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Short-term hotel room price effects of sporting events

Martin Thomas Falk
University of South-Eastern Norway, Norway

Markku Vieru
University of Lapland, Finland

Abstract

A difference-in-differences analysis is used to investigate the short-term price effects of eight sporting events in Finnish Lapland. Data consist of 220,000 room bookings from the reservation system of a nine-hotels chain. Treated hotels are those located within an area where sporting events are regularly held. The control group consists of hotels further away that are not affected by the event. Robust regressions show that hotel room prices rise by 14% on average during the event, when booking and guest specific factors are held constant. For the pre-event period, no significant positive price effect can be detected, and for the post-event period, there is even a significant negative effect of 6%, on average. In addition, there is a large variation in the price effects across the different sporting events, with the highest for the Levi FIS Alpine Ski World Cup competition (60%) and no effect for some small-scale events. Quantile regressions show that price effects are slightly higher for high-priced than for low-priced rooms.

Keywords

difference-in-differences analysis, hotel booking system, hotel prices, quantile regression, sporting events

Introduction

Nowadays, many small sporting events are organized all over the world. Major sporting events have become important attractions for tourists, such as mega-events like the Olympics (Baade and Matheson, 2016; Hall, 1992; Hudson, 2012; Nicolau and Sharma, 2018). The type of sporting events varies markedly, ranging from 1 day marathons to multi-day mega events. Sporting events

Corresponding author:
Martin Thomas Falk, Department of Business and IT, School of Business, University of South-Eastern Norway, Campus Bø, Gullbringvegen 36, 3800 Bø, Norway.
Email: martin.falk@usn.no

typically last a short time but may have positive economic effects on accommodation, hospitality, transport and retail shopping due to the inflow of both participants and spectators. There are many studies available on economic effects of sporting events but only a few examine the short-term impacts on hotel prices. Measuring the price effects of events is important, as local governments and stakeholders (such as hoteliers) often support these activities financially and expect them to have an impact on the local economy (Burgan and Mules, 2001). Knowledge about the price effects of major sporting events is also important for calculating their economic value.

This study explores the short-term effects of sporting events on hotel room prices by employing a difference-in-difference (DID) strategy. The study covers the eight largest sporting events in Finnish Lapland over a 5-year period. This information is linked to detailed booking data from a hotel reservation system covering nine hotels within the same area. The control group consists of booking data belonging to hotels of the same chain located further away from the sporting event. The empirical analysis is based on 220,000 bookings at the daily level for the period 2011–2016.

Few studies investigate the short-term price effects of sporting events using daily data and the objective within these studies still vary. For the United States, Depken and Stephenson (2018) find that small sporting events lead to a temporary increase in the average daily rate of hotels. The price effects of sporting events range between USD 5 and USD 55. Chikish et al. (2019) analyse the effect of professional sporting events and concerts on the performance of nearby hotels measured as the average daily rate. Regression results based on daily data show that price effects depend on the distance of the hotel from the venue and, overall, negative effects predominate.

Earlier studies use aggregate data at the city or district level to investigate the price effects of sporting events. Porter and Fletcher (2008) reveal that the Summer Olympic Games in Atlanta and the Winter Olympic Games in Utah lead to a significant increase in hotel room rates. Solberg and Preuss (2007) show that revenues per guest night (deflated by the consumer price index) in the year of the Sydney Olympics increased by 11%, but the trend is reversed thereafter. Barreda et al. (2017) investigate the impact of FIFA World Cup (2014) on hotel prices (revenue per available room (RevPAR) and average daily rate (ADR)) in the participating cities. The authors find that hotel prices rise during the FIFA World Cup but quickly decrease after the event, to a price level similar to that of the pre-event period.

An important feature of the literature is that the majority of studies focus on the average price effects based on aggregate data at the city or district level and rarely examine the price effects after the end of the event. Exceptions are Depken and Stephenson (2018) and Chikish et al. (2019) who use large samples of individual hotels. The investigation of the post-event price effects is important because an extended stay would indicate a wider effect of the event (Depken and Stephenson, 2018).

It is well known that room rates typically differ widely across hotels and even within the same hotel depending on booking time and many other guest and booking characteristics (Falk and Vieru, 2019), usually due to the use of dynamic pricing methods (Abrate et al., 2019). The availability of extensive information from individual booking data makes it possible to account for the price variation across season, between weekends and weekdays, holiday period, date of booking and many other room and booking characteristics. In addition, the majority of previous studies are conducted without comparing the price effects to a control group of accommodations that are not affected by the event. An exception is the study by Porter and Fletcher (2008) who use other districts in Utah as the control group. Chikish et al. (2019) employ hotels further away from the event venue as a control group. To the best of our knowledge, this is the first study to examine

the price effects of sporting events using a DIDs analysis based on disaggregated data originating from a hotel booking system.

The study focuses on the short-term impacts of small-scale sporting events on accommodation prices. The analysis includes events in the winter season (e.g. Levi FIS Alpine Ski World Cup and Arctic Lapland Rally) and summer season (Rovaniemi Marathon, Levi Ruskamaraton, Kilpisjärvi Ice Fishing Competition and Kilpisjärvi Midsummer Outdoor Activity Event). These events differ from mega sporting events in many respects (Gibson et al., 2012); their duration is usually shorter, and they may attract a higher proportion of local residents. In general, small-scale sporting events affect not only accommodation prices and occupancy but also expenditures for restaurants, transportations and souvenir shops (Gibson et al., 2003; Ryan and Lockyer, 2001). The economic impact of sporting events on accommodation is the most interesting, as accommodation costs usually account for the largest proportion of visitors' costs when attending sporting events (Gratton et al., 2000).

The structure of this article is as follows. The second section outlines the conceptual background, while the third section introduces the empirical approach. The fourth section introduces the data set and the descriptive statistics. The results are presented and discussed in the fifth section, and the sixth section concludes the article.

Conceptual background

The literature focuses almost exclusively on short- and long-term impacts of sporting events on tourist demand (e.g. Brännäs and Nordström, 2006; Fourie and Santana-Gallego, 2011; Kang and Perdue, 1994; Vierhaus, 2019); impacts on aggregate outcome variables, such as gross domestic product per capita and population (Billings and Holladay, 2012; Brückner and Pappa, 2015; Firgo, 2019; Nitsch and Wendland, 2017); or economic impacts on related industries such as accommodation, restaurants, retail and entertainment (Daniels and Norman, 2003; Daniels et al., 2004). Studies focusing on the impact of small-scale events typically estimate the additional revenues to the city generated by the events using stand-alone surveys (Ryan, 1998; Ryan and Lockyer, 2001). Other studies investigating the effects of major sporting events often combine surveys with input–output models including the social accounting matrix or computable general equilibrium models (Huang et al., 2014; Saayman and Saayman, 2012). Another strand of the literature investigates the effect of major sporting events on the market value of hotels and airlines in the winning country (Nicolau and Sharma, 2018; Nicolau et al., 2019).

The results of the studies demonstrate that major sporting events have a long-term impact on international tourism in the host country and that this impact is the greatest in the year of the event and decreases over time (Daniels and Norman, 2003; Fourie and Santana-Gallego, 2011; Kang and Perdue, 1994; Solberg and Preuss, 2007). Fourie and Santana-Gallego (2011) find that major sporting events lead to an 8% increase in tourist arrivals, with a greater impact on the arrivals of the participating countries. However, the Winter Olympics are not significantly linked to tourist arrivals in the host country. Vierhaus (2019) shows that the hosting of the Summer Olympics significantly increases the number of international tourist arrivals in the host countries before, during and after the event. In contrast, the FIFA World Cup has no long-term impact on tourist arrivals. Baumann and Matheson (2017) investigate the impact of smaller sporting events on airplane arrivals and find that only the Honolulu Marathon generates additional air arrivals. Teigland (1999) shows that the actual tourism impact of the Winter Olympics in Lillehammer is

lower than forecasted by the Norwegian national and local authorities, who expected a 'big boom' in tourism after the organization of the 1994 Winter Olympics.

Sporting events as well as other events (festivals and fairs, for instance) attract both out-of-region visitors and locals (Preuss, 2005). These events are usually short term although still with some variation. Some of them, such as cross-country ski races, need a few days, while others, such as marathons, are seldom more than 1-day events. In most cases, out-of-region participants and visitors stay overnight at the venue of the event. This trend is more common in remote regions with a relatively small number of local residents, like Finnish Lapland. Similarly, sporting events with a high proportion of foreign visitors like the Levi FIS Alpine Ski competition lead to a temporary marked surge in local tourism demand. As the accommodation capacity in the host country cannot be expanded at short notice, there is temporarily excess demand for accommodation and this in turn pushes accommodation prices upwards. As a rule, the demand for accommodation during the event period is inelastic for high-priced or high-quality room prices, indicating that travellers are willing to pay the higher prices during this specific period of time (Barreda et al., 2017).

Not surprisingly, the majority of studies find positive effects on accommodation prices during sporting events (Barreda et al., 2017; Porter and Fletcher, 2008). For instance, Porter and Fletcher (2008) report that hotel prices increase by 43% during the Summer Olympic Games in Atlanta and 141% during the Winter Olympic Games in Salt Lake City. Du Plessis and Maennig (2011) note that flight prices during the 2010 FIFA World Cup in South Africa are at least 50% higher than normal. Similarly, in the FIFA World Cup cities (Cape Town, Durban and Gauteng), car rental companies and hoteliers increase their price by a factor of 2 and 3, respectively, during the World Cup. Positive price effects are also reported for trade and world fairs (Sainaghi et al., 2019; Soler and Gémar, 2017). The former find that hotel prices increase between 25% and 40% during the Milan Expo 2015 as compared to the pre-event period, measured as the average of hotel prices for the same calendar months in the last 10 years. Herrmann and Herrmann (2014) show that hotel prices rise during the Munich Oktoberfest by EUR 46 on weekdays and by EUR 24 on weekends compared to non-Oktoberfest days. However, recent studies using detailed data on the average daily rate using the STR database are more sceptical about the price effects of sporting events. Depken and Stephenson (2018) estimate that small sporting events in the United States only lead to a temporary increase in the average daily rate of hotels with price effects in the moderate range. Chikish et al. (2019) demonstrate that the price effects are negligible and depend on the distance to the venue.

There are several reasons why the extent of the price effect of the sporting event might be modest. One reason for this is that the additional demand is lower than expected (Sun et al., 2013). This can be due to the displacement effect described by Hall (1992) or a crowding out effect, described by Baade and Matheson (2004: 346) at the 2000 Olympic Games in Sydney as: '. . . if some non-residents, who might have visited the country, decide not to do so because of congestion and high prices during the event's period'. In other words, due to widespread speculation about congestion and high prices, some tourists avoid the host region and choose other destinations during the event period. This type of crowding out can lower the magnitude of the price effect.

A general feature of the studies is that they perform a simple price comparison before and after the event without comparing prices with a control group of accommodation not affected by the event. The inclusion of the booking and guest situation is important, as the room prices vary greatly depending on the characteristics even for a short period of time. In this study, the control group consists of hotels that are not affected by the sporting event.

In addition, it is likely that the price effects during the event period depend on the characteristics of the event and the city. Larger sporting events and those with a higher international reputation such as Alpine FIS Ski race competitions likely have higher price effects than smaller events or less internationally known sporting events. Price effects are also likely to be different between rural and urban areas. In rural areas, there are limited alternatives to hotel accommodations, while in cities, there might be a supply of alternative accommodations such as short-term rentals.

Thus, based on the reasoning above, the first hypothesis postulates that the direct price effect of sporting events is positive. The reason for this is that event visitors are generally less price-sensitive and accept temporary higher hotel prices (Depken and Stephenson, 2018). However, there might be heterogeneity in the price effect across different types of sporting events, leading to the first two hypotheses:

H1: Sporting events lead to higher hotel room rates during the event period.

H2: Type of sporting event leads to heterogeneous price effects.

An important question concerns the price effect after the event. The literature shows that positive price effects are restricted to the period of the event (Depken and Stephenson, 2018). Using hotel data for the host cities during the FIFA World Cup in Brazil in 2014, Barreda et al. (2017) show that hotel performance rises strongly during the event period but return to their levels of the pre-event period after the event. This holds true for different hotel performance indicators (RevPAR, ADR, revenues, occupancy levels). Du Plessis and Maennig (2011) find that flight and hotel prices after FIFA World Cup quickly fall to the level before the event. A general characteristic of the studies is that they conduct a simple price comparison before and after the event without comparing prices with a control group of accommodations that are not affected by the event. Thus, the third hypothesis states the duration of the price effects of the sporting event:

H3: Price effects disappear shortly after the event.

The fourth hypothesis relates to the heterogeneity of the price effect of sporting events with respect to low- and high-priced rooms. Typically, room rates differ widely across guests, booking and room characteristics. Ordinary least squares (OLS) and robust regression only allow the average price effect of sporting events to be studied. It is likely that high-priced rooms will be more strongly affected by the sporting event. This can be justified by the fact that visitors to sporting events possibly have above-average incomes and are less sensitive to temporary price increases. Thus, the fourth hypothesis can be formulated as follows:

H4: The price effect differs between high- and low-priced rooms.

Empirical model

A DID strategy is used to estimate the impact of sporting events on room prices (Angrist and Pischke, 2009). The DID method is the standard method for analysing the economic impact of major sporting events such as the Olympic Games. Examples of analyses of the economic impact of the Olympic Games are Brückner and Pappa (2015) and Firgo (2019), for both the summer and winter Olympic Games, as well as Nitsch and Wendland (2017) and Billings and Holladay (2012) for the summer Olympic Games. Maennig and Richter (2012) and Vierhaus (2019) employ the

propensity score matching analysis that models the likelihood of cities to host the Olympic. More recently, two studies use synthetic control function approach to analyse the effects of mega events. Pfeifer et al. (2018) analyse the effects of the South African World Cup, while Wan and Song (2019) investigate the effects of the London Olympic Games, Brazil World Cup and Rio de Janeiro Olympic Games on economic growth. Kontokosta (2012) employs a variant of a DID method to examine the impact of the Olympic Games on property prices. The author identifies the impact of a specific intervention (Olympic Games) by comparing the differences in the evolution of real estate prices pre-intervention and post-intervention between cities affected by the treatment with those not affected.

In this study, the DID technique is used. The standard case is that the outcome variable, here room rates, is observed for two groups for two time periods. One group of hotels is exposed to a treatment (i.e. sporting event) in the second period but not in the first period. The second group of hotels is not exposed to the treatment during either period. The control group consists of bookings in hotels belonging to the same hotel chain that are far away from the hotel affected by the event. In particular, the treatment group for each event consists of all bookings of the individual hotel at the event location (except one case with two hotels). The control group includes the bookings of the seven (or eight) other hotels (see Table 3). Model 1 specifies the price effects during the event:

$$lnP_{ijt} = \beta_0 + \beta_1 Treatment_{ijt} + \beta_2 Period_{ijt} + \beta_3 Treatment_{ijt} \cdot Period_{ijt} + X_{ijt}Z + u_{ijt} \quad (1)$$

where ln() is the natural logarithm and P_{ijt} is the room price for the booking of hotel j on day t by guest i. *Treatment* is a dummy variable equal to one for bookings at hotels that are affected by the event, and zero otherwise. *Period* is a dummy variable equal to zero when the booked arrival date is earlier than the event (the pre-event period) and equal to one when arrival date and event date coincide (the event period). The coefficient β_1 captures possible price differences between the treatment and control groups prior to the sporting event and β_2 measures aggregate factors that would cause changes in room rates even in the absence of a sporting event. Coefficient β_3 is the most relevant in this case, since it gives the DID estimates (treatment effect). X_{ijt} is a vector of control variables (a set of dummy variables for hotels that are not affected by the sporting event, four dummy variables for the type of booking channel, six dummy variables for booking lead time, four dummy variables for the number of adults, four dummy variables measuring the high season (summer holiday period, winter break, Easter and Christmas holiday period), a set of dummy variables for the arrival year with the year 2011 as the reference category, arrival weekday and booking weekday; see Falk and Vieru, 2019 for details)). The price equation can be estimated by OLS. To account for influential observations and outliers, the robust regression method developed by Huber (1964) is employed. The estimator gives influential observations and outliers a lower weight.

Special attention is paid to the timing of the price effects of events, that is, whether they are limited to the event period or continue after the end of the event or already occur before the event. Depken and Stephenson (2018) split the possible effect outside the event itself in four groups: 2 days or 1 day before as well as 1 or 2 days after. In order to investigate the pre- and post-treatment effects, the standard DID specification is extended by additional interaction terms for these time periods (models 2 and 3):

$$\begin{aligned} lnP_{ijt} = {} & \beta_0 + \beta_1 Treatment_{ijt} + \beta_2 EventPeriod_{ijt} + \beta_3 Treatment_{ijt} \cdot EventPeriod_{ijt} \\ & + \beta_4 Postevent_{ijt} + \beta_5 Treatment_{ijt} \cdot Postevent_{ijt} + X_{ijt}Z + u_{ijt} \end{aligned} \quad (2)$$

$$\begin{aligned} lnP_{ijt} = {} & \gamma_0 + \gamma_1 Treatment_{ijt} + \gamma_2 EventPeriod_{ijt} + \gamma_3 Treatment_{ijt} \cdot EventPeriod_{ijt} \\ & + \gamma_4 Postevent_{ijt} + \gamma_5 Treatment_{ijt} \cdot Postevent_{ijt} + \gamma_6 Preevent_{ijt} \\ & + \gamma_7 Treatment_{ijt} \cdot Preevent_{ijt} + X_{ijt} Z + u_{ijt} \end{aligned} \quad (3)$$

These models give the treatment effect of sporting events after the event period by coefficient β_5 and for the pre-event period by γ_7. The pre- and post-event periods are defined as a 3-day period ($t = (-1)$-(-3)) before and a 2-day period ($t = 1$ and 2) after the event. A key assumption of the DID technique is the common trend assumption. This cannot be tested directly, but a non-significance of the pre-event effect could indicate that there is a common price evolution before the event. If the pre-event price effects are significant, the common trend assumption is violated. Panel data models cannot be used because it is not possible to track hotel visitors over time. Usually very few guests book the same hotel more than once a year. However, a large number of control variables (hotel fixed effects, year fixed and calendar effects, booking and guest characteristics) are likely to capture a large part of the individual price fluctuations.

The OLS estimator only provides estimates of the average impact of sporting events on room prices. In order to investigate whether there are differences in coefficients at different points in the conditional distribution of hotel room prices, quantile regressions (QRs) are used (Koenker and Hallock, 2001). According to Buchinsky (1994), it is not sufficient to estimate average effects when examining a heterogeneous population of individuals. QRs are now standard in tourism and hospitality research (Assaf and Tsionas, 2018). Recent studies use QRs to study the determinants of hotel prices or prices of Airbnb accommodation (see Masiero et al., 2015; Wang and Nicolau, 2017). The basic idea is that the strength of the independent variables on the dependent variable varies across the different price categories conditional on control factors. In other words, QR techniques make it possible to investigate to what extent the price effects of sporting events differ between low- and high-priced hotel rooms (conditional on control factors). Sporting events can have very different effects on the high and low room rates (given the effects of the other booking characteristics). It is likely that the effects of events are greater at high room prices. The participants in sporting events are usually more educated and have a higher income than that of the average tourist. We use simultaneous QR with the bootstrap procedure with 100 repetitions to obtain an estimate of the entire variance–covariance of the estimator.

Data and descriptive statistics

Data are based on a hotel reservation system with detailed information on room, guest and booking characteristics covering nine hotels with about 220,000 actual room bookings at the daily level over a 5-year period from year 2011 to 2016. The data contains information on the location of the hotels and day of arrival of the guests so that the sporting events can be matched to the location of the hotel and time period.

The 8 biggest sporting events in Finnish Lapland are selected on the basis of information provided by the destination marketing organization (DMO) of Finnish Lapland and its 14 local suborganizations (https://www.visitfinland.com/lapland/). These DMOs offer detailed information on cultural and sporting events. Information on the dates of the eight sporting events is the basis for the empirical analysis (Table 1).

In the winter season from November to April, three sporting events are identified, and in the summer season, there are five sporting events. The sporting events differ considerably in type,

Table 1. Overview of the sporting events.

Name of the event	Type of sport activities	Period	# days	Foundation year	Home page
Kilpisjärvi midsummer	Skiing, orienteering, uphill running and lassoing competition	End of June	3	1950s	http://www.kilpisjarvi.org/en/events/
Kilpisjärvi ice fishing	Ice fishing competition on frozen lakes	Beginning of May	2	1980	http://www.kilpisjarvi.org/en/events/
Rovaniemi Marathon	Marathon	End of June	1	Mid 1990s	http://www.rovaniemimarathon.com/en/
Levi Ruskamaraton	Marathon	Beginning of September	1	1984	http://www.ruskamaraton.com/
Arctic Rally Rovaniemi	Car rally competition	End of January	3	1966	www.arcticrally.fi/
Levi24 MTB race	Mountain biking	Mid of June	2	n.a.	https://www.levi.fi/en/news-events/events/list-of-events/levi-24-mountain-bike-event-2.html
Levi FIS Ski race	Downhill skiing	Mid of November	3	2008	https://www.fis-ski.com/
Lapponia Hiihto	Cross-country skiing competition	Beginning of April	5	1978	http://www.lapponiahiihto.fi/en/lapponia-ski-event.html

Notes: DMO: destination marketing organization. Local DMO and home page of the sporting events.

duration and tradition. Two events are marathons. The Rovaniemi Marathon is organized by the Lapland Long Distance Running Association and has a relatively short history. Ruskamaraton is a running event in Levi (municipality of Kittilä) held the first Saturday in September and it is arranged since year 1984. Another event takes place in summer in Levi, which is an exceptional mountain bike event.

The remaining summer sporting events have a long tradition: ice fishing competition on a frozen lake and a midsummer night outdoor festival which includes several activities in Northern part of Finnish Lapland. The 'Only 2 fish' ice fishing event' is an ice fishing competition held early May when the lakes up north are still frozen. The traditional Kilpisjärvi Midsummer Outdoor Activity Event is a 3-day event and offers a mix of sport activities.

The winter event includes the Levi FIS Alpine World Cup, which has been taken place since 2008 in mid-November. The Arctic Lapland Rally, also known as Tunturiralli, is an annual rally competition held on ice- and snow-covered roads in Rovaniemi organized continuously since 1966. The longest event is the Lapponia Ski Event, which is held annually in April and brings together cross-country skiers from all over the world. It has been organized since 1978 and offers several different distances. The sporting events also differ in terms of their international reputation. The Levi FIS World Cup is well known internationally, while other festivals are less known internationally and rarely attract many international visitors.

Table 2 contains the definition of the event period and the number of affected bookings. The event period ranges between 1 days and 5 days. To define the post-event period, the first day after the end of the event is used and two more nights are added. Similarly, the pre-event period is defined as a 3-day period ending on the day of the event and starting 3 days earlier.

Table 2. Event period and number of affected bookings.

Type of event	Location	Event period	Number of treated hotels	Number of affected bookings	Number of hotels in the control group
Kilpisjärvi midsummer	Kilpisjärvi	24–26 June 2011, 22–24 June 2012, 21–23 June 2013, 20–22 June 2014, 19–21 June 2015	1	408	8
Kilpisjärvi ice fishing	Kilpisjärvi	7–8 May 2011, 5–6 May 2012, 4–5 May 2013, 3–4 May 2014, 2–3 May 2015	1	251	8
Rovaniemi Marathon	Rovaniemi	2 July 2011, 3 June 2012, 29 June 2013, 28 June 2014, 27 June 2015	1	595	8
Levi Ruskamaraton	Levi	3 September 2011, 1 September 2012, 7 September 2013, 6 September 2014, 5 September 2015	1	638	8
Arctic Rally Rovaniemi	Rovaniemi	28–30 January 2016, 22–24 January 2015, 23–25 January 2014, 24–26 January 2013, 27–29 January 2011	1	538	8
Levi24 MTB race	Levi	11–12 June 2011, 15–16 June 2012, 14–15 June 2013, 13–14 June 2014, 12–13 June 2015	1	132	8
Levi FIS Ski race	Levi	11–13 November 2011 (cancelled), 9–11 November 2012, 15–17 November 2013, 14–16 November 2014, 13–15 November 2015 (cancelled)	1	363	8
Lapponia Hiihto	Muonio, Enontekiö, Pallas, Olos	4–8 April 2011, 26–30 March 2012, 2–6 April 2013, 7–11 April 2014, 7–11 April 2015	2	760	7

Notes: DMO: destination marketing organization. Local DMO and home page of the sporting events.

Table 3. Room rates in the event period (Euro).

	P25	P50 = Median	P75
		Summer season	
Control group	44	65	92
Rovaniemi Marathon affected hotel	44	54	78
Levi24 MTB affected hotel	52	55	70
Levi Ruskamaraton affected hotel	57	94	118
Kilpisjärvi midsummer affected hotel	90	97	106
Kilpisjärvi ice fishing affected hotel	135	174	200
		Winter season	
Control group	75	103	140
Arctic Rally Rovaniemi affected hotel	88	104	130
Levi FIS Ski affected hotel	78	95	140
Lapponia hiihto affected hotel	91	121	166

Note: Hotel booking system.

The hotel data for the empirical analysis are based on individual bookings of hotel rooms for the period of January 2011 to February 2016. The data originates from a hotel booking system comprising nine 3- and 4-star hotels located in Finnish Lapland (see Falk and Vieru, 2019 for a description of the database). The database contains information on each booking (such as the hotel room rate, the date of arrival, the date of booking, the room category, the number of visitors (adults), information on guests with or without children, the country of residence and the length of stay; see Table 7 in Online Appendix for descriptive statistics).

In addition, the booking channel (individual offline booking, booking through travel agency, hotel online shop, OTAs) used by the guests are provided. Room rates are generally defined as rates including breakfast and excluding lunch, dinner and other extra services. In some cases, room bookings are packaged, which includes extra services such as on-site lunch and/or dinner, a golf green fee, professional guided walking and snowmobile tours. In order to make prices comparable, the packaged prices are adjusted using monetary value of the extra service provided by the hotel.

The postal codes of the hotels are linked to the location of the sporting events. In all cases, the affected hotels are located directly in the area of the sporting event, with the exception of Rovaniemi, where the hotel is about 2 km from the start of the Marathon (city centre).

Table 3 shows the median room rates during sporting events (each day at the beginning and end is added to the event period). In addition, the 25th and 75th are calculated. This gives a rough first picture of the possible direction of the impact of sporting events on hotel room prices. First of all, hotel room rates are generally higher in the winter season, which is the high season in Finnish Lapland. For three events in the summer season, we find above-average prices and for two events in the winter season. This can also be observed for low- and high-priced rooms.

However, it is difficult to draw meaningful conclusions about price differences from a comparison of median room prices, as room prices depend on guest characteristics (e.g. size of travel group) and booking characteristics (e.g. booking time).

Empirical results

The results of Huber's robust M-estimator show that the eight sporting events on average lead to a significant increase in hotel room rates over the event period (Table 4).

The coefficient on the interaction term between the event dummy variable and the dummy variable for the affected hotels (panel B, model 1) is 0.133, indicating the hotel rooms rates are 14% higher as compared to the control group.[1] Based on OLS estimates, the strength of the price effect of sporting events is somewhat lower with 11%. The specification controls for guest-specific characteristics (e.g. number of guests), booking characteristics (advance booking, booking channel, booking day and arrival day) and seasonal factors (holiday period). The control variables are all significant but not reported (results are available upon request). QRs (Table 4; panels C and D) show that the price effects of the sporting events during the event period differ between high- and low-priced rooms (conditional on booking and guest characteristics). The results for the 0.25 and 0.75 QRs show that the short-term price effect is slightly higher for high-priced room rates (9 vs. 11%). Overall, the positive price effect of sporting events is not only present but also robust with respect to various estimation methods and in line with the literature and hypothesis 1.

While the significant price effects of sporting events for the main event period were to be expected, the question arises as to the price effect outside the main event period. Results based on the robust regression method show that the coefficient of the interaction term between the affected hotels and the dummy for the pre-event period (with a duration of 3 days before the start of the event) using model 3 is not significantly different from zero (coefficient of 0.004 and *t*-statistic of 0.50). Likewise, QR results in panels C and D show that the price effects of the pre-event period do not differ significantly from zero.

In addition, price effects after the event are tested using model 2, whereby this period is defined as two additional nights after the end of the event. The results using the robust estimation method show that the room rates are 7% lower as compared to the base period. QR (0.25) leads to a price effect of 4%, indicating that the negative price effect is less pronounced for low-price rooms (conditional on other characteristics). These estimates support both the second and fourth hypotheses.

As there is a negative price effect after the event, it is interesting to calculate the price effect over the whole period, including the post- and pre-event periods. This can be achieved by normalizing the price effects of the different periods by the number of days and then calculating the sum. The normalized price effect of the sporting event is 0.060 per day or 6% (coefficient of −0.15 divided by 2.5 days) compared to −0.038 (−0.076/2) for the post-event period and zero for the pre-event period, based on robust regression estimates. Thus, the negative price effect after the event partly outweighs the positive price effect during the event. This indicates that, on average, the price effects over the longer period are quite small and that possible revenue increases are mainly attributable to the high occupancy rate during the event period rather than higher hotel room rates.

Overall, the results show that the price increase is limited to the event period and is in the medium range. The results are consistent with Depken and Stephenson (2018) using information on a sample of medium-sized sporting events (marathons, football matches and basketball tournaments). For large sporting events, Porter and Fletcher (2008) find much higher increases in room rates during the winter and summer Olympic games in Salt Lake City and Atlanta, respectively.

One of the main assumptions of the DID estimation procedure is the 'common trend' assumption, which implies that both treatment and control groups would follow a similar trend in

Table 4. Price effects of sporting events (pooled over the events).

	Model 1		Model 2		Model 3	
	Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic
			Panel A: OLS estimates			
Sporting event period	−0.044***	−12.00	−0.051***	−11.99	−0.045***	−9.85
Hotels Affected × Sporting Event Period	0.112***	13.93	0.137***	16.30	0.158***	17.25
Post-sporting event period			0.033***	3.54	0.033***	3.53
Hotels Affected × Post-Sporting Event Period[a]			−0.138***	−8.63	−0.155***	−9.52
Pre-sporting event period					−0.045***	−7.89
Hotels Affected × Pre-Sporting Event Period[b]					−0.038***	−3.72
Wald-test of joint significance of hotel dummy variables of the control group (*p*)	0.00		0.00		0.00	
Control variables	Yes		Yes		Yes	
R^2	0.25		0.25		0.25	
Number of observations	220,128		220,128		220,128	
			Panel B: Robust regression estimates			
Period of the sporting events	−0.038***	−11.36	−0.034***	−9.69	−0.023***	−6.45
Hotels Affected × Sporting Event Period	0.133***	16.89	0.143***	17.31	0.151***	17.10
Post-sporting event period			−0.022***	−4.25	−0.023***	−4.42
Hotels Affected × Post-Sporting Event Period[a]			−0.067***	−4.57	−0.076***	−5.16
Pre-sporting event period					−0.065***	−17.80
Hotels Affected × Pre-Sporting Event Period[b]					0.004	0.50
Wald-test of joint significance of hotel dummy variables of the control group (*p*)	0.00		0.00		0.00	
Control variables	Yes		Yes		Yes	
Number of observations	220,128		220,128		220,128	
			Panel C: QR (0.25)			
Period of the sporting events	−0.001	−0.30	−0.004	−1.26	0.001	0.26
Hotels Affected × Sporting Event Period	0.088***	14.04	0.092***	10.71	0.098***	16.69
Post-sporting event period			0.016***	3.44	0.016***	3.72
Hotels Affected × Post-Sporting Event Period[a]			−0.016**	−2.09	−0.026***	−3.03
Pre-sporting event period					−0.039***	−10.07
Hotels Affected × Pre-Sporting Event Period[b]					−0.003	−0.52
Wald-test of joint significance of hotel dummy variables of the control group (*p*)	0.00		0.00		0.00	
Control variables	Yes		Yes		Yes	
Number of observations	220,128		220,128		220,128	

(continued)

Table 4. (continued)

	Model 1		Model 2		Model 3	
	Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic
			Panel D: QR (0.75)			
Period of the sporting events	−0.067***	−18.51	−0.055***	−13.64	−0.045***	−11.98
Hotels Affected × Sporting Event Period	0.106***	14.45	0.112***	14.72	0.113***	16.18
Post-sporting event period			−0.046***	−7.73	−0.052***	−10.60
Hotels Affected × Post-Sporting Event Period[a]			−0.066***	−5.36	−0.068***	−5.06
Pre-sporting event period					−0.052***	−12.59
Hotels Affected × Pre-Sporting Event Period[b]					0.003	0.32
Wald-test of joint significance of hotel dummy variables of the control group (*p*)	0.00		0.00		0.00	
Control variables	Yes		Yes		Yes	
Number of observations	220,128		220,128		220,128	

Notes: OLS: ordinary least squares; QR: quantile regression. The dependent variable is the natural logarithm of room rates. Control variables are a set of hotel dummy variables for those not affected by the event, booking lead time, year dummy variables, dummy variables for arrival day and for booking day, dummy variables for booking channel and dummy variables for high seasons (Christmas season, winter break, Easter and summer holidays). (*p*) is the *p*-value of the Wald-test of joint significance of hotel dummy variables of the control group. Robust regression estimates are obtained from Huber's *M*-estimator. OLS *t*-statistics are based on heteroscedasticity-consistent standard errors. Bootstrap QRs are based on bootstrap standard errors using 100 bootstrap replications.

***Significance at the 1% level.

**Significance at the 5% level.

*Significance at the 10% level.

[a]Post-event period refers to 2 days after the end of the event.

[b]Pre-event period refers to 3 days before the start of the sporting event.

the absence of the policy. Even though the common trend assumption cannot be tested, the insignificant coefficient of the interaction term of the affected hotels and pre-event period dummy variable indicate that there is no difference in the evolution of the hotel room rates before the event.

Table 5 shows the results of the DIDs analysis, in which the price effects of sporting events are estimated separately for each event using model 2.

The results using the robust regression method and OLS show that sporting events are associated with higher room rates during the event period in six of eight sporting events with the price effect ranging between 3.5% and 63.5% (=(exp(0.49)−1) × 100). In particular, the price effect of sporting events is highest for the Levi FIS Ski competition with 63.5% followed by the ice fishing, sporting event with 50% (=(exp(0.41)−1) × 100). This indicates that there is a large heterogeneity in the short-term price effect of sporting events. Thus, the second hypothesis cannot be rejected. The marathon is associated with higher prices in the affected hotel in Levi but not in Rovaniemi. There are several explanations for the large variation in price effects across the various events. For example, the size and the season of the event, the type of event and its tradition, the duration of the event and the international reputation can play a role. The FIS Ski World Cup in Levi, for example, is the best known sporting event in the world compared to the other, more local sporting events

Table 5. Price effects of each sporting event.

Robust regression estimates			OLS estimates	
Panel A: sporting events in the summer season				
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	0.090***	19.67	0.092***	23.74
Kilpisjärvi midsummer event period	−0.074***	−9.28	−0.092***	−11.88
Hotel Affected × Kilpisjärvi Midsummer Event Period	0.150***	6.24	0.189***	11.30
Kilpisjärvi midsummer post-event period	0.046***	3.50	0.050***	3.61
Hotel Affected × Kilpisjärvi Midsummer Post-Event Period	−0.003	−0.06	−0.036	−1.14
Controls	Yes	Yes		
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	0.091***	19.95	0.093***	24.39
Kilpisjärvi ice fishing event period	−0.172***	−3.91	−0.196***	−4.10
Hotel affected × Kilpisjärvi Ice Fishing Event Period	0.408***	7.84	0.419***	7.73
Kilpisjärvi ice fishing post-event period	0.170	0.96	0.157***	4.05
Hotel Affected × Ice Kilpisjärvi Fishing Post-Event Period	0.181	0.51	0.211	1.43
Controls	Yes	Yes		
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	−0.020***	−6.18	−0.004	−1.27
Rovaniemi Marathon event period	−0.001	−0.14	−0.086***	−6.22
Hotel Affected × Rovaniemi Marathon Event Period	0.015	0.71	0.111***	4.73
Rovaniemi Marathon post-event period	0.005	0.42	0.230***	6.89
Hotel Affected × Rovaniemi Marathon Post-Event Period	−0.098***	−3.66	−0.333***	−8.51
Controls	Yes	Yes		
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	−0.133***	−44.54	−0.092***	−24.07
Levi24 MTB event period	−0.188***	−20.21	−0.218***	−14.61
Hotel Affected × Levi24 MTB Event Period	0.076*	1.82	0.059**	2.51
Levi24 MTB post-event period	−0.165***	−12.92	−0.015	−0.43
Hotel Affected × Levi24 MTB Post-Event Period	0.040	0.57	−0.136***	−3.00
Controls	Yes	Yes		
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	−0.132***	−44.07	−0.091***	−23.67
Ruskamaraton event period	−0.178***	−19.53	−0.177***	−22.04
Hotel Affected × Levi Ruskamaraton Event Period	0.198***	9.95	0.140***	7.49
Ruskamaraton post-event period	0.003	0.27	−0.023**	−2.36
Hotel Affected × Levi Ruskamaraton Post-Event Period	−0.217***	−4.83	−0.222***	−4.77
Controls	Yes	Yes		

(continued)

Table 5. (continued)

Robust regression estimates			OLS estimates	
Events in the winter season				
Panel B: sporting events in the winter season				
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	−0.134***	−44.66	−0.093***	−24.28
Levi FIS Ski event period	−0.072***	−3.64	−0.060***	−3.80
Hotel Affected × Levi FIS Ski Event Period	0.485***	16.01	0.416***	15.80
Levi FIS Ski post-event period	−0.069**	−2.08	−0.105***	−3.03
Hotel Affected × Levi FIS Ski Post-Event Period	−0.061	−0.49	−0.030	−0.42
Controls	Yes	Yes		
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	−0.023***	−7.12	−0.008**	−2.56
Arctic Rally Rovaniemi event period	0.145***	15.19	0.125***	13.56
Hotel Affected × Arctic Rally Rovaniemi Event Period	0.016	0.72	0.021	1.20
Arctic Rally Rovaniemi post-event period	0.173***	9.99	0.133***	7.96
Hotel Affected × Arctic Rally Rovaniemi Post-Event Period	−0.118***	−3.24	−0.098***	−3.64
Controls	Yes	Yes		
	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Hotel affected	0.084***	24.17	0.091***	24.21
Lapponia Hiihto event period	0.056***	8.91	0.061***	8.04
Hotel Affected × Lapponia Hiihto Event Period	0.054***	2.89	0.001	0.05
Lapponia Hiihto post-event period	0.003	0.26	−0.038***	−3.06
Hotel Affected × Lapponia Hiihto Post-Event Period	−0.090***	−2.60	−0.062	−1.50
Controls	Yes	Yes		

Notes: OLS: ordinary least squares. The dependent variable is the natural logarithm of room rates. Control variables are a set of hotel dummy variables not affected by the event, booking lead time, year dummy variables, dummy variables for arrival day and for booking day, dummy variables for booking channel and dummy variables for high seasons (Christmas season, winter break, Easter and summer holidays). Robust regression estimates are obtained from Huber's *M*-estimator. OLS *t*-statistics are based on heteroscedasticity-consistent standard errors.

***Significance at the 1% level.

**Significance at the 5% level.

*Significance at the 10% level.

considered. Results for the price effects of the post-event period (two additional nights) estimated separately for the eight sporting events show that the price effects are no longer significant at the 5% level in all cases. In three cases, significant negative price effects can be observed, indicating a possible displacement effect. This indicates that the price effects are limited to the event period and wider effects cannot be observed.

Table 6 shows the QRs of the price effects of the sporting events during the event period estimated for each sporting event separately. The results for the 0.25 and 0.75 QRs show that in five of eight sporting events, the short-term price effect is more pronounced for high-priced room rates. This is to be expected if the guests during sporting events tend to belong to higher income

Table 6. Price effect of sporting events (QRs).

	QR 0.25		QR 0.75	
Hotel affected	Coefficient	*T*-statistic	Coefficient	*T*-statistic
Kilpisjärvi midsummer event period	0.031***	2.60	0.105***	7.88
Kilpisjärvi ice fishing event period	0.200***	4.44	0.502***	13.13
Rovaniemi Marathon event period	−0.010	−1.00	−0.030	−1.08
Levi Ruskamaraton event period	0.092***	2.64	0.194***	13.83
Levi24 MTB event period	0.200***	10.90	−0.097***	−3.39
Levi FIS Ski event period	0.430***	12.61	0.489***	14.36
Arctic Rally Rovaniemi event period	0.098***	6.35	−0.010	−0.61
Lapponia Hiihto event period	−0.028	−1.04	0.101***	6.84

Notes: QR: quantile regression. The dependent variable is the natural logarithm of room rates. See Table 5 for the control variables. Bootstrap QRs are based on bootstrapped standard errors with 100 replications.
***Significance at the 1% level.
**Significance at the 5% level.
*Significance at the 10% level.

and wealth categories with higher willingness to pay than guests during non-event period. Thus, the results support hypothesis 4.

In summary, none of the hypotheses can be rejected. The price effects are modest, limited to the duration of the event and vary greatly depending on the type of sporting event with slightly larger price effects for high-priced rooms (conditional on other factors).

Conclusions

This study analysed the impact of small sporting events on hotel room prices based on several sporting events in Finnish Lapland. Previous studies have mainly focused on the economic impact of major sporting events such as the Olympic Games or the FIFA World Cup. In general, studies that evaluate price effects are underrepresented and studies based on microdata with information on individual hotel room prices are scarce. Since hotels often support the events that take place in their neighbourhood, it is important to study their room rate effects.

Robust regression estimates show that hotel room prices at sporting events are significantly higher. On average, hotel room prices rise by 14% in the event period. This is much lower than the price effects of major sporting events found in the literature. An important finding is that the price effect of sporting events is limited to the event period. There are no significant positive price effects for the two nights after the sporting event; there are even significant negative price effects. Similarly, pre-event price effects are not significant. QRs show that the price effects are more pronounced for high-priced rooms conditional on control factors. In addition, there is a large variation in the strength of the price effect with the highest effect for the Levi FIS Alpine Ski competition.

Several conclusions can be drawn for decision makers and hoteliers. The price effects of these small sporting events are in the medium range and are limited to the duration of the event. Hoteliers and municipalities should therefore not be very generous in providing financial support for events. The price effects also depend strongly on the type of event, although the effects are stronger for

internationally known events and longer events. The nature of the sporting event should therefore be taken into account when deciding on the financing of sporting events.

The analysis of price effects of events based on hotel booking data has several advantages over the analysis based on survey data or aggregate data. Booking data from a property management system cover the entire universe of hotel guests and therefore do not suffer from non-response bias. These data are also rich in various features and allow researchers to examine the price effect of different types of visitors or according to characteristics of the booking (such as chosen booking channel).

Some limitations have to be mentioned. First, the empirical analysis is limited to sporting events. During the period, there are also some smaller cultural events (music, cinema and Jazz festivals) that affect prices. However, these are typically smaller and attract a lower number of external visitors. In addition, the cultural events are concentrated in the summer season, where many other accommodation options are available. Second, the analysis is based on booking data of nine hotels belonging to a hotel chain and therefore cannot be generalized for the total universe of hotels in the area. Third, price effects depend on the number of local competitors. In larger cites, there is an increasing supply of online short-term rentals (Airbnb accommodations).

There are several ideas for future work. Future work can analyse the hotel price effect of cultural events. This makes it possible to compare the results for the price effects of sporting events with those of cultural events. Another promising area of future research is to re-examine the price effects of sporting events on Airbnb accommodations but new data are needed.

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ORCID iD

Martin Thomas Falk https://orcid.org/0000-0003-0518-6513
Markku Vieru https://orcid.org/0000-0002-8833-5248

Supplemental material

Supplemental material for this article is available online

Note

1. Calculated as (exp(0.133)-1) × 100 (Halvorsen and Palmquist, 1980).

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Author biographies

Martin Thomas Falk is an associate professor of innovation and entrepreneurship at the School of Business and IT at the University of South-Eastern Norway. His research interests are in the field of economics of innovation, firm behaviour, tourism economics and cultural economics. He holds a master's degree in economics from the University of Kiel and a doctoral degree in economics from the University of Regensburg. He is a guest professor at the Shanghai Lixin University of Accounting and Finance (School of International Economics and Trade).

Markku Vieru is a professor of accounting at the University of Lapland at the Multidimensional Tourism Institute in Rovaniemi (Finland). His main research interests lie in the area of financial economics, accounting and tourism research. He holds a master's degree in Business Administration (Accounting) from the University of Vaasa (Finland) and a PhD in Business Administration (Accounting) from the University of Oulu (Finland).