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Evaluation of best price clauses in online hotel bookings[☆]



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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, hotels publish their offers more often at Booking.com when the OTA does not use the narrow BPC, and also tend to promote the direct online channel more actively. Moreover, the abolition of Booking.com's narrow BPC is associated with the direct channel of chain hotels having the strictly lowest price more often.

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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 distribution channels other than 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 of how BPCs actually affect the market outcome. 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), but can also be welfare-enhancing (see in particular Johansen and Vergé, 2017). However, empirical research on this topic is still very limited. With this article we start to fill the gap.

We exploit the variation in the BPCs due to different 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, 2017). For instance, the French competition authority had accepted Booking.com's commitments to narrow down the parity clauses in April 2015, only to be overruled by the French parliament which completely prohibited BPCs of OTAs in July 2015. These different decisions provide a quasi-experimental set-up for assessing the effects of different BPC policies.

Interestingly, according to a large hotel survey the standard commission rates of OTAs did not change following the prohibition of BPCs.³ Our focus is therefore on analyzing how the abolition of a BPC has influenced the choice of distribution channels on which hotels publish prices (OTAs and their direct channel) and the pricing of the same hotel room across these channels.⁴ A BPC can restrict price differentiation as it forbids hotels from charging higher room prices at the OTA, which imposes the clause, then on other channels covered by the clause (narrow BPCs cover only the direct channel, wide BPCs also other OTAs).⁵ There are related clauses, such as availability requirements, which further restrict a hotel's sales strategy. If a hotel faces less parity restrictions, it might

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 Online Appendix I for a list of the different decisions.

³ In 2016, a HOTREC study finds that for more than 90% of over 2000 hoteliers in Europe the effective commission rates have not decreased over the past one year (see press release on www.hotrec.eu; last accessed December 1, 2017).

⁴ Note that in the context we study hotels essentially set the sales prices on the OTAs. We refer to this as the *agency model* which is in contrast to the *merchant model* under which the platform would set the retail price.

⁵ 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 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. A narrow BPC does *not* contractually restrict the hotel's room prices at other OTAs.

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 were previously less attractive to use in view of these restrictions.

The main data source are price data from the website Kayak that covers the period January 2016 to January 2017. Kayak is a travel meta-search engine that displays the prices of the same hotel room on different online distribution channels, in particular the OTAs and the hotel website which we refer to as a *direct online channel*. We complement this data set with data from two additional sources. First, we add data from the OTA website Booking.com, which allows us to distinguish between chain and independent hotels. Second, we gathered time series data of travel-related search queries from Google Trends. These data date back before the beginning of our observation period and allow us to control for other developments in the analyses that are not BPC-related.

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 analyze the removal of Booking.com's narrow BPC in Germany since February 2016.⁶ By means of regression analyses, we compare the changes in the market outcome in Germany with the changes in other countries without such a regulatory treatment of the BPCs in the course of 2016.

We find that the price of the direct channel among hotel chains is more often strictly lower than the prices on all other visible online sales channels following the abolition of Booking.com's narrow BPC in Germany. At the same time, the price at Booking.com is less often the lowest among hotel chains in Germany. This suggests that Booking.com's BPC did restrict the hotels' price setting. The result is consistent with a simple cost-based pricing in case the hotel has lower distribution costs on the direct online channel relative to the OTAs that typically charge commission rates for each mediated booking. The 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.

With respect to the availability of hotel room offers on different distribution channels, 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 fraction of the hotels indeed responds to parity clauses by not being active at an OTA that imposes them. Similarly, hotels that had already been active on Booking.com increasingly often publish prices there once the clause is removed. Moreover, we observe a distinctive increase in the availability of the direct online channel of chain hotels at Kayak in Germany, also relative to other countries. This indicates that these hotels increasingly promote the direct channel when they are not constrained by Booking.com's narrow BPC.

⁶ We also partly capture a legislative prohibition of BPCs in Austria.

In France and Austria, we partly observe similar developments as in Germany. In particular, we observe that in these countries more hotels have started using Booking.com as a distribution channel. In Austria, hotels which had already been active at Booking.com more often publish prices at this OTA. These patterns support the results we have found in Germany as they can be related to changes in the BPCs in these countries. 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. In France, all BPCs of OTAs were prohibited in August 2015 with the *Loi Macron*, and in November 2016 the commercial court in Paris also prohibited the OTAs from using availability parity clauses.⁷

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](#), present various robustness checks in [Section 7](#) and conclude in [Section 8](#).

2. Related literature

2.1. Theory in relation to BPCs

Recent theoretical research finds support for the main theory of harm of various competition authorities that BPCs could restrict competition between OTAs for commission rates and that the resulting high commission rates could induce the hotels to charge higher retail prices (Boik and Corts, 2016; Edelman and Wright, 2015; Johnson, 2017). OTAs argue that BPCs prevent free-riding which would occur when consumers search on the OTA and then book on the hotel website or at another OTA if the price is lower there. Several competition authorities have accepted narrow BPCs as a compromise which only requires parity with respect to the direct online channel and, in principle, still allows for price differentiation across OTAs. According to Wang and Wright (2017), narrow BPCs may be beneficial for consumers if OTAs would leave the market otherwise. Wals and Schinkel (2018) argue that narrow BPCs can, however, have the same anti-competitive effects as wide BPCs when an OTA combines them with a best price guarantee.⁸

In contrast to the contributions above, Johansen and Vergé (2017) offer a divergent view to the main theory of harm. They show that BPCs do not necessarily lead to higher commission rates and consumer prices if hotels can decide whether to be active on the OTA. Moreover, they conclude that narrow BPCs do not increase competition

⁷ See Online Appendix I for details and references of the various decisions with respect to BPCs of OTAs in Europe.

⁸ Under a best price guarantee, an OTA promises to refund any price difference to hotel room offers with exactly the same characteristics on another distribution channel — if customers booked at the higher price and request this refund.

between intermediaries when compared to wide BPCs. These findings could explain the observation that the base commission rates of OTAs have apparently remained largely unchanged in Europe following the move of Booking.com in 2015 to use only narrow BPCs.

2.2. Empirical literature in relation to OTAs

As there are different theoretical predictions on the competitive effects of BPCs, it remains an empirical question as to whether and – if yes – how 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.⁹

A related contribution is the case study of [Lu et al. \(2015\)](#) who find that the introduction of a new online direct sales channel of a hotel chain in 2002 led to a significant reduction of the prices at physical travel agents, which suggests that there is competition between different forms of sales channels for hotel distribution. [Lu et al. \(2015\)](#) do not study BPCs, which is the focus of our study. [De los Santos and Wildenbeest \(2017\)](#) compare the agency model and the merchant model in the e-book market and find that retail prices for e-books are significantly higher when publishers set the prices on the sales platform (agency model).

Our article also relates to studies that characterize online pricing. [Gorodnichenko and Talavera \(2017\)](#) report that there is considerable online price dispersion for narrowly defined product categories and frequent price adjustments. We also document considerable price dispersion for hotel room offers across distributions channels and study how this is affected by BPCs.

3. Data and descriptive statistics

3.1. Data sources

3.1.1. Prices and hotel characteristics from Kayak and Booking.com

We use data on prices of hotel rooms on different online sales channels such as Booking.com, Expedia, and the hotels' direct online channel from the travel meta-search engine Kayak. We understand that Kayak does not post own prices and receives the hotel offers either directly from the OTAs or from a booking engine of the hotels or a third party.¹⁰

⁹ Various European competition authorities conducted an evaluation of BPCs in hotel bookings in 2016 using meta-search data. They found that price dispersion increased across OTAs following the reduction of price parity clauses. They did not address the direct channel as we do. We provided input for this exercise in early 2016, including our research set-up. See "Report on the Monitoring Exercise carried out in the Online Hotel Booking Sector by EU Competition Authorities in 2016," available at http://ec.europa.eu/competition/ecn/hotel_monitoring_report_en.pdf (last accessed December 1, 2017).

¹⁰ Booking engines such as Fastbooking, Travelclick or Derbysoft offer the services necessary to connect the hotel to Kayak.

Kayak then redirects customers to the hotel website or the OTA websites where bookings eventually take place. In case customers choose an OTA to book a hotel room, it is important to note that the OTA typically only acts as an intermediary between the hotel and customer while the hotels generally set the prices at the OTAs.

Best price clauses (if they exist) are specified in the contracts between the hotels and the OTAs. As a consequence, changes in the BPCs, which are induced by national competition law enforcement or new laws, target the contracts between the hotels in the respective jurisdiction and the affected OTA.¹¹ In order to study BPCs, we collect prices of hotels located in countries which differ in their BPC policies: Countries without BPCs (Austria, France, HRS and Booking.com in Germany), narrow BPC countries (Italy and Sweden) and wide BPC countries (Canada).¹²

We collect data from January 26, 2016, onward 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.¹³ Prices are collected for overnight stays for two persons in one room on the same day and the 7th, 14th, 21st and 28th day ahead.

For each hotel, Kayak provides general information and booking conditions from the different distribution channels and displays them to the customer when clicking on a particular hotel offer. We collect the data from the overview page that lists all the available hotels in the cities of interest. In addition, the Kayak data also contains hotel-specific characteristics like user rating and stars. Information about chain affiliation is retrieved by the hotel profile website on Booking.com.¹⁴

Hotel chains might have different distribution and marketing strategies, may benefit from economies of scale or react differently to contract changes. Moreover, they might have more bargaining power toward OTAs and occasionally might be able to negotiate contracts that differ from the standardized contracts between OTAs and independent hotels. In order to account for the heterogeneity between these different hotel types, we conduct the analyses separately for chain and independent hotels.¹⁵

3.1.2. OTA popularity and tourism flow measures from Google Trends

We also retrieve time series data from Google Trends for the time period January 2015 to January 2017 to approximate: 1) the popularity of different OTAs among cus-

¹¹ See for instance par 6.1 of the [commitments given by Booking.com in April 2015](#) (last accessed December 1, 2017) and point 1 of page 3 in the Bundeskartellamt's decision against Booking.com (full reference is in Online Appendix I).

¹² See Online Appendix I for details such as timing.

¹³ The corresponding list of locations and starting dates for data collection can be found in Online Appendix II.

¹⁴ For a small fraction of the hotels, where no profile website was available on Booking.com, we conducted analogously a manual classification into chain and independent hotels.

¹⁵ We discuss the concern of further unobserved heterogeneity and present robustness checks in this regard in [Section 7](#).

Table 1
Basic variables by hotel type.

Variable	Mean by hotel type			All observations			
	All	Chain	No chain	Std. dev.	Min	Max	N
<i>Kayak request level</i>							
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
Kayak hotel rating	7.97	7.90	8.00	0.87	2	10	19,810,437
GT city	76.67	77.60	76.32	15.12	4	100	20,115,292
GT Booking.com	63.50	65.26	62.82	15.53	32	100	20,115,292
GT Expedia	68.02	70.72	66.97	14.82	6	100	20,115,292
GT HRS	69.57	69.79	69.49	18.28	0	100	20,115,292
<i>Hotel level</i>							
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
Number of ratings	628.42	1,248.75	464.76	937.91	1	19,515	28,564

tomers, and 2) the tourism demand for hotels in particular cities. The data comprise the aggregated search volume of specific queries on Google over time.¹⁶

3.2. Summary statistics of the Kayak data

The data set contains around 30,000 hotels over the observation period January 2016 to January 2017. Each observation in the data set refers to a hotel room on a specific travel date which is on offer at a certain search date (which we refer to as *Kayak request*). It 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 chain hotels and independent hotels.

A Kayak request includes, on average, 5 online sales channels (OTAs and direct channel)¹⁷ and in 84% of all observations we find that hotels have published prices on at least two channels. The average price across all listings is at 120 EUR, ranging from 10 EUR to 2,000 EUR.¹⁸ The average standard deviation of the prices is 13 EUR for the Kayak

¹⁶ Similar data have already been used as a predictor of actual tourism data in other studies (Coyle and Yeung, 2016; Siliverstovs and Wochner, 2018). The collection and validation of these data is further explained in Online Appendix III.

¹⁷ This is consistent with Stangl et al. (2016) who find that for Germany, Austria, and Switzerland hotels have published prices at 3.6 OTAs.

¹⁸ We excluded prices below 10 EUR and above 2000 EUR.

Table 2
Channel use.

Channel as displayed at Kayak (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

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.¹⁹ 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.

Kayak displays for every city the number of available hotels and the total number of hotels that are generally listed. We use the fraction of hotels currently not available at Kayak as one measure of hotel occupancy in a city. It has an average value of 64% across all Kayak requests. The Google Trends measures are normalized by the maximum of the search volume in the observation period and scaled to values between zero and 100.

We report characteristics of the cross-section of hotels in the sample in the bottom panel of [Table 1](#). The average hotel has 52 rooms, 2.9 out of 5 stars²⁰ and a Kayak rating of 8 out of 10. We identify 21% of all hotels as belonging to a hotel chain.²¹ Interestingly, 28% (not reported in the table) of our Kayak requests come from chain hotels, which shows that these hotels are listed on Kayak more often. Accordingly, we find that chain hotels, on average, use more distribution channels (an average of 7 listings and in 96% of all cases at least two listings), are larger (124 rooms) and of higher quality (3.2 stars). The differences in Kayak hotel rating between chain hotels and independent hotels reveal that the customers are slightly more satisfied with independent hotels even though these hotels have fewer stars on average. In [Online Appendix IV](#) we compare hotel features across distribution channels and do not find substantial differences.²²

3.2.1. Availability of price offers across channels

[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

¹⁹ Strict in the sense that the second lowest price is higher. We refer to the strictly lowest price of a response to a Kayak request also as “price leader.”

²⁰ Holiday apartments without stars were removed from the analyses.

²¹ The chain classification (including subchains) distinguishes 884 distinct chains in the cities that we study. All hotels not belonging to one of these chains are treated as “independent.”

²² We further note that when distinguishing between chain and independent hotels, the average characteristics of the respective hotels across countries are quite similar (country statistics not reported).

which can be classified as OTAs and direct channels. We observe that hotels publish prices most often at Booking.com, Expedia, and HRS as well as at the related OTAs of the same company groups.²³ Booking.com is the channel that exhibits the highest penetration as 96% of all hotels have published prices there at least once, followed by Expedia with 67% (Table 2, first data column). Across countries, 31% of all hotels make use of HRS. In contrast, for Germany, around three-quarters of all observed hotels had offers listed at least once at HRS. This could be due to HRS being a German incumbent.²⁴ The high listing frequencies of the OTAs Booking.com, Expedia, and HRS are consistent with a survey by HOTREC from 2016 among more than 2,000 European hoteliers.²⁵

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). It is not guaranteed that the direct channel listing observed on Kayak is fully representative of all hotels with direct online channels. According to Eurostat, 74% of all enterprises in the accommodation sector in Europe had a website that provided online ordering, reservation or booking opportunities in 2015.²⁶ However, it is also not obvious why hotels with direct prices visible at Kayak should react in a systematically different way. Direct prices of chain hotels are over-represented on Kayak in relation to the direct prices of independent hotels, which is why we also distinguish between chain hotels and independent hotels.

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 average, a hotel that is listed at least once on Booking.com or Expedia offers rooms there in more than 90% of all Kayak requests. The direct channel of hotel chains exhibits a similar frequency, 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

²³ For our analyses we take into account that some OTAs belong to the same company group (see Online Appendix IV for details).

²⁴ Distinguished by countries, Booking.com is the mostly used channel with a frequency ranging from 84% in Italy to 94% in Sweden and Austria, followed by Expedia with frequencies from 45% in Austria to 83% in Canada. 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.

²⁵ Compared to 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, while the direct online channel has remained constant at close to 7% (HOTREC [Survey on Hotel Online Distribution](#); last accessed December 1, 2017).

²⁶ See [Statistics on ICT use in tourism](#) (last accessed December 1, 2017).

booking engine. In contrast, we find that around 85% of all chain hotels have their own booking engine to transfer data to Kayak (not reported).

4. Conjectures, identification, and methodology

4.1. Conjectures

4.1.1. 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 the per-booking commission.²⁷ The “Book Direct” campaign of HOTREC²⁸ and similar measures of hotel associations indicate that hotels often favor direct channel bookings and might thus prefer to charge lower direct channel prices. The theoretical work of Shen and Wright (2017) confirms that when intermediaries (such as OTAs) determine the commission fees that sellers pay per transaction, the sellers have incentives to charge lower direct prices.

Both wide and narrow BPCs typically forbid hotels from having a lower price on the direct channel than on the OTAs. We therefore expect that without a BPC in place the direct channel will more often have the strictly lowest price. We test the following:

Conjecture 1. *The hotel’s direct online channel has the strictly lowest price (is the price leader) more frequently if the hotel faces no BPCs.*

4.1.2. 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 and start publishing room prices there. Hence, we test:

Conjecture 2. *If an OTA stops using 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 a hotel is less constrained in its price setting, it

²⁷ Booking.com (and other major OTAs) typically act as “agents” for the hotels. In this agency business model, the customer formally does not purchase the hotel service from Booking.com, but does so from the hotel directly. Moreover, the hotel is responsible for the price setting on the OTA as on all other distribution channels. In return the OTA receives a commission payment from the hotels for every mediated booking.

²⁸ See [Book Direct campaign from HOTREC](#) (last accessed December 1, 2017).

could find it profitable to use the less constrained distribution channel(s) more intensively. In particular, it might have been unprofitable for the hotel to promote the direct channel when the hotel could not make the channel more 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.²⁹ If the availability requirements exceed the number of offers a hotel would like to offer on the OTA, one might expect that a hotel will offer 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 the OTA does not use parity clauses.*

4.2. Identification and methodology

As a first step, we investigate the pricing [Conjecture 1](#) by means of cross-sectional statistics which capture differences across countries. In particular, we compare prices between channels 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.

To account for country-specific differences, we test all our conjectures by investigating 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 that Booking.com removes the narrow BPC by February 2016.³⁰ In particular, we compare a change in certain market outcomes in Germany with changes in other countries where the BPC policies did not change in 2016.

We are not aware of other relevant regulatory changes for the investigated jurisdictions during our observation period. We have checked for relevant changes in taxation for our investigated countries by means of the IBFD tax research platform. There were (slight) changes in the value added tax for accommodations in Austria in May 2016 and the corporate taxation in Italy in January 2017. To the extent that they apply to hotels,

²⁹ Even Booking.com's narrow BPCs require the hotel to make a minimum allocation of rooms available on the OTA website.

³⁰ See Online Appendix I for an overview of the decisions.

these should only slightly affect a hotel's profit after taxes, and independently of the distribution channels used. As a consequence, these changes should have no significant impact on the participation of hotels in sites such as Booking.com and the pricing across distribution channels.

While we are not aware of any policy change in Canada, there were, however, changes in the BPC policies in Europe prior to 2016. Across the whole European Union, Booking.com reduced the scope of its BPCs from “wide” to “narrow” by July 2015.³¹ This took place well before our observation period and if it had any effect at all, it should have affected all European member states equally. In the case of France, in addition the parliament prohibited BPCs of all OTAs in the summer of 2015. We therefore compare the developments in Germany with the developments in the countries of the control set one by one. By showing that the developments of our dependent variables are distinctively different from the developments in all (or at least most) of our control countries, we are confident that our results are not driven by certain other developments in a particular control country.

In our main specification, 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*³² can be attributed to the removal of Booking.com's narrow BPC in Germany and that there have been no other country-specific developments since January 2016 which affect the pricing across channels and the publishing of hotel offers online, except for demand and OTA popularity, which we control for with the following variables:

1. The share of non-listed hotels at the city-level, according to Kayak, which approximates the occupancy rate at the travel date from the perspective of the search date,
2. The worldwide search volume for hotels in each city of our data set on Google, as an approximation of the actual demand on the search date, and
3. The country-specific search volume for each of the three main OTAs on Google, which accounts for a potentially different development of the popularity among customers.

We conduct various auxiliary analyses to ensure that we correctly identify the effects of the removal of the BPC in Germany (see [Section 7](#) for details):

1. We address the concern that within-year changes could be due to a particular seasonality in Germany by analyzing the development over a year, both by means of a linear trend over the period January 2016 to January 2017 as well as by using two-months-country fixed effects and comparing the base period of the beginning of 2016 with the fixed effect of the first month in 2017.

³¹ See footnote 5.

³² This closely resembles a difference-in-differences approach as a trend is a difference over time. Because of the short pre-treatment period, we rely on the null hypothesis that the trends in the different countries over one year should not vary systematically from the German trend if the change in the BPC regime in Germany has no effect. In Online Appendix VII we provide evidence that a standard difference-in-differences specification yields qualitatively the same result.

2. We analyze short-term changes in Germany relative to the other countries. The closeness in time between the policy change and distinct changes in the dependent variables can be seen as an indication of a causal relationship. As we only have a short pre-treatment period in the detailed Kayak data, we additionally study time series which go back to the years before 2016 to rule out that Germany is on a different long term-trend than the control countries.

For the main regressions, 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 the hotel, c the country (which is constant for each hotel), t the travel date and d the booking date (when appropriate). The dependent variable $y_{i,c,t,d}$ is a dichotomous variable. Depending on the conjecture to be tested, this is an indicator of a certain channel having the lowest price 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).

The 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, the rating of the hotel as it is displayed at Kayak. To control for demand and OTA popularity, we also include the share of non-listed hotels for that travel date in the city where the hotel is located and the Google Trends time series, as discussed above.

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 analyses.³³

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 change model (1) slightly and estimate the following model:

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

³³ As a robustness test, we run regressions without fixed effects in Online Appendix VI.

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, the aggregated hotel rating in this month and the monthly averages of the Google Trends data.

Due to the 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 a non-linear model is generally more appropriate for prediction purposes, our focus is to estimate the partial effect of the BPC prohibition averaged across the population of hotels. We follow Wooldridge (2010) who argues that the differences between LPM and (theoretically more rigorous) non-linear models may not be important in this instance and that the LPM often seems to give good estimates of these partial effects. We compute standard errors that are robust to heteroscedasticity and serial correlation at the hotel-level.³⁴

5. Pricing across channels

5.1. Cross-sectional observations

Finding 1: The direct channel price is more often below the Booking.com price in Germany and France (largely no BPCs) than in Canada (wide BPCs).

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 ($D > B$).³⁵ 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.

The price relation is possibly measured with some error, although we have not found any indication of a systematic measurement error.³⁶ A potential error may thus materialize in both directions ($B > D$ versus $D > B$) with the same likelihood. On this basis, we can compute a conservative measure of the frequency of the event ($D < B$), called *difference*, by subtracting 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

³⁴ As a robustness check, we have computed standard errors also at the city-level and the country-chain level, but found that our main results were mainly unaffected.

³⁵ The analogous computations for the relation between the direct channel and Expedia as well as HRS yield similar results.

³⁶ See Section 7 and Online Appendix III for details.

Table 3
Relation between Booking.com and direct channel.

Country	Chain			No chain		
	B > D	D > B	Difference	B > D	D > B	Difference
<i>No BPC</i>						
Germany ^a (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
<i>Narrow BPC</i>						
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 ^b (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
<i>Wide BPC</i>						
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. ^aBooking.com removed the narrow BPC in February 2016. ^bIn Austria, narrow BPCs were in place until December 2016.

frequency with which hotels price the direct channel cheaper than Booking.com, which would materialize if all observed (D > B) cases were due to an unsystematic error.

Table 3 shows that in Canada this difference – taken as a conservative measure of the fraction with a lower direct channel price – is at minus 3.6% for hotel chains and at 1.4% for independent hotels. This suggests a possibly high compliance toward wide BPCs in Canada³⁷. In contrast, in countries where there are no BPCs in place the aggregated measure of a lower direct channel price is considerably higher and between 16% for France and 20% for Germany (aggregated values not reported in the table). This comparison confirms [Conjecture 1](#), that the direct channel is more frequently below the price at an OTA if no BPC is in place.

Table 3 also shows that in the countries with narrow BPCs the direct channel is more often cheaper than Booking.com. This observation strongly suggests that direct channel prices covered by a narrow BPC are below the price at Booking.com in a considerable number of cases. The fact that we do not observe similar results for the narrow BPC countries as for Canada suggests that OTAs in these countries cannot enforce price parity between the direct channel and the OTA in the same way as it is feasible in Canada. This observation is interesting as one might expect the same compliance in relation to the direct channel price under a narrow and a wide BPC because both restrict the direct channel price from being lower than the OTA price. 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. The competition

³⁷ A certain degree of non-compliance even in case of wide BPCs is plausible. For instance, the monitoring report of various European competition authorities states that “evidence from the NCA antitrust cases suggests that many hotels did not fully comply with their parity obligations under wide parity” (footnote 17 therein).

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

Country	Existence price leader		Share direct channel		Share Booking.com	
	Share	Deviation	Chain	No chain	Chain	No chain
<i>No BPC</i>						
Germany ^a (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
<i>Narrow BPC</i>						
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 ^b (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
<i>Wide BPC</i>						
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 average relative deviation to the second lowest price (2). Columns 3–6 show by hotel type how frequently the direct channel and Booking.com are the price leader among the requests in which they are listed. ^aBooking.com removed the narrow BPC in February in 2016. ^bIn Austria, narrow BPCs were in place until December 2016.

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

The comparison between chain hotels and independent hotels indicates that the direct channel is more often cheaper than Booking.com among independent hotels, which suggests a lower compliance with the parity clauses of the latter. Moreover, according to our data, independent hotels in Germany and France – where Booking.com was not allowed to use parity clauses anymore in our observation period – most often price the direct channel cheaper than Booking.com.

Finding 2: Kayak shows one channel as price leader across sales channels in about half of all observations.

For Kayak requests with prices from at least two channels, Table 4 displays the cross-sectional frequencies of the event that the second lowest price is strictly higher than the lowest price (existence of a strict price leader). The absolute numbers should be interpreted very cautiously as they might suffer from measurement error, similar to the price relations presented before.

It is more insightful to compare the figures across countries as this is robust to unsystematic data errors (for instance, due to the delayed updating of prices by Kayak). An interesting observation is that the direct channel of independent hotels is the price leader more often in countries where OTAs largely do not have best price clauses, foremost France and Germany (data column 4). The fraction is also relatively high in Austria, where the legal prohibition was arguably already foreseeable for hotels in the course of 2016. Moreover, the direct channel is by far least often the price leader in the wide BPC country Canada. This finding is consistent with Conjecture 1. For chain hotels, the pat-

tern is similar in that France has the highest share of direct price leadership and Canada the lowest fraction, but the shares are more similar and, overall, the pattern is less clear (data column 3).

In order to control for potential time-constant country and hotel-specific differences across BPC regimes, 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 in the next subsection.

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

Finding 3: The direct price of chain hotels in Germany is increasingly often the strictly lowest online channel price.

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 the narrow BPC of the largest OTA, Booking.com. In Germany, the formerly largest OTA, HRS, had already been prohibited from using any BPC in 2013, whereas the investigation of the narrow BPCs of the third largest OTA Expedia is still ongoing. For hotels that do business with Expedia, a narrow BPC might therefore still be in place and would formally not allow them to offer a lower direct price. However, our anecdotal evidence – derived from several phone calls with hoteliers in Germany in 2016 – suggests that hoteliers might not respect Expedia's clause very much in light of the ongoing investigation and the previous prohibitions against HRS's wide, and in particular Booking.com's narrow, BPCs.

[Table 5](#) displays regression results 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.³⁸ In Germany, there is a positive trend of the direct channel of chain hotels being the price leader (0.36 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, and Sweden. For Austria, which went through the process of a legislative prohibition of the BPCs in 2016, there is no significantly different trend from Germany. We obtain the same result for Canada.

By contrast, for the independent hotels (data column 1) there is no significant time trend with respect to the direct channel. Recall that independent hotels in Germany,

³⁸ For all countries with the exception of Austria the beginning of the observation period is defined as hotels that 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.

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 (0.60)	0.46* (0.26)	0.36*** (0.09)	-0.20*** (0.04)
Δ Trend France	0.39 (0.69)	-0.39 (0.28)	-0.77*** (0.11)	0.28*** (0.06)
Δ Trend Italy	1.44* (0.78)	-0.37 (0.30)	-0.58*** (0.16)	0.33*** (0.08)
Δ Trend Sweden	-1.05 (0.97)	-0.21 (0.33)	-1.61*** (0.30)	0.04 (0.12)
Δ Trend Austria	0.49 (0.80)	-0.89** (0.35)	-0.31 (0.20)	-0.21** (0.10)
Δ Trend Canada	0.21 (0.63)	-0.75** (0.32)	-0.17 (0.11)	0.18** (0.08)
Δ Trend Other countries	0.16 (0.66)	-0.07 (0.31)	-0.23 (0.21)	0.36** (0.16)
Share of non-listed hotels	0.01 (0.03)	0.02 (0.02)	0.02*** (0.01)	-0.02*** (0.01)
Kayak hotel rating	-4.00 (3.03)	3.66** (1.47)	1.61 (1.11)	1.67* (0.98)
GT city	-0.02 (0.03)	0.05*** (0.01)	0.03*** (0.01)	0.02** (0.01)
GT Booking.com	-0.01 (0.02)	0.06*** (0.01)	0.01* (0.01)	0.18*** (0.01)
7 days before	-1.60*** (0.47)	-1.49*** (0.25)	0.06 (0.17)	-1.64*** (0.14)
14 days before	-1.34*** (0.49)	-0.90*** (0.29)	-0.14 (0.18)	1.16*** (0.17)
21 days before	-0.25 (0.58)	-1.55*** (0.30)	0.98*** (0.22)	-2.04*** (0.16)
28 days before	0.05 (0.62)	-2.20*** (0.32)	1.45*** (0.23)	-3.71*** (0.18)
Weekdays	Yes	Yes	Yes	Yes
Popularity other OTAs	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	Yes
Observations	481,064	495,315	2,486,955	2,408,906
R ²	0.466	0.202	0.388	0.137
Adjusted R ²	0.465	0.201	0.387	0.136

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

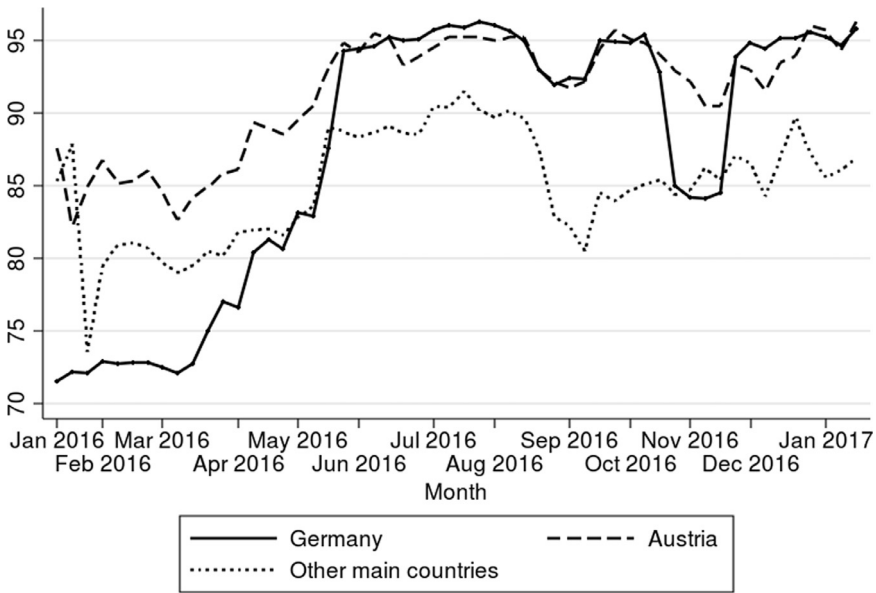
on average, price the direct channel relatively often lowest (Table 4), and in particular below their price at Booking.com (Table 3). It might therefore be that these hotels are generally less compliant than chain hotels and therefore responded less strongly in their pricing to the removal of the narrow BPC of Booking.com.

While the direct channel is more often the price leader within the group of chain hotels, we find that Booking.com is significantly less often the price leader (minus 0.20 pp per month, data column 4) among these hotels in Germany. In particular, this development is different in France, Italy and Canada, where the frequency of Booking.com as price leader does not decrease. As regards the price leadership of Booking.com among independent hotels, the regression results suggest that these hotels, on average, price Booking.com more often lowest (0.46 pp per month, data column 2). However, this trend in Germany is in itself only weakly significant and is not significantly different from the trend in various other countries, including Italy and Sweden. If we pool all hotels together, the result that the direct channel becomes the price leader significantly more often in Germany prevails, while Booking.com is the price leader significantly less often (see Online Appendix VI, Tables 23 and 24 for details). Chain hotels set the strictly lowest price on their direct online channel more often and less often on Booking.com when more hotels in their city are not listed. They also set a strictly lowest price more often – both on the direct channel and Booking.com – when demand is high (as measured by GT city). The respective results for independent hotels are less conclusive, as coefficients are partly not significantly different from zero. However, for both hotel types the popularity of Booking.com (measured by GT Booking.com) positively affects the likelihood of setting a strictly lowest price on Booking.com.

In additional robustness analyses, we observe that the direct channel is more often the price leader, even if we define a price leader as having a discount of at least 5% to the second lowest price. This result lets us conclude that the hotels that are inclined to change their price setting do so up to a price adjustment of 5%. For an average price of 120 EUR in our data, this means that the direct channel is more often 6 EUR or even more below the second lowest price. The result on the price leadership of Booking.com is only robust to a threshold of 1%. However, note that the event of an OTA price being, for instance, 5% below the second lowest price is not really influenced by the abolition of a narrow BPC.³⁹

Taken together, the regression results are consistent with [Conjecture 1](#) in that the direct channel in Germany is becoming the price leader more often in response to the removal of Booking.com's narrow BPC. At the same time, the OTA Booking.com is less often the price leader in Germany. The finding that the direct channel becomes the price leader more often is driven by the chain hotels which we found to be more compliant in general. For this group of hotels, we find that only around 6% of the observations from

³⁹ More specifically, following a suggestion of a referee, we reran the regressions with a more restrictive definition of price leadership. In particular, we defined a price leader only if the corresponding price was at least 1% (5% and 10%) lower than the second lowest price. The corresponding results are available upon request.



Weekly Booking.com frequency. Data collection for Austria was extended in April 2016 from 2 to 30 cities.

Fig. 1. Booking.com listing frequency at Kayak by country.

Germany list the direct channel as a price leader at the beginning of the observation period. The regression results suggest that this fraction increases by 4.32 pp throughout the observation period. This implies an increase of 70% in observations with a direct price leader compared to the level of the beginning of 2016.

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 online price offers. Across all the countries in our data, the frequency of price publications at Booking.com increases over time (Fig. 1). 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 a drastic increase at the beginning of the observation period.⁴⁰

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

⁴⁰ During November 2016 one can observe a drop of around 10% in the frequency of the Booking.com 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.

Finding 4: 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 should yield 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. For this analysis we use 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 hotel rating, the Google Trends data, and the share of non-listed hotels are aggregated to the monthly average for the respective hotel or destination.⁴¹ We report the regression results in [Table 6](#).

The second and fourth data column of [Table 6](#) show a positive trend in the share of hotels in Germany using Booking.com at least once each month. The share increases on average by 1.7 pp per month for independent hotels and by 2 pp per month for chain hotels. The coefficients on the interactions of the time trend with the other countries (i.e., the deviations from the German trend) are significantly negative (except for one case of insignificance). 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 and significant deviations (in absolute values) from the German trend range from 0.65 pp in France (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 for independent hotels in data column 1 might allude to the fact that Booking.com's narrow BPC indeed put a 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 (possibly because they were already marketing the direct channel more actively).

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 regression results suggest that this increase is at 20.1 (24.1) pp for independent hotels (chain hotels) in Germany. To put this into perspective, we relate this increase to the extensive Booking.com use in Germany at the beginning of the observation period in Germany, which is around 75%. In relation to the implied increase of extensive Booking.com use, this suggests that extensive Booking.com use has

⁴¹ 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*** (0.02)	1.68*** (0.07)	0.01 (0.05)	2.01*** (0.11)
Δ Trend France	0.04 (0.05)	−0.65*** (0.09)	0.08 (0.07)	−1.35*** (0.12)
Δ Trend Italy	−0.13*** (0.03)	−0.02 (0.08)	−0.15 (0.10)	−0.89*** (0.17)
Δ Trend Sweden	−0.01 (0.10)	−1.89*** (0.09)	−0.19** (0.09)	−2.09*** (0.12)
Δ Trend Austria	−0.09 (0.07)	−0.91*** (0.10)	0.26* (0.14)	−1.51*** (0.14)
Δ Trend Canada	−0.10* (0.05)	−1.77*** (0.08)	−0.04 (0.07)	−1.91*** (0.11)
Δ Trend Other countries	−0.14*** (0.05)	−1.70*** (0.07)	0.58*** (0.19)	−1.90*** (0.13)
Avg. share of non-listed hotels	−0.00 (0.00)	−0.11*** (0.01)	0.01 (0.01)	−0.12*** (0.02)
Avg. Kayak hotel rating	0.23 (0.19)	1.79*** (0.54)	0.87 (0.98)	0.48 (1.29)
Avg. GT city	0.00 (0.00)	−0.03*** (0.00)	0.00 (0.01)	−0.03*** (0.01)
Avg. GT Booking.com	−0.00 (0.00)	0.15*** (0.00)	−0.01 (0.01)	0.13*** (0.01)
Weekdays	No	No	No	No
Popularity other OTAs	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	Yes
Observations	212,673	212,673	70,716	70,716
R^2	0.874	0.523	0.950	0.483
Adjusted R^2	0.859	0.467	0.946	0.435

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.

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

increased by 26.4% (31.7%) for independent hotels (chain hotels) in Germany compared to the initial level at the beginning of 2016.

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 development is less Germany-specific). That we observe a rather strong increase in the 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 no longer constrained by its BPC.

Finding 5: Hotels make price publications more frequently at Booking.com following the removal of the narrow BPC (intensive margin).

We now analyze the intensive channel use of Booking.com and the direct channel. We measure the intensive channel use as the frequency with which prices for a hotel on a particular channel are available in those Kayak search responses with at least one price offer for that hotel. We conduct the analysis of hotels for which we observe prices on this channel already at the beginning of the observation period in the Kayak data. 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 have increased the frequency at Booking.com and the presence of direct prices at Kayak because hotels were now able to use these distribution channels more flexibly.

We test this conjecture with separate regressions for each of the channels. The dependent variable equals 100 if the channel price is shown in response to the Kayak request, and 0 otherwise. Again, we split the sample into hotel chains and independent hotels and – as mentioned above – only include observations of hotels which are using the respective channel already at the beginning of the observation period.⁴² This measures whether the channel is used more intensively in later months than early in 2016. Note that we control for the hotel rating, OTA popularity according to Google as well as local supply–demand balance by means of the share of non-listed hotels at Kayak and the Google Trends measure of the destination popularity.

We find that both independent and chain hotels increase the frequency of price publications at Booking.com significantly over time in Germany ([Table 7](#) data columns 2 and 4). The negative deviations from the Germany trend suggest that the changes in the intensive use of Booking.com are weaker in most of the other countries. An exception is Austria, where the trend in the intensive channel use of Booking.com is significantly stronger for both types of hotels. These results might indicate that Austrian hotels undergo a similar development as in Germany, as narrow BPCs were in the public legislative process of being prohibited in Austria in 2016. Interestingly, the popularity measure for the OTA Booking.com indicates that hotels of all types particularly rely on this distribution channel in destinations and at times in which many (potential) customers search for hotel rooms via Booking.com. Accordingly, in these instances the direct channel is used less intensively.

For the direct channel of independent hotels we do not see a trend in Germany that is statistically different from zero. However, we observe negative significant coefficients for France and Italy. In contrast, for the direct channel of chain hotels we find that the listing frequency increases significantly by 0.4 pp per month (data column 3). The coefficients for the deviations in the other countries are mostly significantly negative. For the direct channel of hotel chains we observe statistically significant deviations from

⁴² See footnote [37](#).

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)	−0.33 (0.46)	0.18*** (0.04)	0.40*** (0.09)	0.40*** (0.03)
Δ Trend France	−1.33** (0.55)	−0.08 (0.06)	−0.36*** (0.11)	−0.48*** (0.05)
Δ Trend Italy	−3.13*** (0.57)	−0.59*** (0.06)	−0.03 (0.17)	−0.39*** (0.11)
Δ Trend Sweden	−0.35 (0.78)	−0.10 (0.07)	−0.57*** (0.22)	−0.05 (0.06)
Δ Trend Austria	−0.28 (0.76)	0.28*** (0.09)	0.39 (0.24)	0.28*** (0.11)
Δ Trend Canada	−0.43 (0.54)	−0.19*** (0.07)	−0.22* (0.12)	−0.04 (0.05)
Δ Trend Other countries	−0.58 (0.60)	0.02 (0.05)	−0.32 (0.24)	−0.08 (0.07)
Share of non-listed hotels	−0.43*** (0.03)	−0.25*** (0.01)	−0.29*** (0.01)	−0.34*** (0.01)
Kayak hotel rating	−0.29 (3.50)	0.68 (0.53)	−0.71 (1.13)	−0.83 (0.86)
GT city	−0.17*** (0.03)	−0.06*** (0.00)	−0.07*** (0.01)	−0.10*** (0.00)
GT Booking.com	−0.16*** (0.02)	0.03*** (0.00)	−0.02*** (0.01)	0.05*** (0.00)
7 days before	1.51*** (0.26)	0.15** (0.06)	0.19** (0.08)	−0.33*** (0.07)
14 days before	2.01*** (0.28)	0.14** (0.07)	0.58*** (0.09)	−0.09 (0.09)
21 days before	2.23*** (0.32)	0.10 (0.08)	0.51*** (0.10)	0.09 (0.09)
28 days before	2.56*** (0.35)	−0.09 (0.08)	0.54*** (0.11)	0.02 (0.10)
Weekdays	Yes	Yes	Yes	Yes
Popularity other OTAs	Yes	Yes	Yes	Yes
Hotel FE	Yes	Yes	Yes	Yes
Observations	755,437	11,375,241	2,967,784	4,909,284
R^2	0.510	0.233	0.273	0.120
Adjusted R^2	0.509	0.232	0.273	0.119

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 the particular channel is present at the Kayak request and 0 otherwise. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

the German trend in France, Sweden, and Canada. The trends in Austria and Italy are not significantly different from the German trend, indicating similar developments as in Germany. Hence, this confirms [Conjectures 3](#) and [4](#) for the chain hotels (and partly also for the independent hotels) because the hotel chains in particular harness the less restrictive contract terms in order to offer hotel rooms more frequently at Booking.com and their direct channel (as is visible at Kayak).

Taken together, the regression results confirm [Conjectures 3](#) and [4](#) by indicating that the abolition of Booking.com's narrow BPC is related to an increase in the intensive channel use for those hotels that had already adopted Booking.com. The results show that chain hotels use both Booking.com and the direct channel more intensively by 4.8 pp in the span of the observation period. Compared to the intensive channel use at the beginning of 2016, which is around 90% for both channels, this implies that chain hotels make 5.2% more use of Booking.com and the direct channel. Similarly, the results suggest that the independent hotels in Germany make 2.4% more use of Booking.com relative to an initial channel use of around 95%.

The narrow BPC required the direct online channel price to not be lower than the price at Booking.com. Now hotels publish their prices more often at Booking.com. A possible reason for this is that it is now (contractually) possible to be visible at Booking.com and to set lower prices at the direct channel than at Booking.com, whereas with the parity restriction in place they might have opted not to publish offers at Booking.com in order to boost their direct sales.

7. Robustness checks

We summarize our various robustness checks in this section. In [Section 7.1](#), we look at within-year variations, including possible seasonality effects. In [Section 7.2](#), we analyze long-term trends that our Kayak data cannot fully capture. In [Section 7.3](#) we elaborate on potential measurement errors in the Kayak data.

7.1. Potential parallel developments and seasonality

Our identifying assumption for our empirical investigation is that the distinct development in Germany relative to the other countries is attributable to the removal of Booking.com's narrow BPC in Germany. In order to substantiate our claim that no other country-specific developments other than the BPC drive our result, we conduct the following robustness checks.

First, we address the possibility that country-specific seasonality is responsible for the observed results with a specification that allows more flexibly for country-specific seasonal developments than the linear trend. By estimating two-month indicators for each country, we can directly compare the base period of the beginning of 2016 with the first period in 2017. This comparison yields a seasonality-adjusted measure of our

estimates. The results are comparable to those obtained for the linear trend specification (see Online Appendix VII).

Second, we restrict the sample to the period January to July 2016 in order to look for short-term effects. In addition, we also focus on hotels that change their listing or pricing behavior and run regressions without hotel fixed effects. Again, the results are comparable to the main specification (see Online Appendix VI).

Finally, we investigate the comparability of the initial listing frequencies of Booking.com in Germany and the control group. In the spirit of a matching approach, we show that the results concerning the listing frequencies of prices at Booking.com are also obtained when restricting the control group to cities which had a listing frequency that was comparable to the German cities initially in our observation period. This provides a strong indication that the developments in Germany are not just a simple “catch-up” process due to possibly different initial listing frequencies of hotels across countries (see Online Appendix V).

7.2. Long-term trends

The Kayak data that we use in our analysis covers the period January 2016 to January 2017. In order to address the concern that the developments found in our Kayak analysis might be due to longer term trends that started before our observation period, we also compare developments in the relevant outcomes for the different countries prior to our Kayak observation period.

To substantiate the finding that the ban of Booking.com’s BPC in Germany led to an increase in hotel registrations on Booking.com, we collected registration dates of the hotels in our sample directly from Booking.com.⁴³ This allows us to study the development of registrations by hotels on Booking.com for Germany, Austria, France, and the other main countries as a moving three-month average in Fig. 2. Similar to the Kayak data plots in Fig. 1, there is a sharp increase in the number of newly registered hotels in Germany in 2016. This increase is clearly higher than any increase in the previous five years. This also confirms that the evolution of listing frequencies as observed at the meta-search site Kayak is plausible. Another sharp increase can be observed slightly earlier in France. This might be related to the removal of all BPCs in France by law in the second half of 2015. More importantly, the graph suggests for the remainder that the developments of registrations are similar across time and countries.

Furthermore, we study the development of the popularity of Booking.com over time for each country in Fig. 3. The graphs confirm that there is no obvious Germany-specific development in the popularity of Booking.com from the customer perspective, when

⁴³ For this, we queried the website Booking.com directly for the same set of travel destinations in September 2016 over a time period of four weeks. We subsequently accessed the respective hotel profile websites on Booking.com and gathered the official entry date (“...has been welcoming Booking.com guests since...”) as of the end of September.

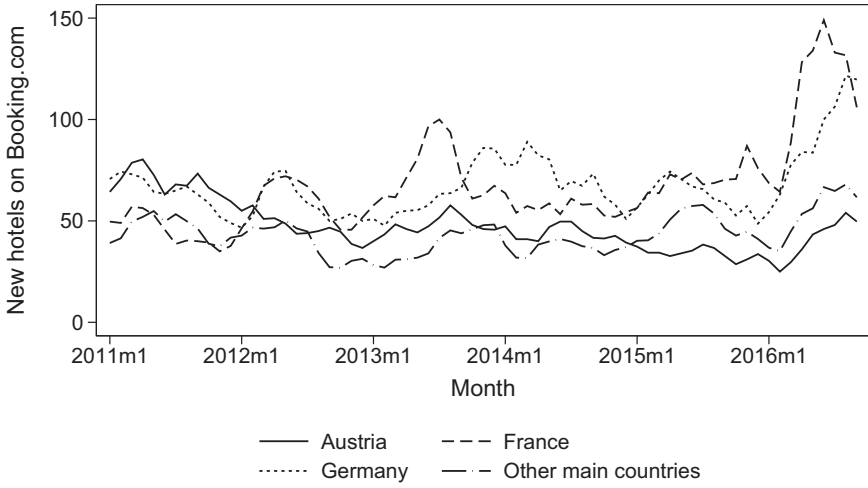


Fig. 2. Number of new hotels registered on Booking.com (3 months moving average).

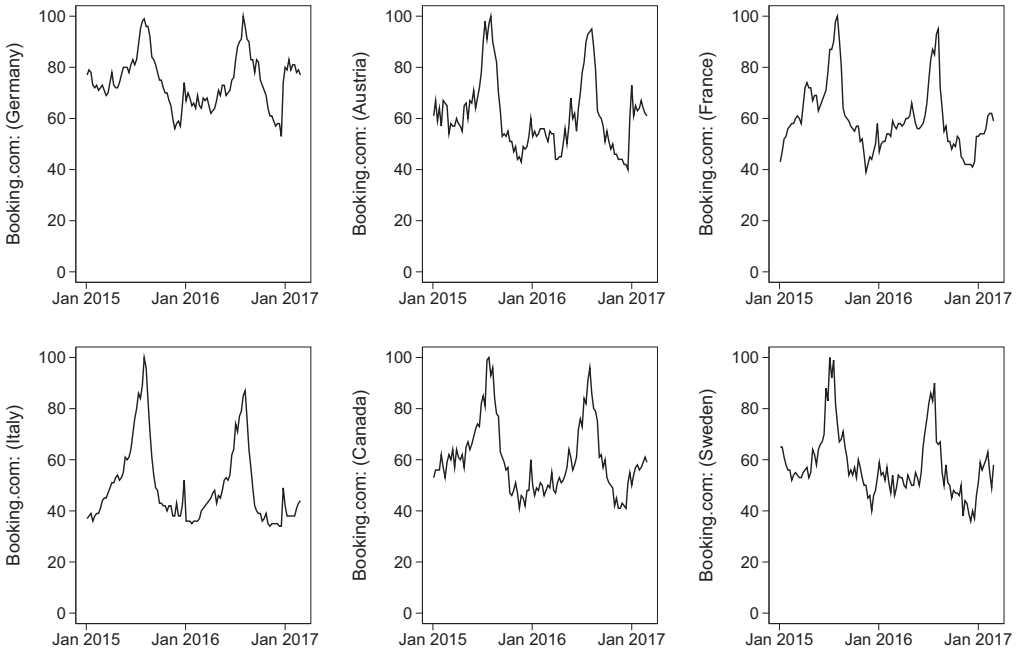


Fig. 3. Relative search volume directed to Booking.com on Google.

comparing across time and country. This reassures us that our main results are not driven by a longer term trend which is not fully captured in our Kayak data.

7.3. Measurement error

One may be concerned about whether there is a potential measurement error in the Kayak prices. For example, in response to one of our Kayak requests, Kayak might return

the up-to-date price of Booking.com but a slightly older price for the direct channel, where in the meantime the actual price has changed. To assess the potential impact of such a potential measurement error, recall that we conduct two different types of analysis:

1. We study whether a hotel makes any offers available on certain channels at a certain point in time at all or not (Section 6). For this analysis it is not critical whether Kayak compares exactly the same offers.
2. We compare prices across distribution channels (Section 5). For this analysis it is relevant that we can make a meaningful comparison.

In order to address the concern that the availability and price structure of hotel room offers as displayed at Kayak are measured accurately, 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. The comparison sample includes 171 booking requests for travel dates ranging from June to August 2016. With regard to the order of prices across channels, we find that the price leader among qualitatively comparable offers 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. For a detailed description of the validation analysis see Online Appendix III. Reassured by our checks, we eventually base our analysis on the assumption that Kayak is comparing equal offers with each other as this is the core of the business model of a price comparison site.

We cannot rule out, though, that there might still be differences across the offers in some of the cases even though Kayak posts these prices for comparison. Even if there are some differences across the offers, our analyses of the different price changes across countries are still valid as long as these unobserved differences between offers do not change over time in a way that is mistakenly interpreted as a change due to the BPCs. For instance, for the result of the direct channel having the strictly lowest price more often once the BPC has been removed to be flawed, it would need to be the case that Kayak in the year 2016 increasingly often wrongly presented the direct channel price as the lowest price, but only for hotels in Germany. We have no indication that the Kayak search results have this very particular bias.

8. Conclusion

Motivated by recent proceedings against best price clauses imposed by online travel agents, we have empirically investigated the effects of such clauses using the 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), and hotels which already used

Booking.com before publish offers more frequently there (intensive margin). These are Germany-specific trends which distinctively differ from the main developments in the control group. In addition, more independent hotels, which initially did often not make direct channel prices available at Kayak, started doing so more often in Germany once the BPC of Booking.com had been removed. Consistent with having previously posted direct prices more often on Kayak, chain hotels in Germany increase the frequency of listing direct channel prices once the BPC is removed. These results indicate that hotels increasingly promote the direct channel when they are not constrained by Booking.com's narrow BPC.

We also find that once the BPCs had been removed in Germany, chain hotels more frequently set the direct online channel price below all other available online prices, as visible at Kayak. Again, this trend differs from the main developments in the control group. This suggests that Booking.com's narrow BPC did indeed restrict the hotels' price setting. We do not observe such a trend for independent hotels, which is consistent with the observation that independent hotels already initially had a direct channel price below the price of Booking.com much more often than chain hotels, indicating a higher non-compliance with BPCs.

More generally, across the different countries and BPC regimes, the observed direct channel prices are below the prices at Booking.com in a significant fraction of the cases. Even when accounting for the possibility that the Kayak data is imprecise to some degree, the numbers suggest that there could be a significant non-compliance with the existing price parity clauses. While the degree of non-compliance appears to be rather similar across the different European countries with narrow BPCs and without BPCs, it appears to be 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 than the narrow clauses. To see this note that the narrow BPCs of Booking.com in Europe (and indirectly of Expedia which aligned its clauses) are the result of commitments that Booking.com gave to the competition authorities of France, Italy and Sweden. These commitments include certain clauses that prevent Booking.com from enforcing compliance with the narrow BPCs.⁴⁴ Moreover, the prominent policy actions against the OTAs might have discouraged OTAs in Europe from actually enforcing the clauses and similarly might have encouraged part of the 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.⁴⁵ One reason could be that the effects of BPCs are limited overall. To the extent that hotels did

⁴⁴ Such measures could include e.g. de-listing of non-compliant hotels. See Section 4 of the [Booking.com commitments](#) (last accessed December 1, 2017).

⁴⁵ See Online Appendix VIII for details.

not comply with the parity clauses or that the clauses were not binding because hotels charged higher direct prices than OTA prices, it is natural that their abolition had limited effects. Another reason for why the standard commission rates have not yet changed could be that the (large) OTAs still have enough power to sustain such commission rates even without parity clauses. In addition, the OTAs might have incentives to not create evidence in the sense that commission rates decrease in countries without parity clauses in view of possible future competition law enforcement.

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

Supplementary material

Supplementary material associated with this article can be found, in the online version, at [10.1016/j.ijindorg.2018.03.008](https://doi.org/10.1016/j.ijindorg.2018.03.008).

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