

# Hotel Rankings of Online Travel Agents, Channel Pricing, and Consumer Protection

## Online Appendix

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# 1 Appendix: Travel destinations in the dataset

Tables A1 until A5 show the travel destinations covered in our dataset which is as in Hunold et al. (2018) and further enriched by travel destinations in Switzerland. We include the 25 biggest German cities (Table A2), a control sample of 20 pairs of German and non-German cities along the German border (Table A3), and other countries for which we chose a composition of the 15 biggest cities and 15 most popular travel destinations with the objective to gather representative data across touristic and urban destinations for these countries.

Table A1: Countries covered in dataset

Country	Cities covered
Germany	25 biggest cities
Various	20 pairs of cities near German border
Italy	15 biggest cities and 15 tourist destinations
Sweden	15 biggest cities and 14 tourist destinations
Canada	15 biggest cities and 15 tourist destinations
France	15 biggest cities and 15 tourist destinations
Austria	15 biggest cities and 15 tourist destinations
Switzerland	16 biggest cities and 15 tourist destinations

Table A2: 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 A3: Twin cities along German border

Pair	German City	Non-German neighbor	Neighbor country
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 A4: Cities covered in dataset

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

## Selection of travel destinations

For Italy, Sweden, Canada, France, Austria, and Switzerland we selected the travel destinations in two steps. First, we looked up the 15 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 again took the 15 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 proceedings against narrow PPCs later in 2016. In a similar vein, cities in Switzerland were chosen shortly before the beginning of the data collection in July 2016.

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

Table A5: Sources for travel destination selection

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

## 2 Appendix: Robustness checks

Table A6: Determinants of Booking.com's ranking – Additional Specifications

	(1)	(2)	(3)	(4)
Price at Booking/100	4.92***	4.95***	4.92***	4.84***
Preferred Partner	74.80***	74.82***	74.81***	74.81***
User Rating at Booking	-3.88*	-3.86*	-3.87*	-3.90*
# Bookings Last 3 Days	0.01**	0.01**	0.01**	0.01**
% Hotels Sold Out	40.56***	40.53***	40.56***	40.57***
Google Trends	-0.07***	-0.07***	-0.07***	-0.07***
(Booking-Direct)/Direct	-10.26***			
(Booking-Expedia)/Expedia	-10.76***			
PPC x (Booking-Direct)/Direct	1.02			
PPC x (Booking-Expedia)/Expedia	4.28**			
Booking-Direct		-0.05***		
Booking-Expedia		-0.04***		
(Booking-Direct)/Direct > 0			-10.51***	
(Booking-Expedia)/Expedia > 0			-9.14***	
(Booking-Direct)/Direct < 0			-7.48**	
(Booking-Expedia)/Expedia < 0			-5.77***	
I[0 > (Booking-Direct)/Direct >= -0.1]				0.69*
I[(Booking-Direct)/Direct < -0.1]				2.33***
I[0 < (Booking-Direct)/Direct <= 0.1]				0.53
I[(Booking-Direct)/Direct > 0.1]				-1.48**
I[0 > (Booking-Expedia)/Expedia >= -0.1]				-0.23
I[(Booking-Expedia)/Expedia < -0.1]				2.01***
I[0 < (Booking-Expedia)/Expedia <= 0.1]				0.06
I[(Booking-Expedia)/Expedia > 0.1]				-0.63*
Channel Availability	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Observations	2307513	2307513	2307513	2307513
$R^2$	0.91	0.91	0.91	0.91

Heteroscedasticity-robust standard errors not reported.

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

Table A7: Determinants of Expedia's ranking – Additional Specifications

	(1)	(2)	(3)	(4)
Price at Expedia/100	-11.50***	-11.65***	-11.52***	-11.63***
Sponsored Ad	1.66*	1.73*	1.71*	1.71*
User Rating at Expedia	3.02**	3.19***	3.19***	3.12**
# Bookings Last 2 Days	0.66***	0.66***	0.66***	0.65***
% Hotels Sold Out	137.91***	138.10***	137.98***	138.08***
Google Trends	0.17***	0.17***	0.17***	0.17***
(Expedia-Direct)/Direct	-58.05***			
(Expedia-Booking)/Booking	-66.89***			
PPC x (Expedia-Direct)/Direct	50.16***			
PPC x (Expedia-Booking)/Booking	44.05***			
Expedia-Direct		-0.12***		
Expedia-Booking		-0.16***		
(Expedia-Direct)/Direct > 0			-38.20***	
(Expedia-Booking)/Booking > 0			-39.28***	
(Expedia-Direct)/Direct < 0			-24.36***	
(Expedia-Booking)/Booking < 0			-38.27***	
I[0 > (Expedia-Direct)/Direct >= -0.1]				0.11
I[(Expedia-Direct)/Direct < -0.1]				6.92***
I[0 < (Expedia-Direct)/Direct <= 0.1]				-1.59*
I[(Expedia-Direct)/Direct > 0.1]				-10.12***
I[0 > (Expedia-Booking)/Booking >= -0.1]				2.32***
I[(Expedia-Booking)/Booking < -0.1]				8.36***
I[0 < (Expedia-Booking)/Booking <= 0.1]				-2.14***
I[(Expedia-Booking)/Booking > 0.1]				-10.15***
Channel Availability	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Observations	2457164	2457164	2457164	2457164
$R^2$	0.92	0.92	0.92	0.92

Heteroscedasticity-robust standard errors not reported.

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

Table A8: Time structure of the reaction to deviations

	Booking.com			Expedia		
	(1)	(2)	(3)	(4)	(5)	(6)
Price at OTA/100	6.69***	4.74***	4.73***	-1.65*	-6.81***	-6.80***
PPP/Sponsored Ad <sup>^</sup>	72.94***	61.46***	61.41***	2.20	2.11	1.84
User Rating at OTA	-0.89	-11.08	-10.98	-5.43	0.20	-0.61
# Past Bookings <sup>°</sup>	0.08***	0.04***	0.04***	0.50***	0.14**	0.13**
\% Hotels Sold Out	19.03***	19.33***	19.32***	134.49***	136.82***	136.45***
Google Trends	0.14***	0.03	0.03	0.31***	0.14*	0.14*
(OTA-Direct)/Direct	-10.87***	-1.99	-0.91	-35.86***	-32.34***	-31.34***
(OTA-(Other OTA))/(Other OTA)	-4.17	-7.01**	-8.96***	-38.38***	-23.59***	-18.16**
Lag $t - 1$ - (Dev. on Direct)			0.21			0.44
Lag $t - 2$ - (Dev. on Direct)			-0.20			-0.30
Lag $t - 3$ - (Dev. on Direct)			2.19			3.76
Lag $t - 4$ - (Dev. on Direct)			-2.33			-9.60**
Lag $t - 5$ - (Dev. on Direct)			-0.60			4.29
Lag $t - 6$ - (Dev. on Direct)			-0.28			0.28
Lag $t - 7$ - (Dev. on Direct)			-4.01*			-2.07
Lead $t + 1$ - (Dev. on Direct)			-2.34			-3.53
Lead $t + 2$ - (Dev. on Direct)			-1.83			-6.86
Lead $t + 3$ - (Dev. on Direct)			-0.62			-0.67
Lead $t + 4$ - (Dev. on Direct)			0.55			1.16
Lead $t + 5$ - (Dev. on Direct)			-2.23			1.51
Lead $t + 6$ - (Dev. on Direct)			0.19			10.34
Lead $t + 7$ - (Dev. on Direct)			-2.70			0.83
Lag $t - 1$ - (Dev. on other OTA)			1.80			-8.70
Lag $t - 2$ - (Dev. on other OTA)			3.22			-12.13*
Lag $t - 3$ - (Dev. on other OTA)			-1.10			-17.88**
Lag $t - 4$ - (Dev. on other OTA)			-2.22			-13.07***
Lag $t - 5$ - (Dev. on other OTA)			-1.41			-13.13**
Lag $t - 6$ - (Dev. on other OTA)			0.30			-8.83
Lag $t - 7$ - (Dev. on other OTA)			3.88			-9.50
Lead $t + 1$ - (Dev. on other OTA)			4.62**			0.25
Lead $t + 2$ - (Dev. on other OTA)			3.94			4.51
Lead $t + 3$ - (Dev. on other OTA)			2.24			9.08
Lead $t + 4$ - (Dev. on other OTA)			-1.48			-9.99
Lead $t + 5$ - (Dev. on other OTA)			1.50			6.45
Lead $t + 6$ - (Dev. on other OTA)			-1.35			1.33
Lead $t + 7$ - (Dev. on other OTA)			1.00			-0.96
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	146883	38697	38697	151397	44045	44045
$R^2$	0.91	0.95	0.95	0.84	0.87	0.87

Heteroscedasticity-robust standard errors not reported.

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

Notes: <sup>^</sup> For Booking.com, this is an indicator of whether the hotel is participating in the Preferred Partner Program, while for Expedia it indicates that the hotel had a sponsored advertisement. <sup>°</sup> Past Bookings are as reported from the respective OTA; for Booking.com, this is in the last three days, while for Expedia it is for the last two days.

### 3 Appendix: Price differentiation across channels

Table A9: Characteristics of hotels with lower prices on their websites than at Booking.com

	(1)	(2)	(3)	(4)
Average Price/100	2.77***	2.57***	2.57***	5.67***
Preferred Partner	-2.07	-1.90	-1.89	-0.87
Hotel Stars	-1.63	-1.60	-1.60	
User Rating at Booking	0.44	0.45	0.45	-3.57
Number of User Ratings/100	-0.08	-0.03	-0.03	
Number of Rooms/100	-2.06**	-1.96**	-1.98**	
Chain Hotel	-16.83***	-16.79***	-16.79***	
Google Trends	0.04*	0.05*	0.05**	-0.00
# Bookings Last 3 Days		-0.04***	-0.04***	-0.01**
% Hotels Sold Out		5.46***	4.27***	2.33***
7 days before			-2.32***	-2.21***
14 days before			-2.06**	-2.00***
Month FE	Yes	Yes	Yes	Yes
FE	City	City	City	Hotel
Observations	375758	375758	375758	375758
$R^2$	0.11	0.11	0.11	0.46

Heteroscedasticity-robust standard errors not reported.

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

Table A10: Characteristics of hotels with lower prices at Expedia than at Booking.com

	(1)	(2)	(3)	(4)
Average Price/100	0.31	0.29	0.28	0.05
Preferred Partner	1.48***	1.53***	1.53***	1.00*
Hotel Stars	1.21***	1.21***	1.21***	
User Rating at Booking	-1.16***	-1.18***	-1.17***	-1.10
Number of User Ratings/100	-0.04**	-0.02	-0.02	
Number of Rooms/100	-0.38	-0.33	-0.32	
Chain Hotel	-3.49***	-3.48***	-3.48***	
Google Trends	-0.04***	-0.04***	-0.04***	-0.01
# Bookings Last 3 Days		-0.02***	-0.02***	-0.01***
% Hotels Sold Out		0.41	0.65	0.82***
7 days before			0.81***	0.60***
14 days before			0.04	-0.11
Month FE	Yes	Yes	Yes	Yes
FE	City	City	City	Hotel
Observations	1622767	1622767	1622767	1622767
$R^2$	0.07	0.07	0.07	0.34

Heteroscedasticity-robust standard errors not reported.

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

Table A11: Characteristics of hotels with lower prices on their websites than at Expedia

	(1)	(2)	(3)	(4)
Average Price/100	3.69***	3.36***	3.40***	5.17***
Sponsored Ad	-3.68*	-3.62*	-3.56*	-0.44
Hotel Stars	-2.28	-2.17	-2.20	
User Rating at Expedia	0.00	0.16	0.13	0.06
Number of User Ratings/100	-0.18**	-0.16*	-0.16*	
Number of Rooms/100	-1.46**	-1.41**	-1.43**	
Chain Hotel	-17.41***	-17.56***	-17.56***	
Google Trends	0.02	0.01	0.02	-0.01
# Bookings Last 2 Days		-0.09	-0.08	-0.00
% Hotels Sold Out		14.52***	10.10***	8.89***
7 days before			-3.33***	-3.26***
14 days before			-2.59**	-2.46***
Month FE	Yes	Yes	Yes	Yes
FE	City	City	City	Hotel
Observations	444470	444470	444470	444470
$R^2$	0.09	0.09	0.09	0.45

Heteroscedasticity-robust standard errors not reported.

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

Table A12: Characteristics of hotels with lower prices at Booking.com than at Expedia

	(1)	(2)	(3)	(4)
Average Price/100	-0.24	-0.17	-0.14	-0.37**
Sponsored Ad	0.27	0.28	0.30	0.13
Hotel Stars	-0.28	-0.30	-0.32	
User Rating at Expedia	-2.96***	-2.99***	-3.01***	-4.56**
Number of User Ratings/100	-0.02	-0.02	-0.02	
Number of Rooms/100	-1.48***	-1.46***	-1.47***	
Chain Hotel	-1.83***	-1.84***	-1.84***	
Google Trends	0.06	0.06	0.06	0.05***
# Bookings Last 2 Days		-0.02	-0.02	0.03
% Hotels Sold Out		-3.58	-5.43	-3.51***
7 days before			-1.18***	-1.21***
14 days before			-1.54***	-1.66***
Month FE	Yes	Yes	Yes	Yes
FE	City	City	City	Hotel
Observations	1554516	1554516	1554516	1554516
$R^2$	0.10	0.10	0.10	0.34

Heteroscedasticity-robust standard errors not reported.

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