", The Journal of Law and Economics 59, no. 1 (February 2016): 105-134
4. Edelman, B. and J. Wright (2015), "Price Coherence and Excessive Intermediation", Quarterly Journal of Economics, 130(3), 1283-1328.
5. European Commission (2016), "Report on the Monitoring Exercise Carried Out in the Online Hotel Booking Sector by E.U. Competition Authorities in 2016", available in the following link: http://ec.europa.eu/competition/ecn/hotel_monitoring_report_en.pdf
6. Ezrachi, A. (2016), "The Competitive Effects of Parity Clauses on Online Commerce", European Competition Journal, 11(3), 488-519.
7. Fletcher, A. and M. Hviid (2017), "Broad Retail MFN Clauses: Are They RPM at its Worst?", Antitrust Journal, 81(1), 61-98.
8. González-Díaz, F.E. and M. Bennett (2015), ""The Law and Economics of Most-Favoured Nation Clauses","Competition Law & Policy Debate, 1(3), 26-41.
9. Hunold, M., R. Kesler, U. Laitenberger and F. Schlütter (2018), "Evaluation of Best Price Clauses in Hotel Bookings", International Journal of Industrial Organization, Elsevier, 2018, 61, pp.542-571
10. Johnson, J. P, (2017), "The Agency Model and MFN Clauses", The Review of Economic Studies 84.3 (2017): 1151-1185
11. Johansen, B.O. and T. Vergé (2017), "Platform Price Parity Clauses with Direct Sales", University of Bergen Working Paper No. 1.17.
12. Mantovani, A., C. Piga, and C. Reggiani, (2017), "The Dynamics of Online Hotel Prices and the E.U. Booking.Com Case". NET Institute Working Paper No. 17-04. Available at SSRN: https://ssrn.com/abstract=3049339

13. Proserpio, D., and G. Zervas (2017), "Online Reputation Management: Estimating the Impact of Management Responses on Consumer Reviews", Marketing Science, permanent link: https://doi.org/10.1287/mksc.2017.1043
14. Sridhar, M. and R.A. Winter (2006), "Price-Matching Guarantees", The RAND Journal of Economics, 37(2), 449-465.
15. Wals, F. and M.P. Schinkel (2018), "Platform Monopolization by Narrow-PPC-BPG Combination: Booking et al.", International Journal of Industrial Organization, Volume 61, November 2018, Pages 572-589
16. Wang, C. and J. Wright (2020), "Search Platforms: Showrooming and Price Parity Clauses", the RAND Journal of Economics, Volume 51, Issue 1 Spring 2020, Pages 32-58 .