Discussion Paper No. 16-066

Evaluation of Best Price Clauses in Hotel Booking

Matthias Hunold, Reinhold Kesler,
Ulrich Laitenberger, and Frank Schlütter

ZEW

Zentrum für Europäische
Wirtschaftsforschung GmbH

Centre for European
Economic Research

Discussion Paper No. 16-066

Evaluation of Best Price Clauses in Hotel Booking

Matthias Hunold, Reinhold Kesler,
Ulrich Laitenberger, and Frank Schlütter

First Version: October 7, 2016
This Version: April 23, 2017

Download this ZEW Discussion Paper from our ftp server:

http://ftp.zew.de/pub/zew-docs/dp/dp16066.pdf

Evaluation of best price clauses in online hotel booking

Matthias Hunold*, Reinhold Kesler†,

Ulrich Laitenberger‡ and Frank Schlütter§

First Version: October 7, 2016

This Version: April 23, 2017

Abstract

We analyze the best price clauses (BPCs) of online travel agents (OTAs) using meta-search price data of nearly 30,000 hotels in different countries. We find that BPCs influence the pricing and availability of hotel rooms across online sales channels. In particular, the abolition of Booking.com's narrow BPC is associated with the hotels' direct channel having the strictly lowest price more often. Moreover, hotels publish their offers more often at Booking.com when it does not use the narrow BPC, and also tend to promote the direct online channel more actively.

Keywords: Best price clauses, evaluation, hotel booking, MFN, OTA, vertical restraints.

JEL Class: D40, L42, L81

*Heinrich-Heine-Universität (HHU) Dusseldorf, Dusseldorf Institute for Competition Economics (DICE), Universitätsstr. 1, 40225 Dusseldorf, Germany; E-mail: hunold@dice.hhu.de.

†ZEW Centre for European Economic Research, MaCCI Mannheim Centre for Competition and Innovation, Address: L7,1, 68161 Mannheim, Germany; E-mail: kesler@zew.de.

‡ZEW Centre for European Economic Research, MaCCI Mannheim Centre for Competition and Innovation, Address: L7,1, 68161 Mannheim, Germany; E-mail: laitenberger@zew.de.
Affiliated researcher - KU Leuven, Department of Managerial Economics, Strategy and Innovation, Naamsestraat 69, 3000 Leuven, Belgium.

§DICE as above; E-mail: schluetter@dice.hhu.de.

Financial support by the State Government of Baden-Württemberg, Germany, through the research program 'Strengthening Efficiency and Competitiveness in the European Knowledge Economies' (SEEK) is gratefully acknowledged.

We thank participants at the ICT Conference in Mannheim 2016, the Media Economics Workshop in Zurich 2016, the IIOC in Boston 2017, the IODE Workshop in Liège 2017, the MaCCI annual conference in Mannheim 2017, seminar participants at DIW Berlin, the University of Cologne, the University of St. Gallen, and in particular Irene Bertschek, Tomaso Duso, Justin Johnson, Michael Kummer, Martin Peitz, and Hannes Ullrich for helpful comments.

1 Introduction

Motivated by recent proceedings against best price clauses (BPCs) imposed by online travel agents (OTAs), we empirically investigate the effects of such clauses using meta-search price data of nearly 30,000 hotels in various countries.[1] Under a BPC, an OTA obliges the hotel not to offer better prices or conditions on other distribution channels than on the OTA. Various National Competition Authorities in Europe agreed that best price clauses could restrict competition between OTAs for commission rates, but eventually arrived at different assessments and decisions.[2]

These differences trigger the question how BPCs actually affect the market outcome. While the theoretical literature on this topic is developing rapidly and shows that BPCs can harm consumers (Boik and Corts, 2016; Edelman and Wright, 2015; Johnson, 2017; Wang and Wright, 2017), empirical research is yet very limited. With this article we start to fill the gap.

We exploit the variation in the BPCs due to different national enforcement policies across various countries and over time. The different national decisions seem to be due to differences in the assessments rather than to fundamental differences in the market characteristics in each country (see Hunold, 2016). For instance, the French competition authority had accepted Booking.com's commitments to narrow down the parity clauses in April 2015, just to be overruled by the French parliament that completely prohibited BPCs of OTAs in July 2015. These different decisions provide a quasi-experimental setup for assessing the effects of different BPC policies.

Our focus is on analyzing how the abolition of a BPC has influenced on which distribution channels hotels publish prices (OTAs and their direct channel) and the pricing of the same hotel room across these channels. A BPC can restrict price differentiation as it forbids hotels to charge higher room prices at the OTA imposing the clause than on other channels covered by the clause (narrow BPCs cover only the direct channel, wide BPCs also other OTAs)[3]. There are related clauses, such as availability requirements, which

[1] In this article, we generally refer to hotels as the typical accommodations on offer at a booking platform. In its general terms and conditions, Booking.com uses the term "accommodation". Other types of accommodation present on OTAs include, for example, holiday apartments.

[2] See Annex IV for a list of the different decisions.

[3] Under a *wide* BPC, an OTA obliges the hotel not to charge a higher price on the OTA than on almost any other booking channel, which in particular includes other OTAs and the hotel's own direct

further restrict a hotel's sales strategy. If a hotel faces less parity restrictions, it might thus price differentiate more across channels. In particular, a hotel could lower the prices on its direct channel, where the marginal distribution costs are potentially lowest. A hotel might also start using an OTA that has relaxed its parity clauses, and could start using other channels which had been less attractive to use in view of these restrictions.

We use data of the period January 2016 to January 2017 from Kayak. Kayak is a travel meta-search engine that displays the prices of the same hotel room at different online channels, in particular the OTAs and the hotel website. Our empirical approach is twofold: In view of different BPC policies across countries, we use cross-sectional statistics to investigate the channel choice and pricing across channels. Moreover, we mainly analyze the removal of Booking.com's narrow BPC in Germany since February 2016.[4] By means of regression analyses we compare the time trend in the market outcome in Germany with the trend in other countries without such a change of the BPCs in the course of 2016. We refer to this approach as *difference-in-trends*.[5]

We find that more hotels start using Booking.com as a distribution channel following the abolition of Booking.com's price parity and minimum availability clauses in Germany – also relative to the developments in unaffected countries. This result suggests that a part of the hotels indeed responds to parity clauses by not being active at an OTA imposing them. Similarly, hotels that had already been active on Booking.com before increasingly publish prices there. Moreover, we observe a distinctive increase in the availability of the direct online channel prices at Kayak in Germany, also relative to other countries. This indicates that hotels increasingly promote the direct channel when they are not constrained by Booking.com's narrow BPC.

With respect to the pricing across distribution channels, we report that the direct channel of hotel chains is more often the price leader (meaning it has a price that is strictly lower than the prices on all other visible online sales channels). This suggests that Book-

sales channels. *Narrow* BPCs prohibit the hotel from publishing lower prices on its direct online sales channels than at the OTA that imposes the clause. However, a narrow BPC does *not* contractually restrict the hotel's room prices at other OTAs.

[4]We also partly capture a legislative prohibition of BPCs in Austria.

[5]This closely resembles a difference-in-differences approach as a trend is a difference over time. The null hypothesis is that the trends in the different countries should not vary systematically from the German trend if the change in the BPC regime in Germany has no effect. In Annex VII we provide evidence that a standard difference-in-differences specification yields qualitatively the same result.

ing.com's narrow BPC did restrict the hotels' price setting. This result is also consistent with free-riding in the sense that hotels might use the OTAs to show their rooms, but induce customers with lower prices to eventually book directly. However, our results are not a proof of free-riding.

In France and Austria we partly observe similar developments as in Germany. In particular, we observe more hotels start using Booking.com as a distribution channel, and in Austria already active hotels more often publish prices there. Note that the Austrian parliament passed a law in November 2016 that prohibits BPCs of OTAs from January 2017 onward, following an intensive public debate and consultation process in 2016.[6] In France all BPCs of OTAs were prohibited in August 2015. Additionally, in November 2016 the commercial court in Paris also prohibited the OTAs to use availability parity clauses.[7] These patterns therefore confirm the effects of the BPCs we have observed in Germany.

The remainder of the article is structured as follows. We discuss the related literature in the next section, introduce the data and present descriptive statistics in Section 3, discuss conjectures, methodology and identification in Section 4, show the analysis of the pricing in Section 5 as well as price publications across channels in Section 6, and then conclude in Section 7.

2 Related literature

2.1 Theory in relation to BPCs

Recent theoretical research investigates the theory of harm of various competition authorities that BPCs could restrict competition between OTAs for commission rates. Boik and Corts (2016) and Johnson (2017) analyze BPCs in a model in which customers can only purchase through a platform. Boik and Corts (2016) show that BPCs lead to an increase in retail prices and platform fees in a model with a monopolistic supplier and two differentiated platforms that compete in per-unit transaction fees. Higher platform profits

[6] See https://www.parlament.gv.at/PAKT/VHG/XXV/I/I_01251/index.shtml, last accessed March 07, 2017.

[7] See Annex 7 for details.

may raise incentives for potential entrants, but market entry of lower-cost, lower-value platforms is exacerbated due to price parity and therefore BPCs can also make market entry more difficult. In a more general setting, Johnson (2017) investigates different business models between suppliers and retailers that can be distinguished by the "terms of trade", i.e. the way profits are split between the suppliers and retailers.[8] Moreover, either the supplier or the retailer determines these terms of trade, while the other party sets the retail price. This model encompasses – inter alia – the agency model, where suppliers (e.g. hotels) set retail prices and retailers (e.g. platforms) decide on the commission fee (as the terms of trade), and the traditional merchant model, where the suppliers set the wholesale prices and the retailers decide on the retail prices. Without vertical restraints – such as BPCs – Johnson shows that the equilibrium retail prices tend to be lower under the agency model than under wholesale pricing and that – given firms employ revenue-sharing contracts in order to shift profits between supplier and retailer – the firm that is allowed to set the commission rate is better off than the firm that sets the retail prices. Moreover, Johnson analyzes the effect of retail price parity restrictions in case of the agency model. He stresses that these restrictions decrease the retailers' incentives to compete in the terms of trade they offer to the suppliers. His results show that retailers have an incentive to adopt the agency model and that BPCs tend to raise retail prices and harm consumers. Foros et al. (2015) also study the effect of BPCs in the agency model and particularly dress the retailers' incentives to adopt the agency model in contrast to the merchant model. Their results also suggest that BPCs increase retail prices.

Edelman and Wright (2015) and Wang and Wright (2017) assume that platforms charge linear per-transaction fees and allow customers to buy from either the platform or the direct channel. Edelman and Wright (2015) refer to BPCs as price coherence and find incentives for excessive investment in convenience benefits. This leads to even higher prices and negative "externalities on nontraders", resembling Segal (1999) in that consumers who do not use the platform are harmed by price coherence due to a higher price level. Wang and Wright (2017) expand the setting by allowing the customers to search on the platform and switch the sales channel to complete the transaction. To our knowledge they are the first who allow for the possibility that consumers search on OTAs and then book at a

[8] In Johnson (2017) these include linear wholesale prices and revenue-sharing agreements.

lower price on the direct channel (which they refer to as showrooming). With this they address an important aspect in the ongoing discussion of the competitive effects of narrow BPCs. They show that showrooming effectively disciplines the platforms' incentives to raise commissions, but may make platforms unviable – depending on the marginal costs and the extent of convenience benefits that the platform offers to the customers.

In Edelman and Wright (2015) and Wang and Wright (2017) suppliers always have an incentive to price the direct channel below the platform price and thereby incentivize the customers to purchase directly. Shen and Wright (2017) study the suppliers' incentives to engage in showrooming more closely. Similar to Johnson (2017) they distinguish between settings in which the supplier can set the commission fee and settings in which the intermediary can set the commission fee. They find that only in the latter case there exists an incentive for the firms to engage in showrooming. Pointedly, the hotel market is characterized by intermediaries (OTAs) that set the commission fees and therefore serves as an example for market settings in which the model predicts showrooming incentives.

In contrast to the contributions above, a recent theoretical paper by Johansen and Vergé (2017) offers a divergent view on the main theory of harm. In particular, they analyze both wide and narrow BPCs in a vertical relationship model and show that BPCs do not necessarily lead to higher commission rates, retail prices and a welfare loss. Under certain conditions it is even possible that all market participants (supplier, intermediaries and customers) are better off if (wide) BPCs are adopted.

Additionally, Johansen and Vergé address the competitive effects of narrow BPCs in their model. Recall that under narrow BPCs suppliers are allowed to charge different prices on intermediaries and only have to sustain a price parity with respect to the direct channel. As a consequence, a supplier may potentially set lower prices on a platform that offers lower commission rates. However, Johansen and Vergé find that an unprofitably large decrease in commission fees would be necessary to induce the suppliers to differentiate prices between the intermediaries. Therefore, they conclude that narrow BPCs do not increase competition between intermediaries and that equilibrium retail prices are the same as under wide BPCs. With this they offer an explanation for the observation that commission fees of OTAs have remained unchanged and they argue that whenever (wide) BPCs are harmful it is not sufficient to introduce narrow BPCs as a remedy because the

market outcome remains unchanged.

2.2 Empirical literature in relation to OTAs

As discussed above, there is a burgeoning theoretical literature that discusses the potential of BPCs to restrict competition among OTAs for commission rates and deter entry. Yet, it remains an empirical question whether and – if yes – by how much the wide and narrow BPCs of OTAs affect the market outcome. To our knowledge, there are not yet any research articles available which address this question. Though, there is related research that generally investigates online pricing and the role of intermediaries.

In general, our paper relates to studies that characterize online price setting and differences to offline prices. As for many tangible goods that are analyzed in these studies, we also document considerable price dispersion of online prices for hotel rooms across online channels. In a recent large-scale study of 56 retailers in 10 countries, Cavallo (2017) addresses the question whether online and offline prices are similar to each other. The study documents that online and offline prices coincide in 72% of the cases and that price changes occur at similar frequencies. However, the online and offline price series are not well synchronized.

Complementary to Cavallo (2017), Gorodnichenko and Talavera (2017) report basic facts about online prices. Using a 5-year data set from a price comparison website they document that price changes amount on average to 4% of the retail price and that there is considerable price dispersion for narrowly defined product categories with a standard deviation of log prices between 0.13 and 0.16. In comparison of similar studies with offline prices (e.g. Nakamura and Steinsson (2008)), they conclude that online price changes are more frequent and smaller in size than changes of offline prices.

Other studies that particularly address price dispersion are Ghose and Yao (2011) and Zhao et al. (2015). They compare list prices with transaction prices and find that price dispersion is prevalent in both, but less so in transaction prices. Orlov (2011) studies the effect of Internet penetration on price dispersion of airline fares. He finds that variation in the Internet penetration is related to a higher intrabrand price dispersion, while he finds no effect on interbrand dispersion.

There are a few related papers that particularly address the role of intermediaries such as OTAs and the relationship to retailers. De los Santos and Wildenbeest (2017) empirically investigate differences between the agency model and the merchant model in the e-book market. In 2012 the Department of Justice (DOJ) sued Apple and five large U.S. book publishers for introducing the agency model and thereby conspiring to raise prices. As a result, publishers had to return to the merchant model which had been used until 2010. In their study, De los Santos and Wildenbeest (2017) exploit cross-publisher variation in the timing of the adoption of the merchant model in order to analyze the effects on the retail prices. They find that retail prices for e-books decrease by between 8% (Barnes & Noble) and 18% (Amazon) after the adoption of the merchant model. Interestingly, in this industry the publishers pursued the adoption of the agency model against the opposition of the retailers.

Lu et al. (2015) study the relationship between the pricing of intermediaries, such as physical travel agents, and the introduction of a new online direct sales channel of a hotel chain. Using data of hotel room transactions from 2001 to 2007, they analyze the introduction of the direct online sales channel in 2002 and find a significant reduction of the intermediaries' price premia. This result suggests that there is competition between different forms of sales channels for hotel distribution. However, Lu et al. do not study BPCs.

Ursu (2016) exploits a random variation in the ranking of the OTA Expedia to study the effect of rankings on search and booking behavior. She finds that a better ranking position yields more clicks for detailed information about that particular offer. However, given that a consumer has clicked on an offer, the ranking does not affect the purchase decision. Using a structural model, Ghose et al. (2012) find that a high quality ranking can save customers (in money equivalents) up to 9.38 USD per hotel booking. These results highlight the importance of OTAs for the intermediation of hotel rooms online.

3 Data and descriptive statistics

3.1 Data source Kayak

We use data on prices of hotel rooms on different online sales channels from Kayak.[9] Kayak is a travel meta-search engine that collects information from various online channels such as the OTAs Booking.com, Expedia and the hotel's direct online channel. We understand that Kayak derives revenues from advertising placements on its websites and mobile apps and from sending referrals to travel service providers and OTAs.[10] Kayak provides information on the availability of offers and their prices at different online distribution channels. Hotels can submit offers of their direct channel to Kayak, either with their own booking engine or a third-party booking engine provider.[11] We understand that Kayak directly receives the hotel offers from the OTAs that are available there and does not post different prices on its own.

A typical search request at Kayak requires a travel destination, the travel dates, the number of travelers and the number of rooms as inputs, for instance two persons looking for one room in Rome for an overnight stay in two weeks from today. Kayak uses the information provided from OTAs and the hotels' direct sales channels to display a list of available hotels. For every hotel, Kayak lists the prices of the available sales channels.[12] We refer to the list of all available sales channels for a particular hotel at a particular travel date as a 'Kayak request'.

There are three types of countries for which we collect data:[13]

1. Narrow BPC countries: This includes nearly all European Union (EU) member states as regards the major OTAs Booking.com and Expedia (see exceptions below).

[9] We use the German edition of the Internet site `www.kayak.de`. Since 2013, Kayak is a subsidiary of the Priceline Group, which previously also acquired the online travel agencies Booking.com (2004) and Agoda.com (2007).

[10] Priceline Group Inc. Annual Report 2015 (p.2). See http://ir.pricelinegroup.com/annuals.cfm; last accessed September 25, 2016. Hotels report that they have to pay a monthly fee for having their direct channel listed at Kayak, and also a fee whenever a Kayak user is forwarded to the hotels' website. Source: Phone interviews that we conducted with European hoteliers in 2016.

[11] Booking engines such as Fastbooking, Travelclick or Derbysoft offer the services necessary to connect the hotel to Kayak.

[12] Also, Kayak sometimes includes itself in the list of hotel price offers. However, a click on the "Kayak offer" redirects to OTAs which also belong to the Priceline Group such as Booking.com. Therefore, whenever we observe a Kayak entry, we substitute it with the corresponding underlying Priceline OTA and eliminate potential duplicates.

[13] See Annex I for a detailed overview of countries and cities covered.

Our data captures mainly Italy and Sweden, as well as various cities close to the German border.

2. Countries without BPCs:

   (a) France (general prohibition of OTAs' BPCs by law in July 2015)

   (b) Germany (HRS prohibited in December 2013, Booking.com since February 2016; Expedia still has a narrow BPC)

   (c) Austria (narrow BPCs since July 2015, prohibition by January 2017, this has been anticipated in 2016).

3. Wide BPC countries: Today only non-EU countries as regards at least the major OTAs Booking.com and Expedia. We have collected data for Canada.

We collect prices from Kayak for all listed hotels from a wide range of cities: the 25 biggest German cities, a list of the 15 biggest cities and 15 popular tourist destinations for the five countries Austria, Italy, Sweden, France and Canada, as well as a selection of 20 pairs of German and non-German cities near the German border.

We collect data from January 26, 2016 onward. The corresponding list of locations and starting dates for data collection can be found in Annex I. Prices are collected for overnight stays for two persons in one room on the same day and the 7th, 14th, 21th and 28th day ahead.[14]

In addition to the price data from various distribution channels, we also observe hotel-specific characteristics. These include the hotel stars, the Kayak customer rating (between 0 and 10), the number of rooms and the information whether the hotel belongs to a hotel chain.[15] In our analyses we particularly address the differences between chain hotels and independent hotels, as we expect systematic differences with respect to the distribution and pricing strategy between these types of hotels.

[14]On certain dates, we were able to collect prices for more travel dates than 0, 7, 14, 21 and 28 days in advance of the booking date, e.g for all days within a 30 day period between booking and travel date, but due to technical difficulties on some days we collected less data. In the analysis, only the observation with travel dates 0, 7, 14, 21 and 28 days ahead are included.

[15]We refer to hotels that do not belong to a chain as no chain or independent hotels.

In order to validate the accuracy of the Kayak data, we manually conducted a comparison of prices and qualitative features between hotel offers on `www.kayak.de` with the offers on the websites of the major OTAs Booking.com, Expedia and HRS and the hotels. The comparison sample includes 171 booking requests for travel dates ranging from June to August 2016. For a detailed description of the validation analysis see Annex II. With regard to the order of prices across channels, we find that the price leader is correctly detected by Kayak in more than 90% of all cases. Furthermore, we have not found patterns in the deviations that indicate a favorable treatment of a particular channel by Kayak. These findings reassure us that Kayak is an adequate source for our evaluation of the price structure across sales channels in relation to differences of the BPCs.

3.2 Summary statistics of the Kayak data

In this section we present summary statistics for the main variables of our analyses and for the prevalence of the main distribution channels in the Kayak data. The observation period ranges from January 2016 until January 2017 and the data set contains data from around 30,000 hotels. Each observation in the data set refers to a hotel room at a specific travel date which is on offer at a certain search date (which we refer to as Kayak request). Every observation contains the price offers of all sales channels of the hotel as listed on Kayak. In total, the data set consists of approximately 20 million observations.

Table 1 depicts summary statistics for a set of basic variables in our data for hotel chains and independent hotels. The data are aggregated on the Kayak request level and on the hotel level. A Kayak request includes on average 5 online sales channels (OTAs and direct channel)[16] and in 84% of all observations we find that hotels have published prices on at least two channels.

[16]This is consistent with Stangl et al. (2016) who find that for Germany, Austria and Switzerland hotels have published prices at 3.6 OTAs.

Table 1: Basic variables by hotel type

	Mean by hotel type			All observations			
Variable	All	Chain	No chain	Std. Dev.	Min	Max	N
Kayak request level							
Number of listings	4.93	7.06	4.11	3.14	1	24	20,115,292
At least two listings (%)	83.67	95.72	79.02	36.96	0	100	20,115,292
Mean price in EUR	120.37	128.41	117.27	95.89	10	2,000	20,115,292
Std. Dev. price	12.66	14.80	11.65	44.73	0	4,615	16,954,059
Strict minimum price exists (%)	48.11	51.69	46.43	49.96	0	100	16,830,677
Diff. (str.) two lowest prices (%)	13.71	9.35	15.98	47.08	0	16,100	8,164,931
Avg. days before travel date	12.74	12.59	12.80	9.63	0	28	20,032,766
Share of non-listed hotels (%)	63.89	60.37	65.25	15.79	0	100	20,073,996
Hotel level							
Number of rooms	52.08	123.55	31.83	74	1	1,590	27,123
Hotel chain (%)	20.50	100.00	0.00	40.37	0	100	29,497
Hotel category in stars	2.92	3.23	2.85	0.86	1	5	29,497
Kayak hotel Rating	8.04	7.89	8.08	0.89	2	10	27,445

The average price across all listings is at 120 EUR, ranging from 10 EUR to 2,000 EUR.[17] The average standard deviation of the prices is 13 EUR for the Kayak requests with offers from at least two distribution channels. In 48% of all observations with at least two listings, there exists a strict minimum price.[18] For the observations with a strict minimum price, the average relative difference between the lowest and second lowest price is at 14% of the lowest price. Moreover, Kayak displays for every city the number of available hotels and the total number of hotels that are generally listed at Kayak. We use the fraction of hotels that are currently not available at Kayak as a measure of local hotel occupancy in a city. It has an average value of 64% across all Kayak requests.

On the hotel level, the average hotel has 52 rooms, 2.9 out of 5 stars[19] and a Kayak rating of 8 out of 10.[20] We identify 21% of all hotels to belong to a hotel chain. Interestingly, 28% (not reported) of our Kayak requests come from chain hotels which shows that these hotels list on Kayak overproportionally often. Accordingly, we find that chain hotels on average use more distribution channels (on average 7 listings and in 96% of all cases at least two listings), are larger (124 rooms) and of higher quality (3.2 stars). Interestingly, the differences in Kayak hotel rating between chain hotels and independent hotels reveal that the customer are slightly more satisfied with independent hotels even though these

[17] Prices below 10 EUR and above 2,000 EUR were excluded.

[18] We refer to the strictly lowest price at a Kayak request as price leader.

[19] Kayak also lists accommodations like holiday apartments without stars. We removed them from the analyses.

[20] The information on the Kayak rating is only available for 85% of all hotels.

hotels have fewer stars on average.

Finding 1: Hotel prices are most often published at the OTAs Booking.com, Expedia and HRS

Table 2 depicts basic information on the availability of price offers across the main distribution channels. In total, we observe 76 distinct sales channels in the Kayak data which can be classified as OTAs and direct channels.[21] We observe that hotels publish prices most often at the OTAs Booking.com, Expedia and HRS and the related OTAs of the same company groups (see Annex V for details).

Booking.com is the channel that exhibits the highest penetration as 96% of all hotels publish prices there at least once, followed by Expedia with 67% (Table 2, first data column). Across the covered countries, 31% of all hotels make use of the OTA HRS. In contrast, for Germany, around three quarters of all observed hotels had offers listed at least once at HRS (country statistics not reported individually). This can be attributed to the fact that HRS is a German incumbent.[22]

The high listing frequencies of the OTAs Booking.com, Expedia and HRS are consistent with a HOTREC survey from 2016 among more than 2,000 European hoteliers according to which the three major OTAs Booking.com, Expedia and HRS account together for more than 90% of all bookings in Europe.[23] Compared to the same survey conducted in 2013, bookings via OTAs have increased by 3 percentage points (pp) to 22%. Direct bookings account in total for 55% of all bookings and have dropped by 4 pp in the same time frame, while the direct online channel has remained approximately constant at close to 7%.

[21] For our analyses we take into account that some OTAs belong to the same company group (see Annex V for details).

[22] With respect to a comparison between countries, one further observes that Booking.com is the mostly used channel with a frequency ranging from 84% in Italy to 94% in Sweden and Austria. Number two is Expedia with frequencies from 45% in Austria to 83% in Canada. Compared to the channels Booking.com and Expedia that are very prevalent in all countries of the data set, the presence of the German OTA HRS varies more across countries. HRS is especially present in Germany (60%) and Austria (24%), while it appears only in 3% of all Canadian Kayak requests. Note that these figures are per listing.

[23] HOTREC Survey on Hotel Online Distribution (http://www.tophotel.de/20-news/7186-hotrec-studie-die-macht-der-online-buchungsportale-nimmt-zu.html, last accessed 30 July, 2016).

Table 2: Channel use

Channel (major channels only)	Fraction of hotels that used channel at least once	Frequency of channel use (given hotel used it at least once)
Direct channel (total)	16%	87%
Direct channel (independent hotel)	5%	71%
Direct channel (hotel chain)	11%	91%
Booking.com	96%	91%
Expedia	67%	91%
HRS	31%	78%
Base	All 29,497 hotels observed during the observation period	All Kayak requests of hotels after hotels have listed for the first time

Finding 2: Direct online channel prices are available in about 17% of all Kayak requests

For the direct channel we find that Kayak displays a direct channel price of a hotel and provides a link to the hotel's own website for approximately 16% of all hotels. Out of these hotels, about two thirds can be identified as chain hotels, whereas the other third are independent hotels. Among the 20 million Kayak requests, a direct channel offer is contained in 17% (not reported) of all requests on Kayak.[24]

The direct online channel is likely to be used by a larger fraction of the hotels than that inferred from the Kayak data. It is not guaranteed that the direct channel listing observed on Kayak is fully representative for all hotels with direct online channels. However, it is not only very difficult to observe a large sample of direct hotel prices of a scientifically selected hotel sample. It yet seems unlikely that the reaction of hotels visible at Kayak differs substantially. In most of our analysis, we do distinguish between chain hotels and independent hotels as direct chain prices tend to be over-represented on Kayak.

The hotels do not always post prices at OTAs or list direct channel offers at Kayak (Table 2, second data column). A usage frequency of a channel below 100% arises if a hotel occasionally does not offer hotel rooms on the particular channel on Kayak. As we control for the date when a hotel starts to use a channel, these figures are a measure of the hotels' ability to react flexibly to changing market conditions on this channel. On

[24]The Eurostat statistics on information and communication technologies use in tourism reports that in 2015, 74% of all enterprises in the accommodation sector in Europe had a website that provided online ordering, reservation or booking opportunities.

average, a hotel that is at least once listed with Booking.com or Expedia offers rooms on the OTA in more than 90% of all Kayak requests. The direct channel of hotel chains exhibits a similar frequency as OTAs, while the direct channel of independent hotels is only used in 71% of all requests. Potentially, the lower listing frequency of independent hotels can be explained by different technologies of transmitting information to Kayak. Among all independent hotels that also list their direct channel on Kayak, more than 90% employ a third-party booking engine provider. In contrast, we find that around 85% of all chain hotels have their own booking engine to transfer data to Kayak (statistics by transmission technology not reported).

In the next section we develop the conjectures and the identification strategy for the empirical analysis.

4 Conjectures, identification and methodology

4.1 Conjectures

Pricing across channels

There are various reasons why a hotel might want to charge different prices on different distribution channels. On the one hand, direct channel customers might have a lower price elasticity than OTA customers as finding another hotel should be easier at an OTA. This could favor higher direct channel prices. On the other hand, the marginal costs of a hotel for bookings on the direct channel are likely to be significantly lower than for bookings through an OTA because of its per-booking commission. The "Book Direct" campaign of HOTREC[25] and similar measures of hotel associations indicate that hotels typically favor direct channel bookings and might thus prefer to charge lower direct channel prices.

Both wide and narrow best price clauses typically forbid hotels to have a lower price on the direct channel than on the OTAs. We therefore expect that without a BPC in place the direct channel has the strictly lowest price more often.

Conjecture 1. *The hotel's direct online channel has the strictly lowest price (is the price leader) more frequently if the hotel faces less (stringent) BPCs.*

[25] See http://www.hotrec.eu/bookdirect.aspx; last accessed 31 August, 2016.

Decision on which channels a hotel publishes prices

A price parity clause requires the hotel to not charge lower prices on certain other channels. Such a clause can make it unprofitable for some hotels to sign a contract with that OTA. A reduction of the parity clauses could therefore induce more hotels to sign a contract with the OTA at all and start publishing room prices there.

Conjecture 2. *If an OTA does not use parity clauses, more hotels become active at the OTA.*

For those hotels that have used the OTA before, the removal of the BPC might have two opposing effects. On the one hand, as the hotel is less constrained in its price setting, it could find it profitable to use the less constrained distribution channel(s) more intensively. In particular, it might have been unprofitable to promote the direct channel before when the hotel could not make the channel attractive by means of a lower price.

Conjecture 3. *More hotels use the direct channel and make it visible at Kayak more often if they face less (stringent) parity clauses.*

On the other hand, we understand that the parity also requires some form of room availability.[26] If the availability requirements exceed the number of offers a hotel would like to offer on the OTA, one might expect that a hotel offers rooms less often at an OTA once it is allowed to do so. On the contrary, a hotel might nevertheless be inclined to use the OTA more frequently following the removal of the BPC because it can now also differentiate between the other channels (in particular the direct channel) and that OTA channel by means of a lower direct price – instead of not listing at the OTA at all. We therefore test

Conjecture 4. *Hotels publish offers more frequently at an OTA if it does not use parity clauses.*

4.2 Identification and methodology

We first investigate the pricing Conjecture 1 by means of cross-sectional statistics which capture differences across countries. In particular, we compare prices between channels

[26] Even Booking.com's narrow BPCs require from the hotel to make a minimum allocation of rooms on the OTA website available.

in case of wide BPCs (as in Canada) with those in case of narrow and no BPCs (as in Europe). The identifying assumption here is that differences across countries are due to the different BPC regimes. We cannot exclude, however, that there are also other country-specific differences which affect the pricing across channels and the publishing of hotel offers online (although it is not obvious to us which ones these should be).

Second, we investigate the effects of the latest prohibition decision in Germany, which was taken by the competition authority in December 2015 against Booking.com, with the obligation for Booking.com to remove the narrow BPC by February 2016.[27] We compare the *trends* in the market outcome in Germany in the course of 2016 with the trends in other countries without such a change of the BPCs. Our identifying assumption for this approach is that the *difference-in-trends* can be attributed to the removal of Booking.com's narrow BPC in Germany and that there are no other country-specific developments since January 2016 which affect the pricing across channels and the publishing of hotel offers online – except for the ones which we can control for, such as the utilization rates of hotels at the city-level. In Annex VII we provide various robustness checks in that regard.

We estimate several equations of the following kind:

$$y_{i,c,t,d} = \beta_1 trend_t + \beta_2' trend_t I_c + \beta_3' X_{i,c,t,d} + \varepsilon_i + \epsilon_{i,c,t,d}, \quad (1)$$

where i denotes hotels, c the country (which is constant for each hotel), t the travel date and d the booking date (when appropriate). The dependent variable y_i is a dichotomous variable. Depending on the conjecture to be tested, this is an indicator of price leadership or of the availability of a hotel offer on a channel. We measure changes over time in our reference country (Germany) by including a linear trend. To capture diverging developments in other countries, we interact this trend variable with indicator variables for other countries (I_c). Vector X controls for other time-varying factors. If not stated differently, we include as control variables the time interval between booking date and travel date, the weekday of the first travel day and the share of non-listed hotels for that travel date in the town where the hotel is located. The latter serves as an approximation for the occupancy (capacity utilization).

[27] See Annex IV for an overview of the decisions.

We control for time-constant heterogeneity between hotels by means of hotel fixed effects ε_i. For instance, factors like the hotel size or the hotel's sales strategy might influence where a hotel publishes prices and how it sets prices across channels. To the extent that the influence stays constant in the course of our observation period, it is captured by the hotel fixed effects. This leaves us with the within-hotel variation. As a consequence, other time-constant observed variables such as hotel stars or the country are not included in the regression analysis.

As we also observe whether a hotel belongs to a hotel chain or is an independent hotel, we explicitly allow for heterogeneity between these different types of hotels. For our main analyses, we therefore conduct the fixed effects regressions separately on the population of chain hotels and independent hotels in order to identify hotel-type-specific developments.

For the analysis of changes in the general availability of hotels on specific channels over time, we slightly change model (1) and estimate the following model:

$$y_{i,c,t} = \beta_1 trend_t + \beta_2' trend_t I_c + \beta_3' X_{i,c,t} + \varepsilon_i + \epsilon_{i,c,t}. \tag{2}$$

In model (2), the subscript d is dropped as we aggregate the observations to the hotel-month-level such that we have one observation for hotel i in country c in month t. Correspondingly, vector X contains only the average monthly share of non-listed hotels in this month in the corresponding city.

Due to high computational effort in case of fixed effects, we conduct the regressions on dichotomous indicator variables with the linear probability model (LPM) rather than with an index model such as probit and logit. Although such a non-linear model is theoretically a more rigorous approach, we follow Wooldridge (2010) that the LPM often yields good estimates of the partial effects on the response probability. We compute standard errors that are robust to heteroscedasticity and serial correlation at the hotel-level.

5 Pricing across channels

5.1 Cross-sectional observations

Finding 3: In countries with narrow BPCs or without BPCs, hotels seem to price the direct channel often cheaper than Booking.com To investigate the pricing across distribution channels, we first compute how often the direct channel price is strictly below or above the price of the major OTAs at the country-level. Table 3 shows for each country and hotel type the share of Kayak requests in which the Booking.com price is above the direct channel price (B>D) and vice versa (D>B).[28] The share of observations with price parity (D=B) is implicitly given as 100% minus both shares. We group the countries by BPC regime. The numbers in parentheses show for each country the number of Kayak requests in which both Booking.com and the direct channel are listed.

Table 3: Relation between Booking.com and direct channel

	Chain			No Chain		
Country	B>D	D>B	Difference	B>D	D>B	Difference
No BPC						
Germany* (n=648,620)	31.4	14.7	16.4	65.4	16.8	48.6
France (n=1,086,796)	28.9	18.1	10.8	65.0	15.4	49.6
Narrow BPC						
Italy (n=359,831)	31.4	22.5	8.9	55.2	19.9	35.3
Sweden (n=129,203)	41.5	23.9	17.6	52.1	29.9	22.2
Austria** (n=143,145)	31.0	21.2	9.8	52.6	21.3	31.3
Others (n=165,736)	35.9	26.2	9.7	37.8	26.5	11.3
Wide BPC						
Canada (n=676,509)	29.2	32.8	-3.6	34.7	33.0	1.4

The column variables indicate the share of Kayak requests (in %) for which the particular relation (e.g. B>D) holds. The net effect is the difference between the two numbers to control for potential measurement errors. *Booking.com removed the narrow BPC in February 2016. **In Austria, narrow BPCs were in place until December 2016.

The price relation is possibly measured with some error, although we have not found any indication of a systematic measurement error.[29] A potential error should thus materialize

[28] The analogous computations for the relation between the direct channel and Expedia as well as HRS yield similar results.

[29] Recall for example that the manual validation of Kayak revealed that Kayak displays the price leader

in both directions (D<B versus D>B) with the same likelihood. As a consequence, we can compute a conservative measure of the frequency of the event (D<B), called *difference,* by substracting the fraction of Kayak requests in which the direct price is larger than Booking.com (D>B) from the fraction in which the direct price is smaller than the Booking.com price (B>D). The *difference* leaves us with a lower bound of the frequency with which hotels price the direct channel cheaper than Booking.com (if all the (D>B) cases were due to an unsystematic error).

The statistics in Table 3 indicate that in the countries with narrow BPCs or without BPCs, hotels price the direct channel often cheaper than Booking.com. In these countries, the *difference* – taken as a conservative measure of a lower direct channel price – aggregated for both chain and independent hotels ranges from 16% in France and Italy to 20% in Germany (aggregated values not reported in table). Note that for the narrow BPC countries this strongly suggests that direct channel prices covered by a BPC are nevertheless below the price at Booking.com in a considerable number of cases. Only in the wide BPC country Canada the *difference* is close to zero, both for chain hotels (minus 3.6%) and independent hotels (1.4%). This indicates a higher compliance to the price parity requirements under the wide BPC in Canada than under the narrow BPCs in Europe.

The comparison between chain hotels and independent hotels also indicates the direct channel is more often cheaper among independent hotels, indicating a lower compliance with parity clauses in this group. Moreover, it is evident that independent hotels in Germany and France – where Booking.com was not allowed to use parity clauses anymore in our observation period – price the direct channel cheaper than Booking.com most often.

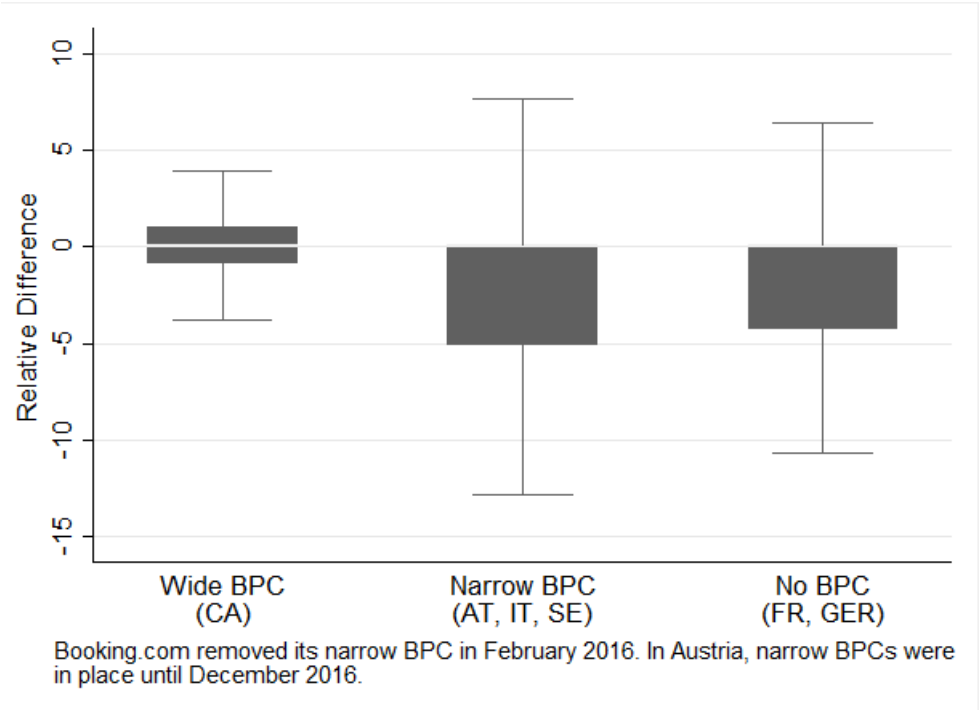
Finding 4: Compliance of the direct channel parity is apparently higher under the wide BPCs in Canada than with narrow BPCs in Europe

The box plot in Figure 1 provides an additional view on the difference between the direct online prices and Booking.com prices across different BPC regimes. It shows the distribution of the relative difference between direct price and the Booking.com price of all Kayak

correctly in 90% of all cases and that the measurement error seems to affect the distribution channels non-systematically. See Annex II for details.

responses that contain prices of both channels. The observations are grouped into the three BPC regimes according to the country of observation, and in the case of Germany and Austria due to regime changes also according to the month of observation.[30]

Figure 1: Relative difference between Booking.com and the direct channel across BPC regimes



The box plots show that the relative difference between the direct channel and Booking.com most often ranges between ± 5% and that the price dispersion between the direct channel and Booking.com is the lowest under the wide BPC in Canada. The dispersion is considerably higher for the narrow BPC group and the group that is not subject to a BPC. This figure confirms that neither under the wide nor narrow BPC full compliance to the price parity can be observed and that compliance is weaker under the narrow BPC than under the wide BPC.

The latter finding is interesting in that one might expect the same compliance in relation to the direct channel price under a narrow and a wide BPC as both restrict the direct channel price not to be lower than the OTA price. The finding of less compliance in case of narrow BPCs might be due to other restrictions that are relaxed in the narrow parity clauses of Booking.com, such as limited punishments in case of non-compliance.

[30]For Germany, the observations from January 2016 are assigned to the narrow BPC and all observations from February 2016 on are assigned to the group of no BPC. For Austria, all observations from the year 2016 are assigned to the narrow BPC group, from January 2017 onward they are assigned to the group of no BPC. The no BPC group additionally contains France.

The competition policy cases run against Booking.com might have also weakened the enforcement power of Booking.com.

Finding 5: Kayak shows one channel as price leader across sales channels in about half of all observations

Next, we analyze the cross-sectional frequency of a strict price leader in the sense of the second lowest price being strictly higher than the lowest price. There is a strict price leader in 48% of all Kayak requests with price offers from at least two channels (see Table 1). For Kayak requests with offers from at least two channels, Table 4 shows for all countries grouped by BPC regime how often a strict minimum price exists and – if it exists – how large the average relative difference between the strict minimum price and the second lowest price is (data columns 1 and 2). The share of Kayak requests with a strict price leader ranges from 39% in Germany to 53% in Canada. In most reported countries the relative difference between the minimum price and the second lowest price is on average around 10%, with a notable exception of 20% in Italy (second data column).

Table 4: Share of Kayak requests with price leader and frequency of direct channel and Booking.com as price leader by chain

	Existence price leader		Share direct channel		Share Booking.com	
Country	Share	Deviation	Chain	No chain	Chain	No chain
No BPC						
Germany* (n=4,169,477)	39.4	10.9	10.7	41.8	5.3	12.3
France (n=4,741,024)	48.9	9.2	15.0	42.2	8.4	15.1
Narrow BPC						
Italy (n=6,327,717)	50.0	19.6	8.4	27.8	6.5	24.1
Sweden (n=596,213)	44.2	10.1	10.8	18.6	12.2	14.5
Austria** (n=1,032,744)	50.2	12.6	10.2	39.5	8.3	23.8
Others (n=1,416,241)	57.8	17.8	11.6	14.6	9.6	24.9
Wide BPC						
Canada (n=1,831,876)	53.1	10.3	9.0	10.4	10.7	23.4

The first two columns indicate the share of Kayak requests with at least two listings (in %) with a strict price leader (1) and the the average relative deviation to the second lowest price (2). Columns 3 to 6 show by hotel type how frequently the direct channel and Booking.com are the price leader among the requests in which they are listed. *Booking.com removed the narrow BPC in February in 2016. **In Austria, narrow BPCs were in place until December 2016.

Moreover, Table 4 indicates in data columns 3 to 6 how frequently hotels price the direct

channel and Booking.com as strict price leader. The distinction by hotel type reveals that independent hotels use these channels more intensively to set the (strictly) lowest price than chain hotels. This finding might be related to the fact that chain hotels generally use more channels than independent hotels and might employ a more complex distribution strategy (see Table 1). Interestingly, we also find that independent hotels in Germany and France use the direct channel as price leader more than the hotels in the other countries (more than 40% of all listings). In contrast, the lowest share of direct channel price leadership is prevalent in Canada, where wide BPCs are in place.

However, the scope of the BPCs in a country is not directly related to the frequency of strict price leadership across channels in an obvious way[31], we take these findings as an additional indication for country-specific and hotel-type-specific differences across BPC regimes. In the next section we analyze the effects of Booking.com's removal of the narrow BPC in Germany on the price leadership of the direct channel and Booking.com.

5.2 Effects of Booking.com's removal of the narrow best price clause in Germany on pricing

Finding 6: Chain hotels price the direct channel increasingly often as price leader in Germany

According to Conjecture 1, the hotels' direct online channel should more often have the strictly lowest price on offer (price leader) following the removal of Booking.com's narrow BPC. In Table 5 we test this conjecture separately for chain hotels and independent hotels. The dependent variable is equal to 100 if the direct channel (first and third data column) or Booking.com (second and fourth data column) has the strictly lowest price on offer, and is 0 otherwise. The linear country-specific trend captures whether the particular distribution channel becomes price leader more often. For the regressions we only include observations of hotels that have used the particular channel already at the beginning of the observation period and Kayak requests that contain a Booking.com and a direct channel listing.[32]

[31] Note for example that in Canada the share of Kayak requests with a strict price leader is the highest among all countries.

[32] For all countries except of Austria the beginning of the observation period is defined as hotels that

Table 5: Channel has the strictly lowest price

	No chain		Chain	
	(1) Direct	(2) Booking.com	(3) Direct	(4) Booking.com
Trend (Base: Germany)	−0.68	0.14***	0.37***	0.05
Δ Trend France	0.33	−0.18**	−0.70***	−0.08
Δ Trend Italy	1.22*	0.03	−0.50***	0.13*
Δ Trend Sweden	−1.01	−0.63***	−1.55***	−0.21*
Δ Trend Austria	0.42	−0.49***	−0.28	−0.27***
Δ Trend Canada	0.23	−0.76***	−0.18*	0.18**
Δ Trend Other countries	0.12	0.00	−0.18	0.23*
Share of non-listed hotels	0.05*	0.04***	0.04***	0.01
7 days before	−1.64***	−2.17***	0.08	−1.79***
14 days before	−1.33***	−1.54***	−0.03	0.39***
21 days before	−0.39	−1.75***	1.18***	−1.75***
28 days before	−0.09	−2.45***	1.69***	−2.68***
Weekdays	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	Yes
Observations	541,031	8,033,144	2,686,010	4,455,962
R^2	0.457	0.364	0.368	0.169
Adjusted R^2	0.456	0.363	0.368	0.168

Standard errors (clustered by hotel) not reported. Only observations of hotels included that have used the particular channel already at the beginning of the observation period. Dependent variables are equal to 100 if particular channel is price leader and 0 otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In Germany, there is a positive trend of the direct channel of chain hotels being the price leader (0.37 pp per month, see Table 5, data column 3). For all other countries the coefficients indicating the difference from the German trend are negative, with particularly large and significant values for France, Italy, Sweden, and Canada. For Austria, which has gone through the process of a legislative prohibition of the BPCs in 2016, there is no significantly different trend from Germany. By contrast, for the independent hotels (data column 1) there is not a significant time trend with respect to the direct channel as price leader.

For Booking.com, the regression results suggest that the independent hotels price Booking.com significantly more often as strict price leader (0.14 pp per month) and that there are negative and significant deviations from this trend in France, Sweden, Austria and Canada. However, note that the result of a significant increase in price leadership only

have used the particular channel already in February 2016. As the data collection for Austria started later, we extend this time frame for Austria until April 2016.

remains robust for the direct channel and not for Booking.com if we aggregate for the hotel types (see Annex VII, Table 23 and 24 for details.)

Taken together, the regression results provide an indication that the direct channel in Germany is becoming the price leader more often due to the removal of Booking.com's narrow BPC (at least for chain hotels) – in line with Conjecture 1.

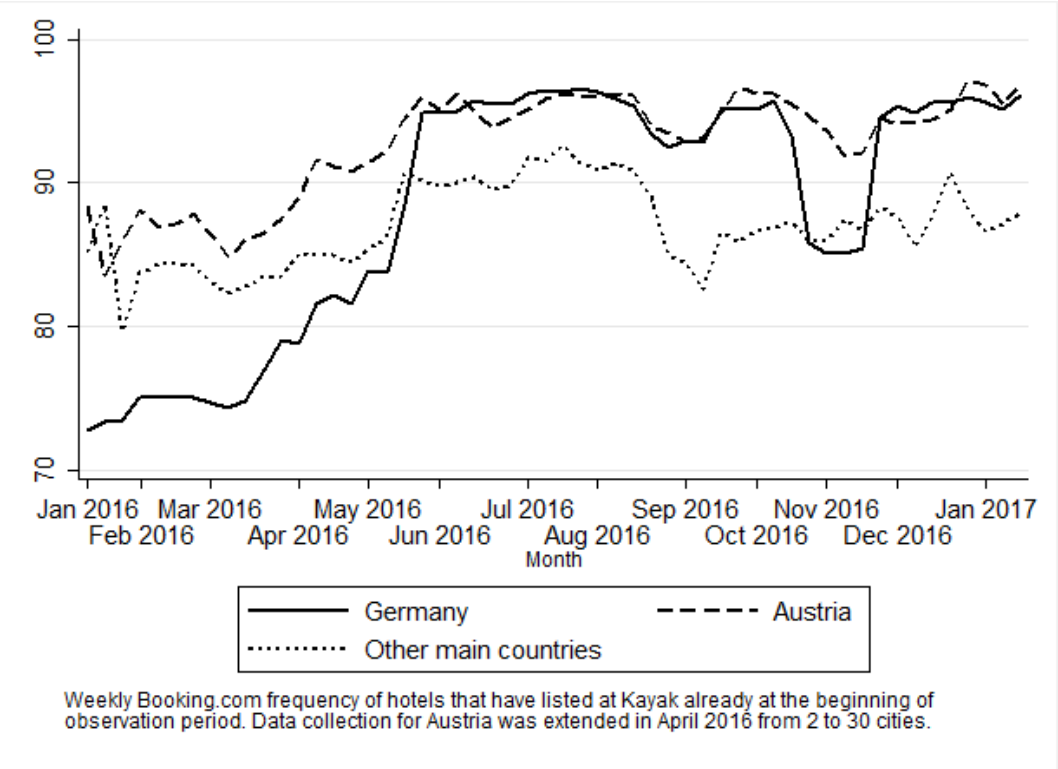
6 Analysis of hotel room availability across channels

In this section we study the effects of Booking.com's removal of the narrow best price clause in Germany on the availability of price offers. For all countries the frequency of price publications at Booking.com increases over time (Figure 2). This indicates Booking.com's growing importance in online hotel distribution. The frequency in Germany starts from an average level of around 73% and exhibits the sharpest increase at the beginning of the observation period.[33]

We analyze below whether the increased listing frequency can be attributed to the abolition of Booking.com's BPCs in Germany, as the implied less restrictive contract terms might make it more attractive for hotels to list with Booking.com. The following regressions address the intensive and extensive publication decisions (Conjectures 2, 3 and 4).

[33]During November 2016 one can observe a drop of around 10% in the frequency of Booking listings for Germany. We understand from hoteliers that technical problems with the interface occurred during this period, which could explain the temporary non-availability of hotels as shown in our data. Additionally, a new API by Booking.com was rolled out in this month, which could also have had an impact.

Figure 2: Booking.com listing frequency at Kayak by country



Finding 7: More hotels make price publications at Booking.com in Germany following the removal of the narrow BPC (extensive margin)

According to Conjecture 2, a reduction in the scope of a BPC yields an increase in price publications at the extensive margin, especially for the OTA that narrows down its BPC. This can be tested for Germany where Booking.com had to waive its narrow BPC from February 2016 onward.

Again, we test this conjecture separately for chain and independent hotels with a data set where each observation corresponds to a hotel in a specific month. The dependent variable equals 100 if a particular channel (such as Booking.com) was used by the hotel at least once in that month according to the Kayak data, and 0 otherwise. The linear country-specific trend captures whether hotels use the channel in later months but not early in 2016 (extensive use). The variable "Share of non-listed hotels" is the monthly average for the respective location.[34] The regression results are reported in Table 6.

[34]The control variables for the time interval between booking and travel date and the weekday of the first travel day are not included.

Table 6: Extensive channel use (at least once in a month)

	No chain		Chain	
	(1) Direct	(2) Booking.com	(3) Direct	(4) Booking.com
Trend (Base: Germany)	0.09***	1.70***	−0.00	2.13***
Δ Trend France	0.04	−0.69***	0.10	−1.33***
Δ Trend Italy	−0.13***	−0.28***	−0.15	−1.04***
Δ Trend Sweden	−0.03	−1.60***	−0.17**	−1.94***
Δ Trend Austria	−0.08	−1.12***	0.27*	−1.71***
Δ Trend Canada	−0.10**	−1.58***	−0.01	−1.89***
Δ Trend Other countries	−0.14***	−1.56***	0.63***	−1.93***
Avg. share non-listed hotels	−0.00	−0.14***	0.01	−0.20***
Weekdays	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	Yes
Observations	219,311	219,311	71,046	71,046
R^2	0.873	0.610	0.949	0.496
Adjusted R^2	0.858	0.564	0.945	0.449

Standard errors (clustered by hotel) not reported. Dependent variable is equal to 100 for all months in which a hotel used the particular channel at least once and 0 otherwise.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The second and fourth data column of Table 6 show a positive trend in the share of hotels using Booking.com at least once in each month. The share of hotels using Booking.com increases on average by 1.7 pp per month for independent hotels and by 2.1 pp per month for chain hotels in Germany. The coefficients on the interactions of the time trend with the other countries (i.e. the deviations from the German trend) are significantly negative. These time trends are thus less pronounced for the other countries, where no change in the BPC regime took place in the investigated time frame. The negative deviations (in absolute values) from the German trend range from 0.3 pp in Italy (independent hotels) to approximately 2 pp in Canada and Sweden (chain hotels). As a result, in these countries the trend of Booking.com's extensive price publications is close to zero.

The significant and positive coefficient on the extensive direct channel use of 0.09 pp in data column 1 might allude to the fact that Booking.com's narrow BPC indeed put a considerable constraint on the direct channel. After its abolition, it might be reasonable for more independent hotels to engage in direct online sales. For chain hotels we do not find an increase in the extensive direct channel use.

The regressions on the extensive channel use of Booking.com confirm Conjecture 2: There

is a significant positive trend in the extensive channel use of Booking.com following the removal of its narrow BPC in Germany. This trend is significantly stronger than in the other countries. The direct sales channel of independent hotels in Germany also seems to be positively affected by the abolition of Booking.com's narrow BPC (although the picture across countries is less clear). That we observe a rather strong increase in fraction of hotels using Booking.com at all is in line with the argument underlying Conjecture 2 that hotels are now particularly more willing to register with this OTA as they are not constrained by its BPC anymore.[35]

Finding 8: In Germany hotels publish offers more frequently at Booking.com (intensive margin) and on the direct channel as visible at Kayak

We now analyze the intensive channel use. According to Conjectures 3 and 4, we expect that BPCs lead to less frequent price publications, both at the OTA using the clause as well as at channels covered by the clauses. In Germany, Booking.com had to abolish its narrow BPC that explicitly only restricted the price setting on the direct online channel. As a consequence, the removal of the BPC should increase the frequency at Booking.com and the presence of the direct prices at Kayak.

We test this conjecture with regressions where the dependent variable equals 100 if the channel is present at the Kayak request, and 0 otherwise. Again, we split the sample into hotel chains and independent hotels. We only include observations of hotels which used the respective channel already at the beginning of the observation period[36] and measure whether the channel is used more intensively in later months than early in 2016. Note that we control for the local supply-demand balance by means of the share of non-listed hotels, which has a both statistically and economically highly significant negative coefficient in all specifications.

Both independent and chain hotels increase the frequency of price publications at Booking.com significantly over time in Germany (Table 7 data column 2 and 4). The deviations from the German trend suggest that the changes in intensive use of Booking.com

[35] One might wonder why the average use is already higher in other countries. In these countries HRS has typically been weaker in the past, while it used to be the market leader in Germany. However, we do not see indications of a German specific movement of hotels from HRS to Booking.com in the observation period. See Appendix 7 for- further robustness checks.

[36] Cf fn. 32.

are weaker in the other countries. An exception is Austria, where the independent hotels even have a stronger trend in intensive channel use of Booking.com. The trend for the Austrian chain hotels is not significantly different from the German trend. These results might indicate that Austrian hotels undergo a similar development as in Germany since narrow BPCs were prohibited in Austria in the course of 2016.

For the direct channel of chain hotels we do not see a trend in Germany that is statistically different from zero. Instead, for the direct channel of chain hotels the frequency increases significantly by 0.38 pp per month. The coefficients for the deviations in the other countries are mostly significantly negative. For the direct channel of hotel chains (data column 3) we observe statistically significant deviations from the German trend in France, Sweden and Canada. The trends in Austria and Italy have a positive sign and are not significantly different from the German trend, indicating similar developments as in Germany. This partly confirms Conjectures 3 and 4 because especially the hotel chains seem to be constrained by Booking.com's price parity.

Table 7: Intensive channel use (if used at the beginning of observation period)

	No chain		Chain	
	(1) Direct	(2) Booking.com	(3) Direct	(4) Booking.com
Trend (Base: Germany)	−0.42	0.20***	0.38***	0.49***
Δ Trend France	−1.23**	−0.26***	−0.38***	−0.61***
Δ Trend Italy	−2.93***	−0.61***	0.03	−0.40***
Δ Trend Sweden	−0.36	−0.27***	−0.63***	−0.15***
Δ Trend Austria	−0.54	0.21**	0.38	0.14
Δ Trend Canada	−0.45	−0.24***	−0.19*	−0.04
Δ Trend Other countries	−0.70	−0.06	−0.36	−0.19**
Share of non-listed hotels	−0.45***	−0.25***	−0.29***	−0.35***
7 days before	1.37***	0.15**	0.16*	−0.36***
14 days before	1.77***	0.16**	0.54***	−0.11
21 days before	1.79***	0.13*	0.42***	0.08
28 days before	1.67***	0.01	0.38***	0.09
Weekdays	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	Yes
Observations	756,215	11,410,209	2,970,265	4,910,425
R^2	0.506	0.235	0.272	0.118
Adjusted R^2	0.505	0.234	0.272	0.117

Standard errors (clustered by hotel) not reported. Only observations of hotels included that have used the particular channel already at the beginning of the observation period. Dependent variables are equal to 100 if particular channel is present at Kayak request and 0 otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Taken together, the regression results confirm Conjecture 3 and 4 by indicating that the abolition of Booking.com's narrow BPC is related to an increase in the intensive channel use. The narrow BPC required the direct online channel price not to be lower than that at Booking.com. Now hotels publish their prices more often also at Booking.com. This might be the case because it is possible to be visible at Booking.com and to set lower prices at the direct channel than at Booking.com at the same time, while before hotels might just not have published offers at Booking.com in such instances.

7 Conclusion

Motivated by recent proceedings against best price clauses imposed by online travel agents, we empirically investigate the effects of such clauses using meta-search price data of nearly 30,000 hotels in various countries from January 2016 to January 2017. We capture the abolition of Booking.com's narrow BPC in Germany during our observation period, so that we are able to particularly address the competitive effects of narrow BPCs.

We have found that more hotels publish prices at Booking.com in Germany following the removal of the narrow BPC (extensive margin). Similarly, hotels publish offers more frequently at Booking.com (intensive margin) and on the direct channel as visible at Kayak. Our *difference-in-trends* approach also revealed that the hotels establish the direct channel more frequently as the price leader in the sense of the cheapest channel across all online sales channels available at Kayak. This suggests that Booking.com's narrow BPC did indeed restrict the hotel's price setting.

Another interesting observation is that across the different countries and BPC regimes the observed direct channel prices are below the prices at Booking.com in a fraction of the cases. Even when accounting for the possibility that the Kayak data is imprecise to some degree, this suggests that there might be a significant non-compliance with the price parity clause. While the degree of non-compliance is rather similar across the different European countries with narrow BPCs and without BPCs, it is significantly lower in Canada – the only country in our data set where the major OTAs still use wide BPCs. This could be interpreted as an indication that the original wide BPCs are more effective in disciplining the price setting of hotels. Recall that the narrow BPCs of Booking.com

in Europe (and indirectly of Expedia) are the result of commitments that Booking.com gave to the competition authorities of France, Italy and Sweden. These commitments include certain anti-avoidance clauses.[37] Moreover, the prominent policy actions against the OTAs might have discouraged OTAs in Europe to actually enforce the clauses and similarly encouraged part of hoteliers to not comply.

As prohibitions of BPCs generally aim at enhancing OTA competition, one would expect to observe changes in the commission rates that hotels have to pay for every mediated booking. Yet, to our knowledge, the standard commission rates of the major OTAs have not changed since the competition policy interventions in Europe.[38] One reason could be that the effects of BPCs are limited overall. In addition to the fraction of direct prices which are below the major OTAs, there also seems to be a significant fraction of cases in which the direct prices are above the major OTA prices. To the extent that the parity clause was effectively not binding for a large fraction of the hotels (or hotels just did not comply), it is natural that its abolition has limited effects.

Another reason for why the standard commission rates have not yet changed could be that the large OTAs can sustain such commission rates nowadays also without parity clauses. In particular, the OTAs might have incentives to not create evidence in the sense that commission rates decrease in countries without parity clauses in view of the ongoing evaluation of the sector by European competition authorities.

We see scope for more empirical research with respect to best price clauses of online travel agents. Future empirical research should assess the long term effects and welfare implications of BPCs, including a further investigation of possible changes in the effective commission rates of online travel agents, as well as the levels of consumer prices.

[37] See Section 4 of the Booking.com commitments (http://www.konkurrensverket.se/globalassets/english/news/13_596_bookingdotcom-commitment.pdf, last accessed April 23, 2017).

[38] See Annex III for details.

References

Boik, Andre and Kenneth S. Corts, "The Effects of Platform Most-Favored-Nation Clauses on Competition and Entry," *The Journal of Law and Economics*, 2016, *59* (1), 105–134.

Cavallo, Alberto, "Are Online and Offline Prices Similar? Evidence from Large Multi-channel Retailers," *American Economic Review*, January 2017, *107* (1), 283–303.

De los Santos, Babur and Matthijs Wildenbeest, "E-book Pricing and Vertical Restraints," *Working Paper*, 2017.

Edelman, Benjamin G. and Julian Wright, "Price coherence and excessive intermediation," *Quarterly Journal of Economics*, 2015, *130*, 1283–1328.

Foros, Øystein, Hans Jarle Kind, and Greg Shaffer, "Apple's Agency Model and the Role of Resale Price Maintenance," 2015, (2015/32).

Ghose, Anindya and Yuliang Yao, "Using Transaction Prices to Re-Examine Price Dispersion in Electronic Markets," *Information Systems Research*, 2011, *22* (2), 269–288.

_ , Panagiotis Ipeirotis, and Beibei Li, "Surviving social media overload: Predicting consumer footprints on product search engines," *mimeo*, 2012.

Gorodnichenko, Yuriy and Oleksandr Talavera, "Price Setting in Online Markets: Basic Facts, International Comparisons, and Cross-Border Integration," *American Economic Review*, January 2017, *107* (1), 249–82.

Hunold, Matthias, "Best Price Clauses: What Policy as Regards Online Platforms?," *Journal of European Competition Law & Practice*, 2016.

Johansen, Björn Olav and Thibaud Vergé, "Platform parity clauses with direct sales," *Working Paper*, 2017.

Johnson, Justin P., "The agency model and MFN Clauses," *The Review of Economic Studies*, 2017.

Lu, Qiang, Yupin Yang, and Ulku Yuksel, "The impact of a new online channel: An empirical study," *Annals of Tourism Research*, 2015, *54*, 136 – 155.

Nakamura, Emi and Jón Steinsson, "Five Facts about Prices: A Reevaluation of Menu Cost Models," *The Quarterly Journal of Economics*, 2008, *123* (4), 1415.

Orlov, Eugene, "How Does the Internet Influence Price Dispersion? Evidence from the Airline Industry*," *The Journal of Industrial Economics*, 2011, *59* (1), 21–37.

Segal, Ilya, "Contracting with Externalities," *The Quarterly Journal of Economics*, 1999, *114* (2), 337–388.

Shen, Bo and Julian Wright, "Why (don't) firms free ride on an intermediary's advice?," *Working Paper*, 2017.

Stangl, Brigitte, Alessandro Inversini, and Roland Schegg, "Hotels' dependency on online intermediaries and their chosen distribution channel portfolios: Three country insights," *International Journal of Hospitality Management*, 2016, *52*, 87 – 96.

Ursu, Raluca M., "The Power of Rankings: Quantifying the Effects of Rankings on Online Consumer Search and Choice," *Working Paper*, 2016.

Wang, Chengsi and Julian Wright, "Search platforms: Showrooming and price parity clauses," *Working Paper*, 2017.

Wooldridge, Jeffrey M, *Econometric analysis of cross section and panel data*, MIT press, 2010.

Zhao, Kexin, Xia Zhao, and Jing Deng, "Online Price Dispersion Revisited: How Do Transaction Prices Differ from Listing Prices?," *Journal of Management Information Systems*, 2015, *32* (1), 261–290.

Annex I: Countries and cities covered in data set

Tables 8 until 12 show the selected countries and cities covered in our data set. Data collection started for the 25 biggest German cities (Table 9) and a control sample of 20 pairs of German and non-German cities along the German border (Table 10) in January 2016. In order to cover all three different BPC regimes in the data and to gather data for countries in which future decisions on BPC are possible, the additional countries depicted in Table 8 were subsequently included. For these countries, we chose a composition of the fifteen biggest cities and fifteen largest travel destinations with the objective to gather representative data across touristic and urban destinations for these countries.

Table 8: Countries covered in data set

Country	Cities covered	Start
Germany	25 biggest cities	25/01/2016
Various	20 pairs of cities near German border	27/01/2016
Italy	15 biggest cities and 15 tourist destinations	10/02/2016
Sweden	15 biggest cities and 14 tourist destinations	12/02/2016
Canada	15 biggest cities and 15 tourist destinations	12/02/2016
France	15 biggest cities and 15 tourist destinations	18/02/2016
Austria	15 biggest cities and 15 tourist destinations	20/04/2016

Table 9: Germany - TOP 25 cities

Germany TOP 25 cities				
Berlin	Stuttgart	Leipzig	Bochum	Karlsruhe
Hamburg	Dusseldorf	Dresden	Wuppertal	Mannheim
Munich	Dortmund	Hanover	Bielefeld	Augsburg
Cologne	Essen	Nuremberg	Bonn	Wiesbaden
Frankfurt am Main	Bremen	Duisburg	Munster	Gelsenkirchen

Table 10: Twin cities along German border

Pair	German City	Non-German neighbor	Country of neighbor
1	Flensburg	Kolding	Denmark
2	Puttgarden/Fehmarn	Rodby	Denmark
3	Wilhelmshaven	Groningen	The Netherlands
4	Borkum	Schiermonnikoog	The Netherlands
5	Rheine	Enschede	The Netherlands
6	Aachen	Maastricht	The Netherlands
7	Heringsdorf	Wolin	Poland
8	Greifswald	Stettin	Poland
9	Cottbus	Zielona-Gora	Poland
10	Trier	Rosport	Luxembourg
11	Monschau	Eupen	Belgium
12	Pruem	St. Vith	Belgium
13	Saarbrücken	Metz	France
14	Karlsruhe	Strasbourg	France
15	Freiburg	Basel	Switzerland
16	Konstanz	St. Gallen	Switzerland
17	Oberstdorf	Bad Ischl	Austria
18	Garmisch-Partenkirchen	Innsbruck	Austria
19	Nuremberg	Pilsen	Czech Republic
20	Dresden	Prague	Czech Republic

Table 11: Cities covered in data set

Italy	**Canada**	**France**	**Sweden**	**Austria**
		Biggest Cities		
Rome	Toronto	Paris	Stockholm	Vienna
Milan	Montreal	Marseille	Göteborg	Graz
Naples	Vancouver	Lyon	Malmö	Linz
Turin	Calgary	Toulouse	Uppsala	Salzburg
Palermo	Edmonton	Nice	Västeras	Innsbruck
Genoa	Ottawa	Nantes	Örebro	Klagenfurt
Bologna	Québec	Strasbourg	Linköping	Villach
Florence	Winnipeg	Montpellier	Helsingborg	Wels
Bari	Hamilton	Bordeaux	Jönköping	St. Pölten
Catania	Kitchener	Lille	Norrköping	Dornbirn
Venice	London	Rennes	Lund	Wiener Neustadt
Verona	Victoria	Reims	Umea	Steyr
Messina	Saint Catharines	Le Havre	Gävle	Feldkirch
Padua	Halifax	Saint-Étienne	Boras	Bregenz
Trieste	Oshawa	Toulon	Eskilstuna	Leonding
		Tourist Destinations		
Lecce	Regina	Grenoble	Växjö	Zell am See
Viareggio	St. John's	Cannes	Lulea	Kitzbühel
Matera	Fredericton	Chambéry	Falun	Bad Hofgastein
Sanremo	Charlotte Town	Annecy	Varberg	Hermagor
Mantova	Whitehorse	Aix-les-Bains	Visby	Schladming
Vasto	Yellowknife	Menton	Ystad	Mittelberg
Merano	Niagara On The Lake	Albertville	Kiruna	Neustift
Caltagirone	Whistler	Bayeux	Strömstad	Bad Gastein
Montecatini Terme	Banff	Argelès-sur-Mer	Ronneby	Velden am Wörther See
Narni	Jasper	Chamonix	Jokkmokk	Finkenstein am Faaker See
Abano Terme	Tofino	Évian-les-Bains	Grebbestad	Kirchberg in Tirol
Ischia	Dawson City	Cavalaire-sur-Mer	Marstrand	St. Kanzian
Monte Argentario	Churchill	Saint-Gervais-les-Bains	Jukkasjärvi	Mayrhofen
San Felice Circeo	Bay of Fundy	Gruissan	Stöllet	Seefeld in Tirol
Santa Margherita Ligure	Thousand Islands National Park	Sainte-Marine		Sölden

Selection of travel destinations

For Italy, Sweden, Canada, France and Austria we selected the travel destinations in two steps. First, we looked up the fifteen biggest cities in terms of population on Wikipedia respectively. Additionally, for each country, we collected information about popular tourist destinations from travel guides and official tourism websites. We then ordered all these destinations by population and took again the fifteen biggest locations. For Italy, France,

Sweden and Canada the websites were all accessed in January and February 2016. The Austrian cities were selected in April 2016 after the Austrian competition authority announced to proceed against the narrow BPC later in 2016.

The sources of the travel destinations can be found in the following table:

Table 12: Sources for travel destination selection

Country	Type	Source
Italy	Listing of health resorts	wikipedia.de
	Ten most popular beaches	telegraph.co.uk
	Beyond Rome and Florence: 12 alternative Italian destinations	cnn.com
Sweden	Top 10 Places in Sweden	neverstoptraveling.com
	Top 10 Green Attractions	visitsweden.com
Canada	Travelers Choice	tripadvisor.com
	Tourist attractions	planetware.com
	Places to Go	de-keepexploring.canada.travel
France	The top 10 beach holidays	telegraph.co.uk
	Travelers Choice Destinations	tripadvisor.com
	16 Top-Rated Tourist Attractions in the French Alps	planetware.com
Austria	Most popular winter destinations	austriatourism.at
	Most popular summer destinations	austriatourism.at

Annex II: Validation of Kayak data

As mentioned in section 3.1, to validate the accuracy of the offers listed on Kayak we have compared prices and qualitative features of 171 hotels on Kayak with corresponding offers on the websites of the major OTAs and the hotel websites.

We generated our validation sample as follows. From all hotels that we observed in our data we took a random draw of 115 hotels. We augmented the sample with 56 hotels from Germany, Austria and Sweden that we observed to frequently offer a direct sales channel on Kayak. We did this to obtain more observations with direct channel prices as well as HRS prices and to have a better coverage of the countries Germany, Austria and Sweden. Consequently, the sample consists of observations from Canada, Italy, Sweden, Germany, Austria and France plus a few observations for the Czech Republic, Switzerland and Poland. For 40 hotels of our sample Kayak did not display any information during

the enquiry period for various travel dates.

From a request on Kayak we obtain room rates for all available sales channels and information on room features (e.g. double bed) and booking conditions (e.g. free cancellation, free breakfast, etc.). We used the forwarding links on the Kayak website to reach the corresponding offer on the OTAs and the hotel websites. With the gathered data we conducted two kinds of consistency validations. First, we compare prices and qualitative characteristics of a room offer on Kayak with the corresponding offer on the OTAs or on the hotel website. Second, we verify whether the price structure between the major OTAs and the direct sales channel shown on Kayak is consistent with the price structure on OTAs and hotel websites. In eight cases (4.7%) on Kayak the qualitative features differed across the sales channels.[39] As prices are not comparable across channels in these cases, the observations are excluded from the analysis of the price structure.

As shown in Table 13 we observe that prices coincide in more than two-thirds of all observations on both sources. For this comparison we have assumed that prices coincide if the difference amounts to less than three EUR in order to capture differences in rounding and exchange rates.[40] For deviating prices, the data suggest that prices on Kayak most often are higher than the prices on OTAs and websites and that only in a few cases prices on Kayak are lower than on the actual sales channel. The sales channel that is measured most accurately is the direct sales channel. On average, prices on Kayak and prices on the OTAs or the hotel websites deviate from each other by approximately five EUR. Comparing the room features and booking conditions on both sources, we found that this information on Kayak is identical with the information provided on the OTA or the hotel website, whenever rooms were available on both sources.

[39]Deviations are due to different cancellation policies or the inclusion of breakfast and do not seem to affect room offers or sales channels systematically.

[40]Expedia displays an exact amount including euros and cents for a hotel room, while Booking.com usually adjusts prices upwards to the next integer. Moreover, prices from Sweden or Canada sometimes were displayed in domestic currencies. For the sake of comparability, we converted the prices in EUR using the exchange rate of the booking date (Source: www.finanzen.net/waehrungsrechner/).

Table 13: Frequency of price deviations of Kayak from OTAs and hotel websites

	N	Kayak price higher	Kayak price equal	Kayak price lower
Booking.com	106	26%	69%	5%
Expedia	64	34%	66%	0%
HRS	34	29%	68%	3%
Direct channel	51	12%	80%	8%

In order to ensure comparability among sales channels in the second consistency validation, we only compared hotel offers of different sales channels with each other if these offers were qualitatively identical. In more than 90% the offers on all sales channels were qualitatively identical regarding room features and booking conditions. Among these offers we identify a price leadership whenever the lowest price is at least 1 EUR lower than the second lowest price. Table 14 shows that the information whether one sales channel is the price leader (i.e. offers a price strictly lower than the second best and qualitatively identical offer) is consistent between Kayak and the actual sales channels in approximately 90% of the cases. If there is a distinct price leader the average difference between the lowest price and the second lowest price is around 7.50 EUR both on Kayak and on the sales channels.

Table 14: Consistency of price leadership

Price leadership	N	Price leadership consistent
Booking.com	67	93%
Expedia	50	91%
HRS	29	91%
Direct channel	39	89%

Annex III: Evidence on commission rates of OTAs

We understand that major OTAs such as Booking.com and Expedia use an agency model where hotels set room prices on the OTA and pay a commission to the OTA for every realized booking via the OTA. We understand that effective commissions are determined by a standard rate plus an additional fee if hotels want to appear higher in the OTA's ranking.[41] The interventions against BPCs aimed at removing restraints of competition

[41]For example via Expedia's hotel accelerator program that sells higher ranking positions by auction (see https://skift.com/2016/03/03/first-look-at-expedias-hotel-accelerator-program-for-improving-hotel-

among OTAs in commission rates. However, the recent interventions have not obviously led to significant changes in the OTAs' commission rates so far. A recent[42] Europe-wide survey among more than 2,000 hoteliers by HOTREC finds that for more than 90% of all hotels the effective commission rates have not decreased over the past one year.[43]

Our anecdotal examination (including interviews with hoteliers) in the course of 2016 indicates that basis commission rates of the major OTAs range between 12% and 18% in Europe. While we took note of basis commissions of 15% at Expedia and HRS, Booking.com's basis commissions apparently vary across destinations (see Table 15 for the observations). Similarly, the Bundeskartellamt reported in the decisions regarding HRS[44] and Booking.com[45] that in 2013 and in 2015 the major OTAs' basis commission rates range from 10% to 15%. This also indicates that in Germany (basis) commissions have not changed in the last years.

Table 15: Booking.com's standard commissions by destination

Dusseldorf	Berlin	Termoli	Rome	Orebro	Stockholm	Toulouse	Paris
12%	15%	15%	18%	15%	15%	17%	15%

According to the Bundeskartellamt, effective commissions can account for up to 50% of the room price.[46] In 2015, the German hotel association estimated average commissions payments to range between 20% and 25%.[47]

placement/; last accessed September 25, 2016) or Booking.com's preferred partner program (see http://www.booking.com/content/hotel-help.de.html; last accessed September 25, 2016).

[42]HOTREC is the European trade association of hotels, restaurants and cafes in Europe.

[43]HOTREC survey on online platforms of 2016 (see http://www.hotrec.eu/newsroom/press-releases-1714/dominant-online-platforms-gaining-market-share-in-travel-trade-no-signs-of-increased-competition-between-online-travel-agents-unveils-european-hotel-distribution-study.aspx; last accessed September 03, 2016).

[44]Bundeskartellamt (2013) B9-66-10 Par. 225

[45]Bundeskartellamt (2015) B9-121-13 Par. 18.

[46]Bundeskartellamt (2015) B9-121-13 Par. 2.

[47]Statement of the German hotel association from August 31, 2015 according to Bundeskartellamt (2015) B9-121-13, Fn 414.

Annex IV: Public decisions with respect to BPCs of OTAs in Europe

Table 16: List of public decisions with respect to BPCs

Date	Country	Decision body	Content	Reference
01/2014	UK	OFT	OFT decision	Decision 31.01.2014, OFT1514dec – Case reference CE/9320/10
12/2013	Germany	Bundes-kartellamt	Prohibition	Decision of 20.12.2013, B 9 – 66/10 – HRS - Hotel Reservation Service
04/2015	Sweden	Konkurrens-verket	Acceptance of Booking.com's commitment to at most narrow BPCs with effect of July 2015	Decision of 15.04.2015 – 596/2013 – Booking.com
"	France	Autorité de la concurrence	"	Decision of 21.04.2015 – 15-D-06 – Booking.com
"	Italy	Autorità Garante della Concorrenza e del Mercato	"	Decision of 21.04.2015 – I779 – Booking.com
2015	UK	Court decision	OFT decision was annulled on appeal on procedural grounds	CMA press release, 16.09.2015, CMA closes hotel online booking investigation.[a]
07/2015	EU/EEA	Expedia	Announces to use narrow BPCs in Europe	Expedia press release 01.07.2015; „Expedia Amends Rate, Conditions and Availability Parity Clauses".[b]
07/2015	France	French parliament	Law that prohibits BPCs for OTAs in France	„Loi Macron" 10.07.2015.[c]
12/2015	Germany	Bundes-kartellamt	Prohibitions of Booking.com's narrow BPCs by February 2016. Announcement to continue investigation with Expedia	Bundeskartellamt, decision of 23.12.2015, B 9-121/13 – Booking.com.
07/2016	Austria	Austrian parliament	Government bill to prohibit narrow BPCs for OTAs in Austria by January 2017	Nationalrat, decision of 18.10.2016 government bill (1251 d.B.)
11/2016	France	Tribunal de commerce de Paris	Prohibitions of availability parity clauses	Decision of 29.11.2016 - No. RG: 2014027403 - Booking.com

[a] See https://www.gov.uk/government/news/cma-closes-hotel-online-booking-investigation. (last access April 04, 2016)

[b] See http://www.expediainc.com/news-release/?aid=123242&fid=99&yy=2015, last access April 04, 2016.

[c] See http://www.hotelnewsnow.com/Article/16460/Frances-end-to-rate-parity-creates-grey-areas for more information, last access April 27, 2016.

Annex V: Definition of OTAs and direct sales channels

In our data set, we observe 76 distinct sales channels that list hotel rooms on Kayak. These can be classified into OTAs like Booking.com, and the direct hotel channel. Taking together all hotel offers out of all Kayak requests, we observe in total more than 108 million price offers. Table 17 lists the 15 most observed sales channels that account for almost 90% of all observed price offers. Booking.com is the most frequent channel in our data set accounting for 17% of all price observations.

Table 17: Sales channels observed on Kayak

Sales Channel	No.	%
BOOKINGDOTCOM	18,534,188	17.1
HOTELSDOTCOM	16,235,725	15.0
EXPEDIAHOTEL	16,208,094	15.0
EBOOKERSHOTEL	11,156,665	10.3
AGODA	5,420,055	5.0
HRS	5,338,770	4.9
HOTELRESERVIERUNG	4,350,524	4.0
HOTELOPIA	3,935,577	3.6
AMOMA	3,659,841	3.4
TRIPADVISOR	2,674,348	2.5
HOTELSCLICK	2,338,775	2.2
OTEL	2,003,584	1.8
LOWCOSTHOLIDAYS	1,361,933	1.3
TOURICO	1,310,164	1.2
VENERE	1,093,568	1.0
Total	108,411,643	100.0

It is noteworthy that the well-known OTAs Booking.com, Expedia and HRS belong to company groups which own further OTAs (Table 20). Together the three company groups account for more than two-thirds of our price observations. For these Kayak requests in which two OTAs of the same company group are observed together (column 4), we computed how often the prices are identical (column 5).

As a benchmark, we also compared the primary OTAs Booking.com, Expedia and HRS in Tables 18 and 19. Table 18 shows how frequently the OTAs appear together in one Kayak request. For those Kayak requests in which two OTAs are observed together, we find that prices are equal in less than 50% (Table 19).

Table 18: Contingency of OTA Listings

	Booking.com	Expedia	HRS
Booking.com	18,534,188		
Expedia	13,792,646	16,208,094	
HRS	4,669,818	4,305,990	5,338,770

Table 19: Price coherence on major OTAs

	Booking.com	Expedia	HRS
Booking.com	100%		
Expedia	42%	100%	
HRS	52%	46%	100%

We conducted the same analysis with OTAs belonging to the same company group. The OTA Agoda that belongs to the Priceline Group appears in more than 80% with the primary website Booking.com. For the OTAs belonging to Expedia Inc. (Hotels.com, Venere, ebookers) the mutual appearance with the primary website Expedia is at almost 100% of all observations. The Expedia website prices are also very often equal to the prices at Hotels.com and Venere,[48] which suggests to treat them as one entity. For ebookers an abrupt change in pricing policy can be observed between May and June 2016. While ebookers used to have a price parity with Expedia in only 18% of all Kayak requests until May, this value increased in June and July to 90%. Therefore, also Expedia and ebookers is treated as one entity.

Interestingly, the correspondence between Booking.com and Agoda is quite low. As a consequence, we treat them as separate OTAs. Finally, we also treat HRS and Hotel.de as separate as the mutual appearance between HRS and Hotel.de is at only 39% and also the coherence is only moderate.

[48]Note that the OTA Venere is observed on Kayak only in January and February 2016.

Table 20: Price coherence within company groups

Group	OTA	Share in total price listings	Appearance with primary website	Price coherence with primary website
Priceline	Booking.com	17%	100%	100%
	Agoda	5%	87%	38%
Expedia Inc.	Expedia	15%	100%	100%
	Hotels.com	15%	98%	90%
	Venere	1%	98%	98%
	ebookers	10%	98%	75%
HRS Robert Ragge GmbH	HRS	5%	100%	100%
	Hotel.de	1%	39%	71%

Annex VI: Increase of Booking.com's listing frequency in Germany - robustness check

The Booking.com price publication frequency in Germany starts from a considerably lower level than the frequencies in the other countries at the beginning of the observation period in 2016 (Figure 2). One might, therefore, wonder whether the increase in the publication frequencies of Booking.com in Germany can be fully attributed to the prohibition of its narrow BPC by the Bundeskartellamt.

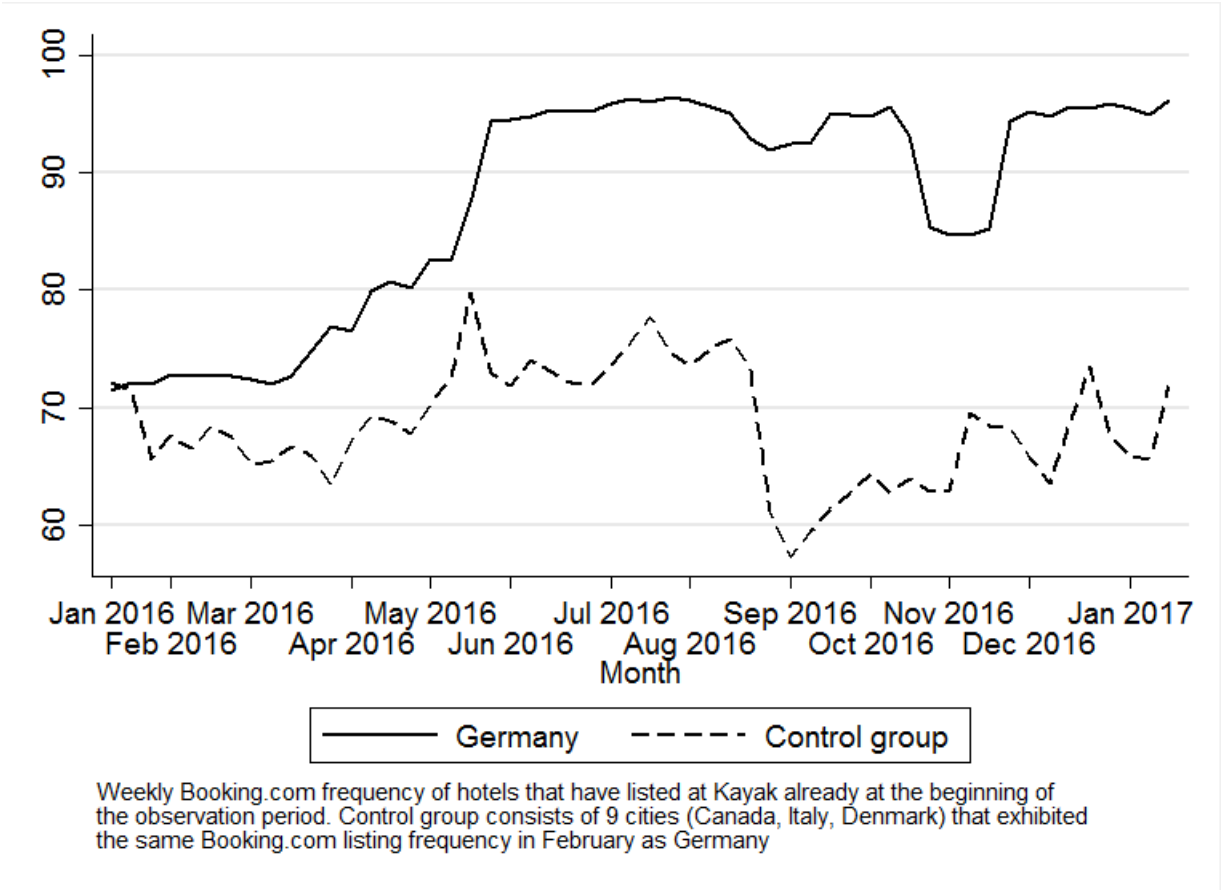
An alternative hypothesis could be that Booking.com might undergo a general catch-up process in regions where it is less established. To descriptively verify the robustness of our result, we conducted a comparison between the evolvement of Booking.com's listing frequency in Germany and in a control group. The control group comprises of nine non-German cities that, on average, exhibit the same Booking.com listing frequency as it can be observed in Germany at the beginning of 2016. The cities of the control group were selected as follows:

At the city-level, we computed for every month the average Booking.com frequency. Taking the nine non-German cities with the lowest Booking.com frequency in February yields approximately the same average Booking.com frequency as for Germany as a whole (74.5%, while 72.6% in Germany). These cities are Rome, Venice, Ischia (all Italy), Rodby (Denmark), Dawson City, Yellowknife, Gananoque (Ottawa), Tofino, St. Catharines (all

Canada). Figure 3 shows how weekly Booking.com frequencies evolve over time for the two groups. In Germany the frequency increases sharply from 73% in February to 96% in June and July and remains at the same level for most of the remaining observation period. The listing frequency of the control sample has the same frequency level at the beginning of the year. But in contrast to Germany, the Booking.com frequency of the control sample does not show a similar increase and only fluctuates between 59% and 80% during the whole observation period.

Hence, we conclude from the comparison of Germany with a control sample consisting of nine cities from Europe and Canada that there is no general catch-up process in regions with low Booking.com frequencies that drives the development in Germany. In turn, this result is taken as supporting evidence that the abolition of Booking.com's BPCs in Germany can be contributed to the especially sharp increase of Booking.com listings in Germany.

Figure 3: Booking.com Frequency (Germany and control group)



Weekly Booking.com frequency of hotels that have listed at Kayak already at the beginning of the observation period. Control group consists of 9 cities (Canada, Italy, Denmark) that exhibited the same Booking.com listing frequency in February as Germany

A related regression on the intensive channel use of the direct channel and Booking.com with the control sample reveals the same result as in the descriptive representation. The intensive channel use of Booking.com increases significantly while the significant and negative trend deviations for the other countries show that the trend in the control sample is in total approximately zero.

Table 22: Intensive channel use

	(1) Direct	(2) Booking.com
Trend (Base: Germany)	0.19***	2.67***
Δ Trend Italy	−0.16***	−2.67***
Δ Trend Canada	−0.04	−1.88***
Δ Trend Denmark	−0.70***	−4.15***
Share of non-listed hotels	−0.08***	−0.23***
7 days before	0.04	−0.04
14 days before	0.07**	0.23**
21 days before	0.09**	0.59***
28 days before	0.10**	1.43***
Weekdays	Yes	Yes
Hotel FE	Yes	Yes
Observations	6,602,884	6,602,884
R^2	0.880	0.423
Adjusted R^2	0.880	0.422

Heteroscedasticity-robust standard errors not reported.
Dependent variables are equal to 100 if particular channel is present at Kayak request and 0 otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Annex VII: Robustness checks for main regressions

We test the robustness of our main regression results concerning four variations to the main specification (Table 23 until Table 28). In general, we find that our results are robust with respect to different specifications.

First, we restrict the observation period to the time frame between January 2016 and July 2016. Recall from Figure 2 that we observe a strong adaption process of the Booking.com listing frequency shortly after the removal of the narrow BPC. In line with this observation, the regression coefficients for the German-specific trend for our main dependent variables of interest are larger in magnitude than the coefficients for the main regression which takes data until January 2017 into account.

Second, we observe that there is a share of hotels that exhibit no variation in the dependent variables during the observation period. In this robustness check we seek to identify

the fraction of hotels that indeed react to the removal of Booking.com's narrow BPC in Germany by changing their listing or pricing *strategy*.[49] To do so, we drop all observations from hotels that do not change their strategy during the observation period. By definition, these hotels exhibit a zero time trend and we find that coefficients are larger in magnitude than those in the main regressions.

Third, we compare our main regression that use hotel fixed effects with regressions without hotel fixed effects. In turn, we are able to include the time-invariant observed hotel characteristics like the number of rooms and the stars.[50] Even though the significance level and the sign of the coefficients generally coincide with the main regression, we find differences in the magnitude of the coefficients. This finding reassures us that we are able to capture unobserved heterogeneity by employing hotel fixed effects.

Last, we compute a difference-in-differences (DiD) specification. The pre-treatment period is defined to cover January and February 2016.[51] Qualitatively, we find comparable results to our *difference-in-trends* specification of the main regressions,

[49]For the regressions on the Kayak request level (intensive channel use and price leadership) the share of hotels that does not change their *strategy* ranges between 0.1% (direct channel as price leader) and 12% (Booking.com as distribution channel). For the regressions on the extensive channel use these figures are considerably higher as the unit of observation is on the hotel-month level. Accordingly, all hotels that use, for example, Booking.com at least once every month, in which we observe them, exhibit no variation in the dependent variable "Extensive Booking.com use". Only 5% (Booking.com) and 18% (direct channel) of all hotel-month observations exhibit variation in this respect.

[50]The time-invariant characteristics are centered (cent) around the mean.

[51]Note that the removal of Booking.com's narrow BPC came into effect at the beginning of February 2016.

Table 23: Robustness check - Price leadership of direct channel

	(1) Main reg.	(2) Until July	(3) Strategy	(4) No FE	(5) DiD
Trend (Base: Germany)	0.33***	1.27***	0.33***	0.21**	
Δ Trend France	−0.64***	−1.19***	−0.64***	−0.69***	
Δ Trend Italy	−0.37**	−1.41***	−0.37**	−0.38**	
Δ Trend Sweden	−1.64***	−2.87***	−1.64***	−0.99***	
Δ Trend Austria	−0.34	−1.15**	−0.33	−1.25***	
Δ Trend Canada	−0.23**	−1.16***	−0.23**	−0.36***	
Δ Trend Other countries	−0.49***	−1.02***	−0.49***	−0.57***	
Share of non-listed hotels	0.02***	0.02**	0.02***	0.10***	0.01
7 days before	−0.21	0.20	−0.20	0.10	−0.20
14 days before	−0.33*	0.08	−0.33*	0.02	−0.33*
21 days before	0.82***	1.32***	0.82***	1.21***	0.85***
28 days before	1.26***	1.44***	1.26***	1.81***	1.30***
France				6.95***	
Italy				−2.00	
Sweden				5.18**	
Austria				9.39***	
Canada				−1.12	
Other countries				1.31	
Hotel category in stars (cent)				−0.92*	
Number of rooms (cent)				−0.03***	
Kayak Hotel Rating (cent)				3.91***	
After February					4.27***
After February × France					−4.07***
After February × Italy					−4.97***
After February × Sweden					1.45
After February × Austria					−0.52
After February × Canada					−3.82***
After February × Other					−2.93**
Constant				8.97***	
Weekdays	Yes	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	No	Yes
Observations	2,968,628	1,792,965	2,965,216	2,650,629	2,968,628
R^2	0.426	0.460	0.426	0.027	0.425
Adjusted R^2	0.425	0.459	0.425	0.027	0.424

Standard errors (clustered by hotel) not reported. (1) is the regression from the main analysis aggregated for all hotel types. (2) only contains data until (end of) July 2016. (3) excludes all hotels that exhibit no variation in the dep. variable ("strategy"). (4) includes no hotel fixed effects and controls for time-invariant observed hotel characteristics. (5) is a usual diff-in-diff specification with pre-treatment period until (end of) February 2016. The dep. variable is equal to 100 if direct channel is price leader and 0 otherwise. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 24: Robustness check - Price leadership of Booking.com

	(1) Main reg.	(2) Until July	(3) Strategy	(4) No FE	(5) DiD
Trend (Base: Germany)	0.04	0.17***	0.04	−0.00	
Δ Trend France	−0.11*	0.49***	−0.11*	−0.23***	
Δ Trend Italy	0.05	0.65***	0.05	0.15*	
Δ Trend Sweden	−0.07	−0.33	−0.07	−0.26**	
Δ Trend Austria	−0.44***	0.27	−0.45***	−0.41***	
Δ Trend Canada	0.01	0.56***	−0.00	−0.04	
Δ Trend Other countries	0.34***	0.56***	0.34***	0.09	
Share of non-listed hotels	−0.02***	0.01	−0.02***	−0.08***	−0.01*
7 days before	−1.55***	−1.17***	−1.53***	−1.61***	−1.53***
14 days before	0.97***	1.35***	0.98***	0.92***	0.99***
21 days before	−1.69***	−1.28***	−1.66***	−1.92***	−1.67***
28 days before	−2.79***	−2.28***	−2.76***	−3.04***	−2.78***
France				4.90***	
Italy				1.26*	
Sweden				5.08***	
Austria				7.44***	
Canada				5.65***	
Other countries				3.34***	
Hotel category in stars (cent)				−0.81***	
Number of rooms (cent)				−0.01***	
Kayak Hotel Rating (cent)				0.39	
After February					0.44*
After February × France					−0.75*
After February × Italy					1.24***
After February × Sweden					−3.71***
After February × Austria					−3.02**
After February × Canada					−2.48***
After February × Other					1.25*
Constant				10.43***	
Weekdays	Yes	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	No	Yes
Observations	2,904,988	1,763,570	2,890,156	2,584,677	2,904,988
R^2	0.140	0.162	0.137	0.014	0.140
Adjusted R^2	0.138	0.160	0.136	0.014	0.138

Standard errors (clustered by hotel) not reported. (1) is the regression from the main analysis aggregated for all hotel types. (2) only contains data until (end of) July 2016. (3) excludes all hotels that exhibit no variation in the dep. variable ("strategy"). (4) includes no hotel fixed effects and controls for time-invariant observed hotel characteristics. (5) is a usual diff-in-diff specification with pre-treatment period until (end of) February 2016. The dep. variable is equal to 100 if Booking.com is price leader and 0 otherwise. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 25: Robustness check - Extensive direct channel use

	(1) Main reg.	(2) Until July	(3) Strategy	(4) No FE	(5) DiD
Trend (Base: Germany)	0.06***	0.16***	1.56***	0.28***	
Δ Trend France	0.05	−0.10	−0.17	−0.04	
Δ Trend Italy	−0.12***	−0.30***	−3.11***	−0.24***	
Δ Trend Sweden	−0.11*	−0.34***	−3.03	−0.29***	
Δ Trend Austria	−0.01	0.70***	−0.84	0.10	
Δ Trend Canada	−0.07*	−0.16*	−1.72*	−0.05	
Δ Trend Other countries	−0.00	−0.17**	0.01	−0.02	
Avg. share non-listed hotels	−0.00	0.01	−0.10	−0.10***	0.00
France				13.80***	
Italy				1.22**	
Sweden				2.23	
Austria				2.25**	
Canada				18.30***	
Other countries				−1.23	
Hotel category in stars (cent)				5.15***	
Number of rooms (cent)				0.16***	
Kayak hotel Rating (cent)				−0.31	
After February					0.76***
After February × France					0.25
After February × Italy					−1.14***
After February × Sweden					−1.42***
After February × Austria					2.38**
After February × Canada					−0.83***
After February × Other					−0.68*
Constant				17.64***	
Hotel FE	Yes	Yes	Yes	No	Yes
Observations	290,357	155,021	13,537	269,476	290,357
R^2	0.946	0.958	0.373	0.201	0.946
Adjusted R^2	0.940	0.948	0.314	0.201	0.940

Standard errors (clustered by hotel) not reported. (1) is the regression from the main analysis aggregated for all hotel types. (2) only contains data until (end of) July 2016. (3) excludes all hotels that exhibit no variation in the dep. variable ("strategy"). (4) includes no hotel fixed effects and controls for time-invariant observed hotel characteristics. (5) is a usual diff-in-diff specification with pre-treatment period until (end of) February 2016. The dep. variable is equal to 100 for all months in which a hotel used the direct channel at least once and 0 otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 26: Robustness check - Extensive Booking.com use

	(1) Main reg.	(2) Until July	(3) Strategy	(4) No FE	(5) DiD
Trend (Base: Germany)	1.83***	3.74***	7.99***	1.69***	
Δ Trend France	−0.92***	−1.59***	−2.08***	−0.86***	
Δ Trend Italy	−0.43***	0.22	−2.18***	−0.44***	
Δ Trend Sweden	−1.71***	−3.44***	−6.88***	−1.69***	
Δ Trend Austria	−1.27***	−1.87***	−3.17***	−1.23***	
Δ Trend Canada	−1.67***	−3.20***	−6.48***	−1.70***	
Δ Trend Other countries	−1.68***	−3.38***	−6.40***	−1.63***	
Avg. share non-listed hotels	−0.15***	−0.26***	−1.33***	−0.07***	0.10***
France				9.09***	
Italy				2.02***	
Sweden				15.88***	
Austria				12.37***	
Canada				14.55***	
Other countries				16.08***	
Hotel category in stars (cent)				−0.27**	
Number of rooms (cent)				0.00	
Kayak hotel Rating (cent)				1.73***	
After February					12.40***
After February × France					−5.75***
After February × Italy					−3.08***
After February × Sweden					−12.49***
After February × Austria					−7.77***
After February × Canada					−12.43***
After February × Other					−12.52***
Constant				86.10***	
Hotel FE	Yes	Yes	Yes	No	Yes
Observations	290,357	155,021	52,424	269,476	290,357
R^2	0.594	0.683	0.330	0.046	0.583
Adjusted R^2	0.549	0.614	0.263	0.046	0.537

Standard errors (clustered by hotel) not reported. (1) is the regression from the main analysis aggregated for all hotel types. (2) only contains data until (end of) July 2016. (3) excludes all hotels that exhibit no variation in the dep. variable ("strategy"). (4) includes no hotel fixed effects and controls for time-invariant observed hotel characteristics. (5) is a usual diff-in-diff specification with pre-treatment period until (end of) February 2016. The dep. variable is equal to to 100 for all months in which a hotel used Booking.com at least once and 0 otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 27: Robustness check - Intensive direct channel use

	(1) Main reg.	(2) Until July	(3) Strategy	(4) No FE	(5) DiD
Trend (Base: Germany)	0.31***	0.70***	0.31***	−0.09	
Δ Trend France	−0.56***	−2.38***	−0.56***	0.12	
Δ Trend Italy	−1.23***	−3.42***	−1.24***	−0.83***	
Δ Trend Sweden	−0.70***	−1.49***	−0.70***	−0.36	
Δ Trend Austria	−0.20	0.44	−0.20	0.61*	
Δ Trend Canada	−0.29**	−1.41***	−0.29**	0.04	
Δ Trend Other countries	−0.97***	−2.68***	−0.97***	−0.82***	
Share of non-listed hotels	−0.32***	−0.30***	−0.32***	−0.16***	−0.32***
7 days before	0.42***	0.32***	0.42***	0.82***	0.43***
14 days before	0.79***	0.87***	0.79***	1.28***	0.80***
21 days before	0.71***	0.95***	0.71***	1.27***	0.77***
28 days before	0.64***	1.10***	0.64***	1.24***	0.81***
France				1.91**	
Italy				−2.87**	
Sweden				2.53	
Austria				−8.13***	
Canada				3.04***	
Other countries				−1.28	
Hotel category in stars (cent)				−0.15	
Number of rooms (cent)				0.02***	
Kayak hotel Rating (cent)				1.82***	
After February					1.09*
After February × France					−6.88***
After February × Italy					−14.17***
After February × Sweden					−4.33***
After February × Austria					12.26***
After February × Canada					−2.21***
After February × Other					−9.71***
Constant				95.72***	
Weekdays	Yes	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	No	Yes
Observations	3,726,480	2,273,209	3,718,109	3,304,693	3,726,480
R^2	0.401	0.325	0.401	0.038	0.402
Adjusted R^2	0.400	0.324	0.400	0.038	0.402

Standard errors (clustered by hotel) not reported. (1) is the regression from the main analysis aggregated for all hotel types. (2) only contains data until (end of) July 2016. (3) excludes all hotels that exhibit no variation in the dep. variable ("strategy"). (4) includes no hotel fixed effects and controls for time-invariant observed hotel characteristics. (5) is a usual diff-in-diff specification with pre-treatment period until (end of) February 2016. The dep. variable is equal to 100 if direct channel is present at Kayak request and 0 otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 28: Robustness check - Intensive Booking.com use

	(1) Main reg.	(2) Until July	(3) Strategy	(4) No FE	(5) DiD
Trend (Base: Germany)	0.30***	0.59***	0.36***	0.10***	
Δ Trend France	−0.40***	−0.36***	−0.44***	−0.25***	
Δ Trend Italy	−0.64***	−0.81***	−0.69***	−0.49***	
Δ Trend Sweden	−0.18***	−0.62***	−0.19***	0.02	
Δ Trend Austria	0.17**	−0.10	0.23***	0.22***	
Δ Trend Canada	−0.13***	−0.85***	−0.13***	0.17***	
Δ Trend Other countries	−0.12***	−0.57***	−0.15***	0.00	
Share of non-listed hotels	−0.28***	−0.26***	−0.34***	−0.19***	−0.28***
7 days before	−0.01	0.17***	−0.06	0.26***	−0.07
14 days before	0.07	0.31***	0.02	0.33***	0.01
21 days before	0.09	0.49***	0.04	0.30***	−0.02
28 days before	0.01	0.28***	−0.06	0.34***	−0.08
France				4.16***	
Italy				−1.05***	
Sweden				−2.57***	
Austria				2.08***	
Canada				−1.88***	
Other countries				−0.28	
Hotel category in stars (cent)				0.86***	
Number of rooms (cent)				0.00	
Kayak Hotel Rating (cent)				−0.33***	
After February					0.68***
After February × France					−2.72***
After February × Italy					−4.15***
After February × Sweden					−1.27***
After February × Austria					−0.96
After February × Canada					−0.66**
After February × Other					−1.58***
Constant				103.07***	
Weekdays	Yes	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	No	Yes
Observations	16,320,634	10,051,398	14,315,455	14,410,145	16,320,634
R^2	0.208	0.225	0.201	0.031	0.208
Adjusted R^2	0.207	0.223	0.200	0.031	0.207

Standard errors (clustered by hotel) not reported. (1) is the regression from the main analysis aggregated for all hotel types. (2) only contains data until (end of) July 2016. (3) excludes all hotels that exhibit no variation in the dep. variable ("strategy"). (4) includes no hotel fixed effects and controls for time-invariant observed hotel characteristics. (5) is a usual diff-in-diff specification with pre-treatment period until (end of) February 2016. The dep. variable is equal 100 if Booking.com is present at Kayak request and 0 otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$