

SPORTS-LED TOURISM, SPATIAL DISPLACEMENT, AND HOTEL DEMAND

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We analyze the relationship between professional sports events and concerts held in LA's Staples Center and nearby hotel performance. Government-led economic redevelopment projects often envision sports facilities as tourist magnets. Little evidence exists supporting links between sporting events and hotel demand. An empirical analysis exploiting exogenous daily variation in the timing of games and concerts from 2002 to 2017 shows a small positive impact on room revenue at hotels within one mile and larger room revenue decrease at hotels located one to 4 miles away. The overall impact on hotel room revenue and rooms rented was not positive. Nearby hotel room rates increased during NBA and NHL work stoppages. The city granted four new hotels built very near the arena exemptions from occupancy taxes for 20–25 years; these exemptions reduced hotel tax revenues by a minimum of \$4.5 million annually and may not have been needed to spur new hotel development. (JEL H26, H71, Z28)

I. INTRODUCTION

Tourism represents a key component in many local government-led economic development projects. Tourism-related projects typically develop a tourist attraction in order to get out-of-town visitors to spend money on admission, food and beverages, hotels, local transportation, and other tourism-related goods and services in the area. The local economy benefits directly from this spending, and local governments benefit from increased tax revenues generated by tourism-related consumer spending.

Professional sports often play a prominent role in these projects. Sporting events attract large numbers of attendees. National Hockey League (NHL) and National Basketball Association (NBA) games can attract upward of 20,000

fans and teams play more than 40 home games each season. Basketball and hockey arenas also host concerts that draw large crowds. Some consumers attending these events travel from out of town, and may rent hotel rooms near the arenas. If this economic activity represents new spending that would not have taken place absent games and concerts, then the local economy could benefit, as long as the events do not make other consumers who would have visited the area alter their plans.

The relationship between sporting events/concerts and tourism-related economic outcomes

ABBREVIATIONS

ADR:	Average Daily Room Rates
CBA:	Collective Bargaining Agreement
MAUP:	Modifiable Areal Unit Problem
MLB:	Major League Baseball
NAIA:	National Association of Intercollegiate Athletics
NASCAR:	National Association for Stock Car Auto Racing
NBA:	National Basketball Association
NCAA:	National Collegiate Athletic Association
NFL:	National Football League
NHL:	National Hockey League
OLS:	Ordinary Least Squares
PAC:	Pacific Athletic Conference
PGA:	Professional Golfers Association
STR:	Smith Travel Research
TOT:	Transient Occupancy Tax
WNBA:	Women's National Basketball Association

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has important public policy implications. Many local economic revitalization projects feature development of new tourist destinations in underdeveloped neighborhoods using public subsidies to finance their construction and operation, a place-based economic policy. These subsidies include direct funding for construction and operation, as well as tax breaks to encourage nearby private development. Project proponents often claim that agglomeration effects will magnify the impact of these projects. Evidence on the effectiveness of such policies is mixed (Busso, Gregory, and Kline 2013).

Also, tourist taxes frequently subsidize new sports facility construction projects. For example, the (then) San Diego Chargers left for Los Angeles in 2016 because the local government would not raise the hotel tax rate from 12.5% to 16.5% to finance a proposed new stadium. The State of Nevada is currently financing the construction of a new \$1.8 billion football stadium in Las Vegas through a hotel room tax rate increase of 0.88 percentage points on rooms rented in nearby hotels.

In Los Angeles, four new hotels near a major tourist destination, the Staples Center/LA Live entertainment complex, received exemptions from the city Transient Occupancy Tax (TOT), a local hotel tax, for 20–25 years, based on the argument that these hotels would not have been built absent tax breaks. Little evidence exists in economics journals on the impact of sporting events and concerts on local economic outcomes related to tourism. The extent to which sporting events and concerts increase local tourism demand affects tax revenues. Granting hotels exemptions from taxes can represent a significant loss of tax revenues.

A clear link exists between games and concerts and local economic outcomes like hotel performance. Professional sports events and concerts attract large numbers of attendees. The capacity of facilities that host games and concerts are large and many tickets are sold for these events. The schedule of games in the NBA and NHL are set months in advance. Event attendees can be either local residents, fans who travel from out of town, or tourists who happen to be in a city when an event occurs and decide to attend. The latter two groups may stay in nearby hotels, leading to increased rental of hotel rooms. To the extent that some attendees are tourists, the presence of these events can increase local demand for hotel rooms.

If out-of-town attendees stay in nearby hotels, then these hotels will benefit economically from

an increase in demand. While out-of-town fans might have specific hotel preferences, based on hotel characteristics like location, amenities, and price, the presence of large numbers of out-of-town attendees attracted to a specific venue would affect overall hotel operating performance; out-of-town visitors have to stay somewhere. For this reason, we analyze outcomes aggregated across hotels in specific geographic areas near a heavily used tourist center, and not outcomes at specific hotels.

Most fans attending these events could be local residents. If this is the case, then local tourism demand would not change in response to the number of events. Local fans simply drive or take public transport to and from the facility, and do not require lodging as part of their attendance.

We analyze the impact of regular season NHL and NBA games, and concerts, held in the Staples Center in Los Angeles—the most intensely utilized professional sports venue in the United States—on local hotel room demand. The scheduling of NBA and NHL games reflects a complex, national process that should be uncorrelated with unobservable local factors in Los Angeles that affect tourism demand. We find little evidence that NHL games, NBA games, or concerts had an overall positive effect on average daily room rates, rooms rented, or total room revenue at hotels within 4 miles of the Staples Center. Hotels located between 2.5 and 4 miles from the arena rented more rooms on days when NBA games were played in the arena, but also lowered their average daily rates on those days, leading to a reduced impact on room revenues. Hotels located more than 1 mile from the arena rented fewer rooms and earned lower room revenue on days when NHL games were played in the arena, and hotels within 1 mile rented more rooms and earned higher room revenues, an example of spatial displacement of economic activity generated by professional sporting events. Our evidence of heterogeneity in economic impact across different types of sporting events has important implications for proposed sports-based economic development projects, since most cities can only hope to attract one team.

We also find evidence of substantial spatial displacement associated with concerts held in the Staples Center. This sizable displacement reduced overall hotel performance within 4 miles of the arena, indicating that music fans differ from sports fans and that augmenting games played in a new arena with a large schedule of

concerts also does not represent a viable local economic development strategy.

While many previous studies have postulated that spatial displacement explains the fact that professional sports events have no net positive economic impact on local economies (Coates and Humphreys 2008), little evidence exists that spatial displacement actually occurs. Depken and Stephenson (2018), using similar data, recently found that National Football League (NFL) and NBA games, and college basketball tournaments played in the center of Charlotte, North Carolina increased hotel room revenues at hotels in the center and decreased hotel revenues in the far Charlotte suburbs. That study used spatial areas of vastly different sizes and did not explicitly account for possible correlation in unobservable factors affecting these areas. This paper uses spatial impact areas of similar size and controls for correlation in error terms across these areas, mitigating potential econometric problems.

Our results also indicate that the forgone TOT revenues granted to four new hotels built near the Staples Center amounted to about \$4.5 million per year, or more than \$70 million in present discounted value over the 20- to 25-year tax exemption period. While hotels near the Staples Center benefit from games and concerts, local tax revenues may not increase because of these tax waivers and the spatial displacement of consumer demand to hotels near the Staples Center. Our results call into question the idea that sport-led tourism can benefit the hotel industry, generate net tangible economic benefits, or raise substantial tax revenues through increases in nearby hotel room revenues, and also raise questions about policies that exempt specific businesses from local taxes to spur local economic development.

II. RELATED LITERATURE

Tourism represents an important source of revenue in countries around the world (Neumayer and Plümper 2016). Sports and entertainment events can affect many local economic outcomes, including crime (Montolio and Planells-Struse 2016), property values (Boualam 2014; Humphreys and Nowak 2017), rent (Carlino and Coulson 2004), and potentially local economic growth (Nitsch and Wendland 2017). Relatively little research exists analyzing the relationship between major league sports events in North America and urban sport-related tourism. Lavoie and Rodríguez (2005) analyze the relationship between hotel occupancy rates and NHL and

NBA games in eight Canadian cities (Vancouver, Calgary, Edmonton, Winnipeg, Toronto, Ottawa, Montreal, and Quebec City) using monthly data over the period January 1990 to December 1999. City-wide average hotel occupancy rate data came from *Canadian Lodging Outlook*, an industry publication from the Canadian Hotels Association. Several work stoppages occurred in the NHL, NBA, and Major League Baseball (MLB) over this period, and several cities lost or gained NHL and NBA teams because of league expansions and team relocation.

Lavoie and Rodríguez (2005) create dummy variables for these events and include them in a Box-Jenkins time series model that explains variation in hotel occupancy rates using lagged values of the dependent variable and these dummy variables. The dummy variables reflect the presence of a team in a city, or the occurrence of a work stoppage, but not the number of games played by teams or lost through work stoppages, or attendance at these games. Lavoie and Rodríguez (2005) found that hotel occupancy rates in Montreal, Ottawa, and Quebec City were lower during the 1994 NHL lockout, which lasted 3 months, but no evidence that hotel occupancy rates increased when a major league team arrived in a Canadian city.

Rishe (2014) analyzes the relationship between mobile sports events (the Super Bowl, NCAA Men's Basketball Final Four, and major professional golf tournaments) and four different daily hotel outcome variables (occupancy rates and total revenues) in 40 U.S. cities that hosted 53 mobile sports events over the period 2008–2014. Rishe (2014) compares occupancy and revenues during the week each event was held to occupancy rates and hotel revenues in the same period the year before and year after the event was held. All these sports events last only a few days, so this analysis focuses on the short run impact of large sports events. Rishe (2014) reports substantial increases in occupancy rates and total revenues associated with the hosting of these mobile sports events, particularly Super Bowls. Hotel occupancy rates in Indianapolis for the week of the 2012 Super Bowl increased by 250% relative to the same weekend the year before and the year after. However, the increased occupancy rates associated with the 2010 Super Bowl in Miami and the 2014 Super Bowl in New York City were only 19% compared to the same weekends the year before and the year after the event. Total hotel revenues also increased substantially, due to increased occupancy rates

and increased room rates. Large sports events like the Super Bowl can clearly have a substantial transitory impact on hotel occupancy rates and revenues near the host venues.

Dermody, Taylor, and Lomanno (2003) perform a similar analysis, investigating how hotel occupancy rates, average daily room rates, and revenue per available room changed on the Saturday night before NFL home games in the 2000 season. Dermody, Taylor, and Lomanno (2003) perform an unconditional comparison of these three outcome variables on Saturday nights before Sunday home and away games, pooling observations for September and October, and for November and December, to account for seasonality. This study finds evidence that hotels near NFL stadiums in a few cities, notably Chicago, Cleveland, and Seattle, had substantially higher revenues on home game weekends, while hotels near NFL stadiums in other cities experienced relatively little revenue impact on home game weekends. This study did not account for variation in attendance at NFL games, or attempt to control for other observable factors affecting hotel revenues.

Collins and Stephenson (2016) undertake a case study of the relationship between minor league baseball games, a small-time (NAIA) college football championship game, a regional tennis tournament, and other nonsports events on hotel operating performance in Rome, Georgia over the period January 1, 2005 through December 31, 2013 using daily frequency data. Results using both indicator variables for events and attendance show modest increases in hotel occupancy and total revenues associated with the championship football game (about one additional room-night for every 20 attendees) and the tennis tournament (about one additional room-night for every three participants) but no impact on room-nights from minor league baseball games or attendees.

Depken and Stephenson (2018) analyze the relationship between a number of sports events (NFL and NBA regular season and postseason games, NASCAR races, college football and basketball games, PGA Tour events, and marathons) and large scale nonsports events like conventions on hotel outcome variables in Charlotte, North Carolina over the period 2005–2013 using daily frequency hotel data. Depken and Stephenson (2018) aggregated hotel-specific data across different geographic areas including a ZIP code, a county, and an entire metropolitan area. This spatial aggregation generated observations for

four distinct geographic areas: all hotels in the center of Charlotte, all hotels within the political boundaries of Mecklenburg County except one ZIP code, all hotels in suburban Charlotte outside Mecklenburg County, and all hotels in the rest of the Charlotte metropolitan area.

Depken and Stephenson (2018) focus on room-nights, average daily room rates, and total revenues, not occupancy rates. The use of daily frequency data allows for an analysis of impacts of these events before and after they occur; empirical models include indicator variables for the event days and 2 days before and after the events. NASCAR races increase room-nights sold on race day and the day before, average daily room rates and total revenues. But room-nights sold and revenues decline in the 2 days following NASCAR events, substantially reducing the net impact of NASCAR races on local hotel operating performance. NFL regular season games and college bowl games increase room-nights sold, average daily room rates and total revenues on game day and the day before, consistent with the results in Dermody, Taylor, and Lomanno (2003). NBA games do not have an impact on hotel operating performance on days before or after games occur. College basketball tournaments have little impact.

The use of hotel data from different geographic areas allows for an analysis of spatial patterns in hotel demand and operating performance. They find evidence of spatial differences in hotel performance. No previous research contained evidence of spatial displacement of economic activity attributable to sporting events; many previous papers speculated that this occurs (Coates and Humphreys 2008). NASCAR and college bowl game impacts occur throughout the Charlotte metropolitan area; they are not concentrated in any specific part. NBA regular season games decrease rooms rented, average daily rates, and revenues on game days only in the near and far suburbs, not in the city center. NFL regular season and post season games increase rooms rented, average daily rates, and daily total revenues in the city center and near suburbs but not in the far suburbs. The local PGA tournament increases rooms rented in the near and far suburbs but average daily room rates were lower in the city center during these events. Spatial displacement occurs in Charlotte and the specific form varies by event.

Both Collins and Stephenson (2016) and Depken and Stephenson (2018) include the national unemployment rate and the real price of unleaded gas per gallon in order to control

for broader economic conditions affecting travel costs and demand for sporting events. These variables are only weakly related to hotel operating performance; both papers report a negative relationship between national unemployment rates and daily hotel revenues.

This paper extends Depken and Stephenson (2018) in several important ways. They undertake a case study of sporting events in a single metropolitan area, Charlotte, North Carolina, which could have unique features that make tourism or hotel performance different there than in other U.S. cities; the sports and entertainment environment could also differ in important ways. Case studies from other large cities help put their results in context. Also, we analyze the effect of concerts, which are not examined by Depken and Stephenson (2018), and exploit work stoppages when scheduled basketball and hockey games were unexpectedly not played, a source of variation in tourism demand not in their sample.

Depken and Stephenson (2018) estimate average daily effects for treatment events of widely different attendance and duration using indicator variables. Their treatment events include multiple- and single-day sports events at a 20,000-seat basketball arena, a 75,000-seat football stadium, and a NASCAR track that seats between 94,000 and 171,000 spectators. The Charlotte PGA tournament included in their sample capped attendees at 35,000 per day during their sample period. Treatment events in Charlotte also include multiday conventions held at a convention center with 280,000 square feet of exhibition space and a ballroom that seats 1,800. This heterogeneity in treatment events may affect the results. This paper uses homogenous treatment events: hockey and basketball games, as well as concerts, held in the same venue with very similar seating capacities for games and concerts.

Depken and Stephenson (2018) split the sample into observations from three irregularly shaped geographic treatment areas of very different sizes. ZIP Code 28202, defined as the center of Charlotte, has an area of 1.8 square miles and has a roughly rectangular shape. Mecklenburg County contains 546 square miles and is irregularly shaped. The Smith Travel Research (STR) data tracts that form another geographic analysis area contain parts of the Charlotte metropolitan area outside Mecklenburg county. The Charlotte MSA contains 3,198 square miles.

Analyzing variables at different spatial scales can lead to econometric problems. This issue is known as the modifiable areal unit problem

(MAUP) and has been extensively documented in spatial empirical analysis (Fotheringham and Wong 1991). The basic problem is that the same variables analyzed at different spatial scales can generate different results.

Our spatial units of measure include donuts with areas of 3, 16, and 27 square miles, respectively, have uniform shapes, and contain areas of uniform distance from the arena. This provides improved geographic borders and characteristics, sharpening estimates of spatial displacement. The use of relatively similar spatial areas can help to assess the extent to which the MAUP may affect the results in Depken and Stephenson (2018).

Depken and Stephenson (2018) use spatially heterogeneous treatments. Their sample includes treatments at three locations dispersed around the area, including a large number of events in a small central area, a large multiday PGA event in Mecklenburg county, and several large NASCAR events at Charlotte Motor Speedway in the distant suburbs. The treatments in this paper all occur at the same place, located in the center of the spatial treatment areas. These extensions provide new information about the form and extent of spatial displacement in economic activity associated with sporting events.

Finally, Depken and Stephenson (2018) estimate separate regression models for each geographic treatment areas, implicitly assuming independence in the error terms for each geographic treatment area. This paper estimates spatial effects in the same regression model, which allows for these error terms to be related. We address possible correlation in error terms within spatial treatment areas using a cluster-correction approach.

Overall, the economic literature on sporting events and hotel outcomes contains mixed results. Large mobile events like the Super Bowl and the Final Four increase hotel occupancy rates and revenues for a short period of time around these events. NFL home games and NASCAR races also increase hotel operating performance on game day, and to a lesser extent 1 day before games are played. NBA games, college basketball tournaments, and minor league baseball appear to have no impact on hotel operating performance. Large mobile events, NFL games, college bowl games, and NASCAR races occur infrequently and primarily on weekends. Fans and travelers know about these events long in advance, and travel on weekends involves lower opportunity costs. These events could be expected to increase room occupancy rates.

NBA games and MLB games occur much more frequently and throughout the week. Despite advanced knowledge of the regular season schedule, these events appear to attract relatively few out-of-town visitors.

A growing literature analyzed the impact of other economic factors on hotel operating performance. Kosova and Enz (2012) analyze the impact of external shock generated by the 9/11 terrorist attacks and the 2008 financial crisis on hotel operating performance and found that these events had sizable impacts on occupancy rates, average daily room rates, and revenue per available room. Kosova, Lafontaine, and Perrigot (2013) analyzed differences in performance of franchised and unfranchised hotels and found little difference in occupancy, room rates, and revenue per available room. These differences are attributed to endogenous choice of organizational form.

Peiro-Signes et al. (2015) analyzed the effect of tourism clusters, geographic concentrations of interrelated firms in the tourism and hospitality industry, on hotel operating performance. LA Live and the Staples Center represent a tourism cluster. They find that hotels located in or near tourism clusters perform better than hotels located outside these areas in terms of occupancy rates, average daily room rates, and revenue per available room; proximity to the cluster and urban location enhance performance. Hua and Yang (2017) analyzed the effect of crime on hotel operating performance in Houston over the period January 2009 to December 2014. They reported that violent crime had a negative impact on revenue per available room.

In general, the literature on the impact of external events on hotel operating performance uses monthly operating performance data, most commonly occupancy, average daily rates, and revenue per available room, from specific metropolitan areas or specific hotels, and estimates reduced form empirical models explaining observed variation in hotel operating indicators. These empirical models include fixed-effects terms to control for unobserved heterogeneity over time and across areas, and generally conclude that many external economic factors affect hotel operating performance.

III. STAPLES CENTER AND L.A. LIVE

The Staples Center opened on October 17, 1999 and is home to three major league sports teams: the Los Angeles Lakers and Clippers of

the NBA and the Los Angeles Kings of the NHL.¹ The arena was privately financed and cost \$375 million to build (about \$554 million in 2017 dollars). It seats 20,000 for concerts and about 19,000 for basketball and hockey; it contains 950,000 square feet of event space and 175 suites. As the home to three major league teams, it is the most intensively used sports arena in the country in terms of NHL and NBA games.

The Staples Center is located adjacent to L.A. Live, a 5+ million square foot entertainment complex containing concert halls, theaters, restaurants, hotels, and office space. The L.A. Live complex covers 27 acres and represents a major entertainment destination in downtown Los Angeles; Phase I which included a larger theater and a number of retail outlets opened in October 2007 and Phase II, which included two large hotels that opened in early 2010. The primary developer was the Anschutz Entertainment Group, which also owns the Los Angeles Kings NHL team that plays in the Staples Center.

Like the Staples Center, the financing for the construction of the L.A. Live complex was largely private. The L.A. Live complex cost about \$2.5 billion to build, and received only about \$30 million in direct public subsidies. However, several hotels that opened adjacent the L.A. Live complex received 20- to 25-year waivers from the Los Angeles TOT, a local hotel tax which is described below.

L.A. Live and the Staples Center are also located adjacent to the Los Angeles Convention Center, one of the largest convention centers in the United States with 720,000 square feet of exhibition space, 147,000 square feet of meeting space and 1,960,000 square feet of parking spaces. The Staples Center, L.A. Live, and the convention center constitute a tourism cluster aimed at attracting large numbers of locals and out-of-town visitors to a specific part of Los Angeles.

The Staples Center/L.A. Live complex represents an urban place-based policy aimed at revitalizing a specific area in Los Angeles. Unlike the urban Empowerment Zone program and other urban place-based policies aimed at job creation (Busso, Gregory, and Kline 2013), this project focused on developing a major tourism center by combining a sports arena, convention center,

1. It is also home to the LA Sparks WNBA team. WNBA teams play only 16–17 home games per year during May–September and draw smaller crowds than NBA and NHL games.

concert theater, restaurants, and hotels in a small area. Los Angeles clearly intended to concentrate both local consumer and tourist spending in a previously undeveloped area south of Downtown Los Angeles. Absent any net new local consumption spending or tourist inflows, this type of place based policy can redirect existing economic activity to a different neighborhood, underscoring the importance of accounting for the spatial dimension of local economic activity in any empirical analysis.

The Staples Center/L.A. Live complex represents an ideal setting for an analysis of the effect of professional sporting events on urban tourism outcomes. Three professional teams call the Staples Center home. While the Los Angeles metro area has two MLB teams, the Los Angeles Dodgers and the Anaheim Angels, the MLB regular season overlaps minimally with the NBA or NHL regular season and the Angels play in a stadium 30 miles away, so the results should not be influenced by omitted variables related to MLB games in the area. The NFL regular season does overlap with the NBA and NHL regular seasons. However, Los Angeles did not have an NFL team during nearly all of the period analyzed here; the Rams played a single season (2016) in LA during this sample.

The NHL and NBA experienced several prolonged work stoppages during the sample period. The 2004–2005 NHL lockout resulted in the cancellation of an entire season and the 2012–2013 lockout delayed the start of the season 3 months. The NBA experienced a lockout in 2011 that delayed the start of the season by 2 months. The end of sports work stoppages cannot be easily anticipated. All of these work stoppages resulted in the cancellation of numerous games that were never made up and can be interpreted as unexpected negative shocks to local sports-related tourism demand in that they clearly affect decisions of tourists who might visit LA to attend NBA or NHL games and could not be anticipated prior to the work stoppage.

This setting also has important public finance implications. The City of Los Angeles collects a 14% TOT on rent or room charges on all transient visitors, defined as persons staying in a hotel or other lodging less than 30 days. The Staples Center and the L.A. Live complex were built using private financing. Hotel occupancy tax revenues were not used to finance their construction. However, the City of Los Angeles granted four new hotels that opened near the Staples Center/L.A. Live complex either full or partial exemptions

from the TOT for 20 to 25 years as an incentive for developers to undertake these projects. Local officials claimed that these new hotels were vital to local economic development and would not have opened without these tax exemptions.

Hotel occupancy taxes have been used to finance the construction of other professional sports facilities across the country, and supporters of public subsidies for the construction of professional sports facilities often tout sports-related travel as an important new source of hotel tax revenues. A better understanding of the relationship between NBA and NHL games played in the Staples Center and nearby hotel operating performance, and spatial patterns of hotel operating performance, provide important context for understanding the effectiveness of hotel occupancy taxes and their general use to finance tourist-related urban economic development plans.

IV. EMPIRICAL METHODS

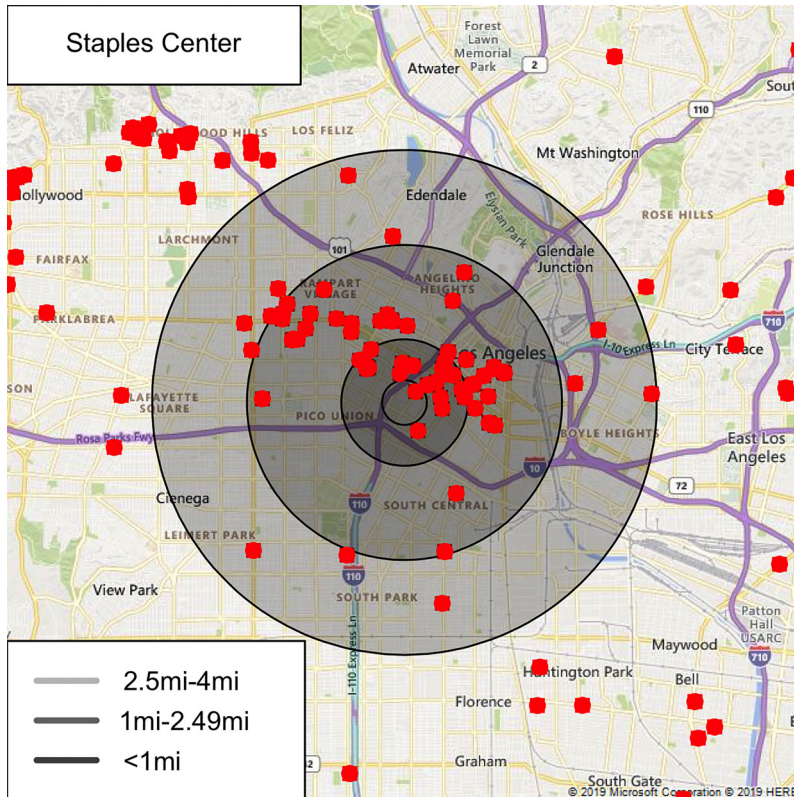
We estimate the following regression model explaining observed spatial variation in daily hotel operating performance

$$(1) \quad HO_{iadm} = \alpha_0 + \alpha_1 G_{dmy} + \alpha_2 \text{Lockout}_{dmy} + \sum_{i=1}^3 \beta_i A_i + \rho_d + \theta_m + \tau_y + \varepsilon_{iadm}.$$

The dependent variable (HO) is a hotel operating performance measure aggregated across all hotels i in spatial area A_i , $1 = 1, \dots, 3$ on day d in month m of year y . We analyze observed variation in three hotel operating performance variables: average daily room rate, a measure of how much hotels charged for a room on that day, daily rooms rented, a measure of demand for hotel rooms on that day in each area, and total daily room revenue, the product of these two variables, which reflects total revenues from rooms on that day.

The hotel performance data are aggregated into three categories based on proximity to the Staples Center/L.A. Live complex: hotels located within a 1 mile radius of the arena complex, hotels located within 1–2.49 miles, and hotels located within 2.5 miles and 3.99 miles of the arena complex. We partition hotels into three geographic areas to determine if spatial displacement occurs in hotel demand or tourist spending around the Staples Center because of sports events and concerts. Spatial displacement occurs when an event like an NBA basketball

FIGURE 1
The Staples Center, Hotels, and Donuts



game increases demand for hotel rooms close to the arena and decreases demand for hotel rooms farther away from the arena.

We call the discrete geographic areas centered on the arena “donuts” and identify them with a vector of indicator variables A_i in Equation (1). Figure 1 shows the Staples Center/LA Live complex, the hotels in our sample, and the three donuts. A large number of hotels are clustered near Staples Center/LA Live, primarily north of the complex.

Hotels located in different donuts might have different time invariant characteristics. For example, from the summary statistics on Table 2 based on data for about 16,000 days, hotels located within 1 mile of the arena charge, on average, higher daily rates compared hotels in all other donuts. We include a set of indicator variables in Equation (1) to account for possible differences in characteristics of hotels in different donuts. The hotels located within a

1-mile radius of the Staples Center form the reference group.

The vector G_{dmy} represents the key explanatory variables of interest: indicator variables for days in which NBA and NHL games, or concerts, occurred in the Staples Center on day d during month m of year y . We employ a number of different specifications for these indicator variables and describe them fully below.

Teams and hotels cannot control or influence the number and timing of NBA and NHL home games scheduled in the Staples Center in each season. Each NHL and NBA team plays 41 regular season home games. The NBA and NHL league offices determine exact details of regular season schedules, in consultation with individual teams and facilities. An enormous number of factors affect the timing of the league schedule, including league rules about which other teams each team must play, team travel schedules, other events scheduled in arenas, traditional games

played by specific teams on certain holidays, and other factors. Leagues set schedules months in advance of the start of the regular season and are not usually changed after the start of the season.

Day-to-day variation in the scheduling of home games played by NBA and NHL teams are plausibly exogenous to unobservable local factors affecting hotel operating performance. It is very unlikely that the scheduling of NBA and NHL games would be systematically correlated with unobservable, time varying factors that affect outcomes in the Los Angeles hotel market. The scheduling of concerts should also be uncorrelated with unobservable factors affecting local hotel performance. Concerts depend on the touring schedules of artists and availability of the arena.

The time frame of our sample includes three periods of work stoppages in the NBA and NHL that led to the cancellation of significant numbers of games. Players in both leagues are unionized, and all terms of employment are determined by collective bargaining agreements (CBAs) negotiated between player unions and teams. Disputes sometimes arise when renegotiating CBAs. In these cases, work stoppages often occur.

Two NHL lockouts occurred during this sample period. The lockout of 2004–2005 resulted in the cancellation of the entire NHL season. This unprecedented event occurred at the end of a CBA when the league wanted to impose a cap on player salaries. The dispute was not resolved for a full calendar year. The 2012–2013 NHL lockout shortened the NHL season by 3 months—it was supposed to begin in October 2012 but actually began in January 2013 and occurred after the expiration of the CBA signed following the 2004–2005 lockout. In 2011 an NBA lockout delayed the beginning of the regular season by about 2 months—the season started on December 25 instead of in early November. In all cases, games were canceled and never made up. To account for the effect of lockouts on NHL and NBA games played, we include dummy variable Lockout_{dmy} which takes a value 1 if an NHL or NBA lockout took place during day d in month m of year y and takes value 0 otherwise.

Note that these lockouts represent “natural experiments” for assessing the impact of pro sports games on nearby hotel operating performance (Coates and Humphreys 2001). They occur because of events unrelated to tourism.

Because the occurrence and length of work stoppages cannot be predicted, they represent random events that could affect demand for hotel rooms in Los Angeles. The uncertain end point makes it unlikely that the operators of the arena would organize alternative activities, for example, additional concerts or other spectators events, to replace canceled games. A strike or lockout could end quickly at any time should the two sides reach an agreement, raising the possibility of overbooking the arena.

The hotel industry experiences seasonal variation in demand and can affect operating performance. Also, the Staples Center/L.A. Live/Los Angeles Convention Center hosts a large number of other entertainment and business events throughout the year, as well as attracting locals to restaurants and other cultural events. The impact of these factors on hotel operating performance needs to be controlled for to capture normal local market conditions. To control for seasonality and other normal local market conditions we include day-of-week fixed effects ρ_d and month fixed effects θ_m in the regression models. Finally, we include year fixed effects τ_y to account for common factors that affect the dependent variables over time which cannot be attributed to the other explanatory variables. For example, the emergence of Airbnb rentals as a substitute for hotel rooms, business cycle effects, and other time varying factors that affect all hotels in the sample.

Hotels located in different donuts might experience different impacts from games or concerts in the Staples Center. For example, people attending NHL or NBA games might prefer to stay in hotels located closer to the arena and not hotels located farther away. To allow for this possibility we estimate the following regression model which includes interaction terms between number of games and donut dummy variables:

$$(2) \quad \text{HO}_{iadmy} = \alpha_0 + \alpha_1 \bar{G}_{dmy} + \alpha_2 \text{Lockout}_{dmy} \\ + \sum_{i=1}^3 \beta_i A_i + \sum_{i=1}^3 \gamma_i A_i \bar{G}_{dmy} + \rho_d \\ + \theta_m + \tau_y + \varepsilon_{iadmy}.$$

Equation (2) contains the same variables as Equation (1). The $\sum_{i=1}^3 \gamma_i A_i \bar{G}_{dmy}$ terms capture interaction effects between the occurrence of concerts, NBA and NHL games and proximity to the Staples Center. Again, these terms reflect the possibility that spatial displacement occurs in the

LA hotel market because of games and concerts in the Staples Center. The γ_i parameters capture these interaction effects.

V. DATA

The hotel operating performance data come from STR, a firm specializing in collection of data from the hotel industry.² The daily hotel operating data cover the period January 1, 2002 to March 31, 2017, more than 16,000 days. Again, we analyze daily variation in three measures of hotel operating performance: average daily room rate, daily rooms rented, and daily hotel room revenues. Depken and Stephenson (2018) use these three hotel outcome variables. Complementary rooms are excluded from the rooms rented variable because we lack information on the number of complementary rooms given out per day.

The hotel data were augmented with data on the timing and characteristics of regular season home games played by the Lakers and Clippers (NBA) and Kings (NHL) and concerts held in the Staples Center. We focus on regular season home games because the exact date and opponent in these contests is known in advance, facilitating possible travel to attend these games. Specifics about postseason games are not known in advance, which may limit the ability of out-of-town fans to travel to these games. Depken and Stephenson (2018) find no relationship between postseason games and hotel room-nights rented in Charlotte and the exact date and opponent for postseason games are not known until a few days before the games are played, making out-of-town travel to games difficult.

Figure 1 shows the location of the Staples Center/L.A. Live complex, the locations of hotels in the sample, and the donuts that form the units of aggregation for the hotel operating performance data. The Staples Center/L.A. Live complex lies at the center of the donuts and red dots identify hotels. Most of the hotels are located to the north and west of the arena complex, toward downtown Los Angeles. Very few hotels are located to the south of the arena.

The sample contains 139 total hotels. The number of hotels in each donut are 49, 60, and 30 moving out from donut 1 to donut 3. Some new hotel openings and hotel closings occur over

the sample period, but the hotel operating performance data are spatially aggregated; we do not have operating performance data for individual hotels. From Figure 1, the hotels are relatively uniformly spread out across the donuts, given that the donuts increase in area with distance from the arena. Most of these hotels, 65%, fall into the “Economy” Class of hotels defined by STR. 20% fall into the “Upscale,” “Upper Upscale,” or “Luxury” classes; most of these upscale hotels are close to the arena. The remaining hotels fall into the “Midscale” Class.

Table 1 contains summary statistics for the Staples Center event indicator variables and the hotel operating performance variables. The temporal unit of observation for the summary statistics shown on Table 1 is a day. In terms of game per month, during the NBA regular season, roughly October to April, an average of six Lakers and six Clippers home games were played each month in the Staples Center. However, a substantial amount of variation occurred across months, with some months containing no Clippers games or only one Lakers game, and other months containing as many as 11 or 12 Lakers or Clippers games and as many as 20 total NBA games. This provides substantial variation in the timing of games to explain observed variation in hotel operating performance.

The NBA lockout accounted for about 3% of the days in the sample. NHL lockouts accounted for about 14% of the regular season days in the sample. While this may seem large, the NHL lost the entire 2004–2005 season, and part of the 2012–2013 season to work stoppages. These lockout periods also represent plausibly exogenous variation in attendance at nearby professional sporting events. If these periods also have reduced hotel operating performance, this would represent causal evidence that professional sporting events impact nearby hotel operating performance, since the duration of these lockouts is random and the timing unrelated to other economic factors related to demand for hotel rooms.

The concert data come from a list of entertainment events held in the Staples Center.³ Two hundred and seventy-four concerts occurred during the sample period, accounting for about 5% of the days in the sample. In terms of monthly concert frequency, on average, 1.5 concerts were held

2. We thank Steve Hood and Duane Vinson from Smith Travel Research for providing the hotel data for this study.

3. Available at https://en.wikipedia.org/wiki/List_of_entertainment_events_at_Staples_Center

TABLE 1
Summary Statistics—Events and Hotel Performance

Variable	Mean	Standard Deviation	Min	Max
Staples Center events data				
Lakers Home Games	0.108	0.311	0	1
Clippers Home Games	0.108	0.311	0	1
NBA Home Games	0.203	0.402	0	1
NBA Lockout	0.029	0.168	0	1
Kings (NHL) Home Games	0.099	0.299	0	1
NHL Lockout	0.076	0.265	0	1
Total Home Games	0.287	0.452	0	1
Lockout	0.105	0.306	0	1
L.A. Live	0.620	0.485	0	1
Concert	0.049	0.216	0	1
Hotel operating performance data				
Average daily room rate	93.42	22.77	50.50	219.80
Rooms rented	2,863	1,551	526	6,876
Room revenue (\$1,000)	290.25	211.91	31.41	1,326.03

Notes: Staple Center Events Data contains 16,707 observations; Hotel Operating Performance Data contains 16,160 observations.

per month, with August being the most concert-intensive month (3.5 concerts on average).

The bottom panel of Table 1 contains summary statistics for the hotel operating performance data. Revenue and price data were deflated using the Consumer Price Index for All Urban Consumers. The average daily room rate was about \$93. More than 2,800 rooms were rented in hotels near the Staples Center on the average day in the sample and average daily hotel room revenues were about \$290,000.

Table 2 contains summary statistics for the hotel operating performance variables by distance from the Staples Center, based on the donuts shown on Figure 1. The number of observations differs because of missing observations for some days in the STR data, primarily in donut 3.

The Staples Center/LA Live complex is a major tourist center, and the spatial variation in hotel operating performance suggests the presence of this complex affects nearby hotel operations to a differing extent. Hotels near the complex charge substantially higher average daily rates, about \$15 more per night on average relative to hotels in donut 2 and almost \$30 more per night relative to hotels in donut 3.

Again, donuts 1, 2, and 3 contain 49, 60 and 30 hotels, respectively. More rooms are rented per day in donut 1 than in those in donuts 2 and 3 combined, reflecting higher occupancy and larger hotels in donut 1. As would be expected, hotels in donut 1 earn more room revenues than hotels in donut 2 or 3.

VI. RESULTS

We estimate the parameters of the regression models defined by Equations (1) and (2) using the OLS estimator correcting the estimated standard errors for heteroscedasticity using the White-Huber “sandwich” correction. Following Depken and Stephenson (2018), we use three dependent variables reflecting hotel operating outcomes: daily rooms rented, average daily rate charged on rooms rented, and total daily revenues.⁴

Table 3 contains the results. In Table 3, columns labeled (1) contain results for Equation (1) with no interaction between games and concerts and the donuts; columns labeled (2) contain results for Equation (2) with game/concert day-donut interactions. Interacting the game day indicator variables with the donuts allows for a test of spatial displacement in economic activity generated by games. All standard errors have been corrected for heteroscedasticity using the Huber-White “sandwich” correction.

The three *Game* variables indicate days on which Kings, Clippers, and Lakers home games took place in the Staples Center. There is no evidence that average daily room rates, rooms rented, or hotel revenues increased on days when the Lakers, Clippers, or Kings were in town. The estimated parameters on the two indicator variables for the donuts around the Staples Center are negative and statistically different from zero in all model specifications. The omitted

4. Depken and Stephenson (2018) call daily rooms rented “registrations.”

TABLE 2
Hotel Performance by Distance from the Staples Center

Variable	Mean	Standard Deviation	Min	Max
Donut 1: 0–0.99 miles (5,569 observations)				
Average daily room rate	107.15	25.98	51.86	219.80
Rooms rented	4,412	1,009	16,001	6,876
Room revenue (\$1,000)	489.31	205.73	92.24	1,326.03
Donut 2: 1–2.49 miles (5,568 observations)				
Average daily room rate	92.85	18.30	53.87	180.12
Rooms rented	3,004	599	1,412	5,523
Room revenue (\$1,000)	281.61	87.61	83.49	687.19
Donut 3: 2.5–3.99 miles (5,023 observations)				
Average daily room rate	78.83	11.26	50.50	130.02
Rooms rented	989	152	526	1,301
Room revenue (\$1,000)	79.13	21.33	31.41	150.49

TABLE 3
Baseline Model—Separate Indicator Variables for All Teams' Games

	Average Daily Rate		Rooms Rented		Room Revenue	
	(1)	(2)	(1)	(2)	(1)	(2)
Kings Game	–0.449 (0.344)	0.901 (0.653)	3.156 (17.48)	39.33 (38.14)	–2.268 (3.168)	6.92 (7.047)
1–2.49 mile donut × Kings Game		–1.484 (0.761)		–95.59** (43.18)		–16.31** (7.558)
2.5–3.99 mile donut × Kings Game		–2.724*** (0.772)		–10.59 (39.24)		–11.62 (7.479)
Lakers Game	–0.456 (0.350)	0.441 (0.681)	12.07 (18.04)	–97.79** (38.95)	–0.437 (3.171)	–11.26 (7.041)
1–2.49 mile donut × Lakers Game		–0.899 (0.797)		76.68 (43.98)		7.456 (7.645)
2.5–3.99 mile donut × Lakers Game		–1.879** (0.804)		268.1*** (40.05)		26.56*** (7.529)
Clippers Game	–0.358 (0.340)	0.570 (0.666)	19.68 (17.40)	–40.64 (38.01)	–0.439 (3.055)	–4.886 (6.887)
1–2.49 mile donut × Clippers Game		–0.953 (0.792)		34.32 (43.77)		1.535 (7.566)
2.5–3.99 mile donut × Clippers Game		–1.930** (0.799)		156.5*** (39.35)		12.67 (7.393)
Concert	1.830*** (0.437)	4.149*** (1.011)	65.01*** (20.50)	260.1*** (47.67)	13.42*** (3.927)	47.39*** (9.924)
1–2.49 mile donut × Concert		–3.881*** (1.182)		–329.3*** (55.41)		–54.15*** (10.75)
2.5–3.99 mile donut × Concert		–3.139*** (1.121)		–257.6*** (50.64)		–48.39*** (10.48)
1–2.49 mile donut	–14.30*** (0.253)	–13.76*** (0.312)	–1,408*** (13.42)	–1,394*** (16.33)	–207.7*** (2.403)	–204.4*** (2.941)
2.5–3.99 mile donut	–29.87*** (0.246)	–29.03*** (0.298)	–3,431*** (11.99)	–3,463*** (14.44)	–416.5*** (2.331)	–417.2*** (2.811)
L.A. Live open	2.674** (1.050)	2.685** (1.058)	29.64 (40.38)	28.06 (40.21)	15.59** (7.572)	15.44** (7.567)
Lockout	1.217*** (0.385)	1.214*** (0.385)	–11.14 (21.06)	–11.35 (20.92)	4.214 (3.421)	4.173 (3.409)
R ²	.715	.716	.848	.849	.731	.732

Notes: All models include year, month, and day-of-week fixed effects. Robust standard errors in parentheses. Observations = 16,160.

** $p < .05$.

*** $p < .01$.

area is hotels 1 mile or less from the Staples Center; the highest average daily room rates most rooms rented, and greatest revenues are earned by hotels located close to the Staples Center/L.A. Live complex. This pattern could reflect the impact of general proximity to the Staples Center/L.A. Live complex, the overall quality of hotels in the inner donut, or other unobservable neighborhood-specific characteristics.

The *Lockout* variable identifies days during the NHL and NBA lockouts that occurred periodically throughout the sample period. Average daily hotel room rates were higher during these periods, and higher than average daily rates during the off season in these sports.

The *Concert* variable identifies days when concerts occurred in the Staples Center. Unlike the case for the sporting events, hotel performance near the Staples center improved on days concerts occurred in the venue. Average daily room rates were higher, rooms rented increased, and revenues increased on days when the Staples Center hosted concerts than on days when other events were held, or days when the arena was dark. Recall from Table 1 that concerts do not occur as often as NHL and NBA home games.

Columns headed with (2) contain results from Equation (2), accounting for spatial variation. These models allow the effect of home games and concerts in the Staples Center to have a different impact on hotel operating performance as hotels get farther from the arena, reflecting spatial displacement. Equation (1) forces the spatial impact of games and concerts to be the same in all donuts. The general pattern emerging from the results in these columns is that the impact of home games and concerts on average daily room rates decline as distance from the arena increases.

This decline appears for concerts across all three hotel outcome variables. The overall effect of concerts on average daily room rates is positive, but the estimated parameters on the concert \times donut interaction terms are negative and statistically different from zero. Hotels near the arena raise room rates, rent more rooms, and earn higher revenues on days with concerts, but hotels more than 1 mile from the arena lower their room rates, rent fewer rooms, and earn lower revenues on concert days. This pattern is consistent with spatial displacement, where demand for hotel rooms close to the Staples Center increases on concert days and demand at hotels that are within 4 miles, but not close to the facility, declines.

Mixed patterns exist in the signs and significance of the games \times donut interaction terms for

the three teams. Positive and significant parameter estimates, negative and significant estimates, and estimates not statistically different from zero all exist. The overall spatial impact of games is discussed in detail below.

Table S1 contains results when the lockout variable is omitted from the models. The results are very similar to those on Table 3, so the lockout period does not affect the general pattern of results in terms of the sign and significance of the game and concert indicator variables.

Fans attending NHL and NBA games may differ in terms of their propensity to stay overnight in hotels near the arena. However, the effect of Lakers and Clippers games on nearby hotel outcomes shown on Table 3 appear to be similar in terms of size and significance of the parameter estimates. Rather than report models using separate indicator variables for games played by all three teams in the same model, the remaining empirical analysis will estimate separate NBA game and NHL game models, as well as a pooled model that assumes homogeneity in the impact of NHL and NBA home games on nearby hotel outcomes. Table S2–S4 contain results analogous to those reported on Table 3 using pooled game indicator variables for hotel outcome variables average daily rate, daily rooms rented, and total daily revenues, respectively. The results on these tables are consistent with those on Table 3 in terms of the estimated impact of NBA and NHL games, and concerts, on nearby hotel outcomes, as well as in terms of the spatial patterns in the parameter estimates.

The primary difference between the results on Table 3 and those on Tables S2–S4 is that the models using pooled game indicators contain consistent evidence of spatial displacement in hotel performance associated with games and concerts in the Staples Center. The game \times donut interaction terms for the outer donut are consistently negative and statistically different from zero in all models on Tables S2–S4. Again, this indicates that demand for hotel rooms 1.5–4 miles from the Staples Center is lower than demand for hotel rooms near the staples center on game days.

The difference in the results likely reflects the relatively small number of game days for individual team games relative to the number of game days identified in the pooled game models. From Table 1, Lakers, Clippers, and Kings games account for only about 10% of the days in the sample individually, but account for 28.7% of the days in the sample when pooled.

TABLE 4
Total Effects of Events on Hotel Performance

	Average Daily Rate		Rooms Rented		Room Revenue	
	Coefficient	[95% Confidence Interval]	Coefficient	[95% Confidence Interval]	Coefficient	[95% Confidence Interval]
NHL Home Games	-3.045*** (0.884)	[-4.778; -1.312]	-95.18** (45.04)	[-183.46; -6.904]	-23.34*** (8.12)	[-39.28; -7.41]
Concerts	-2.361* (1.270)	[-4.850; 0.128]	-371.57*** (57.85)	[-484.95; -258.18]	-58.81*** (11.21)	[-80.79; -36.83]
NBA Home Games	-2.148*** (0.658)	[-3.439; -0.857]	201.78*** (32.59)	[137.91; 265.65]	17.14*** (5.82)	[5.72; 28.55]
Concerts	-2.577** (1.278)	[-5.082; -0.071]	-320.34*** (58.01)	[-434.04; -206.64]	-53.22*** (11.27)	[-75.30; -31.14]
Home Games	-2.620*** (0.551)	[-3.700; -1.540]	116.45*** (27.80)	[61.95; 170.95]	4.57 (4.95)	[-5.14; 14.27]
Concerts	-2.876** (1.280)	[-5.385; -0.367]	-328.66*** (58.22)	[-442.78; -214.54]	-55.41*** (11.29)	[-77.54; -33.28]

VII. OVERALL IMPACT OF GAMES AND CONCERTS

The total impact of games and concerts on nearby hotel performance cannot be easily determined from Tables 3 and S2–S4 because of the spatial interaction terms. For example, from Table 3, the gross effect of a concert on all three hotel outcomes is positive, but the effect on the performance of hotels 1–2.49 miles and 2.5–4 miles away is negative, which indicates spatial displacement of hotel demand. In other words, concerts appear to draw guests who stay in hotels closer to the arena from people who otherwise would have stayed farther from the arena on concert day, but does not lead to overall increases in hotel occupancy rates in the area. To determine the overall impact of concerts, or games, on hotel performance requires additional calculations based on the spatial interaction terms.

Table 4 contains point estimates and confidence intervals for linear combinations of all the game- and concert-related variables for each regression model on Tables S2–S4. From the top row on Table 4, the linear combination of the parameter estimates on the NHL home game indicator and this variable interacted with the two donut indicator variables for the model with average daily room rate as the dependent variable has a point estimate of -3.045 and a 95% confidence interval that does not contain zero. Hotels within 4 miles of the Staples Center received about \$3 less per room per night on nights when an NHL game was played than on nights when no NHL game was played. They also rent 95 fewer rooms and earn about \$23,000 less in revenues than on days with no NHL games.

The middle section on Table 4 shows the overall effect of all NBA games. Like on NHL game days, hotels charge lower average daily rates on NBA game days. Unlike on NHL game days, hotels near the arena rent more rooms, about 200 rooms per night, than on nights with no NBA games. From Table S3, this increase occurs only at hotels between 2.5 and 4 miles from the arena. Again, this reflects spatial displacement of hotel demand. From the final columns, this increase in rooms rented is large enough to offset the lower average daily rate, increasing daily hotel revenues by about \$17,000 on days NBA games are played in the Staples Center.

The bottom section on Table 4 shows the overall effect of all NBA and NHL games on nearby hotel performance. Again, this model implicitly assumes homogeneity in the impact of professional sport games on tourist behavior. The overall impact of games on nearby hotels is lower average daily room rates and more rooms rented on game days relative to days with no games. In the pooled model, the increase in rooms rented is not large enough to overcome the reduced average daily rate, leading to no change in daily hotel revenues.

The overall impact of concerts on nearby hotel operating performance across all three models in Table 4 is negative. Average daily room rates are lower, hotel rooms rented are lower, and hotel revenues are lower on days when the Staples Center hosts concerts relative to days with no concerts. From Tables 3 and S2–S4 the gross effect of concerts on all three outcomes is positive. The overall negative effect reflects substantial spatial displacement. All three outcome variables are substantially lower for hotels

located between 2.5 and 4 miles from the arena relative to closer hotels.

VIII. ROBUSTNESS CHECKS AND EXTENSIONS

The LA Sparks of the Women's National Basketball Association (WNBA) also play in the Staples Center. The WNBA season runs from May to late August or early September and does not overlap with much of the NBA or NHL seasons. WNBA teams play 17 home games and crowds tend to be smaller than at NBA games. WNBA games could attract tourists and impact hotel performance. To our knowledge, no previous research has addressed the economic impact of WNBA games on nearby hotel performance.

The Rams of the NFL played games in Los Angeles during the last year of the sample in the Los Angeles Memorial Coliseum. The NFL season runs from September until late December or January, which overlaps with the NHL and NBA seasons. The Los Angeles Coliseum is located about 4 miles south of the Staples Center, near the campus of the University of Southern California. NFL games could draw some out-of-town visitors to attend games, and this increased demand could coincide with NBA and NHL games.

The Staples Center hosted the NBA All-Star game in 2004 and 2011. The NBA All-Star game involves an entire weekend of events in February and likely attracts visitors from out of town. The Staples Center also hosted the NHL All-Star Game in 2002. This event, held in late January or early February also likely attracts visitors from out of town. We estimated Equations (1) and (2) including indicator variables for days surrounding All-Star games (Friday through Sunday) when played in the Staples Center and all other explanatory variables appearing in Tables 3 and S2–S4.

The Staples Center hosted the PAC 12 Conference Men's basketball Tournament annually from 2002 to 2012. This tournament featured seven games played by eight teams played 3 days in March. Total attendance was generally 60,000–70,000. Depken and Stephenson (2018) also investigated the effects of college basketball tournaments on hotel performance in Charlotte.

We estimated Equations (1) and (2) including indicator variables for days when LA Sparks, LA Rams, PAC12 tournament, and NHL and NBA All-Star games were played in Los Angeles, as well as the variables appearing on Tables 3 and S2–S4. These models were

estimated separately for each alternative sports event. Table 5 contains the results. Each cell in Table 5 contains results from a separate regression model. Again, columns headed with (1) contain results for Equation (1) and columns headed with (2) contain results for Equation (2). All standard errors have been corrected for heteroscedasticity using the Huber-White "sandwich" correction.

NBA and NHL All-Star games increase average daily rates, daily rooms rented, and daily total revenues. These high-profile events include activities taking place for an entire weekend, feature star players from across the leagues, and clearly attract additional visitors who stay in hotels near the arena.

LA Sparks games do not appear to attract large numbers of visitors to hotels near the arena. Instead, results on Table 5 show that hotels near the arena rent fewer rooms and reduce average daily rates on Sparks game days, leading to lower daily revenues. This could reflect the impact of negative game-related externalities on tourist demand like increased traffic and crowds near the arena if most Sparks game attendees are local residents. Rams games also have little impact on hotel performance. Some evidence of lower average daily rates and revenues for hotels in the outer donut appear on Table 5. Recall that the outer donut contains some hotels near the LA Memorial Coliseum, where the Rams played in 2016. The PAC12 tournament appeared to have little impact on nearby hotel performance, except at hotels in the 1- to 2.49-mile radius donut, which rented more rooms and earned higher room revenues. Depken and Stephenson (2018) found that college basketball tournaments increased daily rates, rooms rented, and revenues in Charlotte.

IX. TEMPORAL SPILLOVER EFFECTS

The study of Depken and Stephenson (2018) contains limited evidence that large numbers of sporting event or convention attendees arrive in Charlotte before the events or linger after them. Depken and Stephenson (2018) test for these effects using indicator variables that identify 1 or 2 days before ("spillover effects") and 1 or 2 days after ("hangover effects") the start of each event in their sample. Only multiday events like NASCAR Races and college basketball tournaments generate consistent changes in hotel operating performance before and after events, and some of the estimated lead and lag effects are negative.

TABLE 5
Other Sporting Events and Hotel Operating Performance

Dependent Variable: Event	Average Daily Rate		Rooms Rented		Room Revenue	
	(1)	(2)	(1)	(2)	(1)	(2)
NHL/NBA All Star Games	21.43*** (6.505)	33.70*** (10.09)	426.2** (206.1)	476.9 (413.4)	116.7** (47.83)	190.7** (88.51)
1–2.49 mile donut × All Star Game		–12.27 (13.78)		61.12 (541.1)		–71.97 (115.3)
2.5–3.99 mile donut × All Star Game		–28.53** (13.67)		–271.6 (431.8)		–175.4 (94.24)
Sparks Game	–2.390*** (0.435)	–4.189*** (0.934)	–81.27*** (20.81)	–59.50 (48.83)	–17.54*** (3.850)	–24.11** (9.474)
1–2.49 mile donut × Sparks Game		1.523 (1.113)		–29.22 (55.93)		7.627 (10.29)
2.5–3.99 mile donut × Sparks Game		4.141*** (1.049)		–38.28 (50.70)		12.74 (9.939)
Rams Game	0.745 (2.665)	10.25** (4.414)	19.81 (95.17)	80.32 (230.2)	–4.124 (24.13)	81.91 (55.26)
1–2.49 mile donut × Rams Game		–9.838 (6.087)		–195.5 (247.9)		–107.0 (59.28)
2.5–3.99 mile donut × Rams Game		–18.64*** (5.083)		12.70 (246.5)		–151.2*** (55.78)
PAC12 Men’s Basketball Tournament	2.313*** (0.861)	0.785 (1.923)	90.61 (47.69)	16.13 (102.2)	12.75 (8.103)	–10.60 (19.05)
1–2.49 mile donut × PAC12		1.284 (2.159)		254.9** (119.6)		41.44** (20.52)
2.5–3.99 mile donut × PAC12		3.634 (2.014)		–51.65 (103.7)		29.44 (19.29)

Notes: Each cell contains results from a separate regression model. All models include the same game/concert indicator and explanatory as Tables S2–S4 as well as year, month, and day-of-week fixed effects. Robust standard errors in parentheses. Observations = 16,160.

** $p < .05$.

*** $p < .01$.

We investigate the presence of spillover and hangover effects associated with NHL and NBA games played in the Staples Center using the same approach as Depken and Stephenson (2018). This setting is not as amenable to analysis using lags and leads of events as Charlotte, because the Staples Center is intensively used during the basketball and hockey seasons. Infrequent, multiday events like NASCAR races and college basketball tournaments generate spillover effects in Charlotte. The Staples Center frequently hosts NHL and NBA home games on several consecutive days during the regular season, reducing the number of available open days for identifying spillover and hangover effects.

Table 6 contains the parameter estimates on the indicator variables for days before and after NBA and NHL games in the Staples Center during the sample period. Each cell represents results from a different regression model that included indicator variables for home games in the respective sports leagues, concerts, and year, month, and day-of-week fixed effects. These

results are not reported for brevity but are available on request.

The results on Table 6 provide no evidence supporting the presence of spillover or hangover effects associated with NBA or NHL games in Los Angeles. Depken and Stephenson (2018) also report no spillover or hangover effects associated with NBA games in Charlotte. The increase in rooms rented and hotel revenues on NBA game days reported on Table 3 does not apply to days before or after games.

X. RESULTS USING CANCELED KINGS GAMES

The 2004–2005 NHL lockout resulted in cancellation of all regularly scheduled games. However, the regular season schedule was made available to the public prior to the games’ cancellation. This represents a setting for conducting a placebo test on the impact of games on hotel outcomes.⁵ One concern with the empirical

5. We thank an anonymous referee for pointing this out. Unfortunately, the regular season schedules for other lockouts in the sample were not published.

TABLE 6
Regression Results—Temporal Spillover
Effects

	NHL	NBA	All
Previous day average daily rate	0.785 (0.531)	-0.551 (0.471)	-0.410 (0.419)
Next day average daily rate	0.430 (0.504)	-1.378*** (0.463)	-0.879** (0.416)
Previous day daily rooms rented	27.21 (25.88)	-6.240 (24.08)	10.68 (21.03)
Next day daily rooms rented	20.86 (25.76)	-24.18 (23.73)	4.299 (20.83)
Previous day daily room revenue	5.817 (4.977)	-2.987 (4.222)	-0.783 (3.806)
Next day daily room revenue	3.074 (4.706)	-7.622 (4.173)	-3.676 (3.765)

analysis is that games in the Staples Center happen to be scheduled on days that have systematically different hotel demand characteristics than nongame days. If this was the case, then we would expect hotel operating performance on days of scheduled 2004–2005 regular season NHL games that were canceled to resemble days when scheduled NHL games in other seasons were played. Recall, from Table 3, that hotel operation performance was not different on days of Kings games than other days and two of the $\text{gameday} \times \text{donut}$ interaction parameters were negative and statistically different from zero.

The Kings were scheduled to play 41 home games in the 2004–2005 NHL regular season. We created an indicator variable for these 40 days and added it to Equations (1) and (2), including interactions with the donut indicator variables, indicator variables for NBA home games, and indicator variables for concerts. Table 7 contains selected results for the indicator variable for scheduled Kings games that were not played.

The results on Table 7 look nothing like the results on Table 3 for Kings games. In fact, they are opposite to those results. Hotel performance was negative on days when Kings games were scheduled and not played, but the spatial interaction terms are uniformly positive and statistically significant. Taking the spatial interaction terms into account, the overall effect of canceled Kings games on hotel performance is positive. The evidence from this falsification test does not

support the idea that Kings games happen to be scheduled on days where hotel demand near the Staples Center is systematically negative relative to other days. Note that the NBA regular season schedule is determined months before the start of the season and cannot be changed, so NBA games being moved to days of canceled Kings games cannot drive the results on Table 7.

XI. FORGONE TAX REVENUES

The City of Los Angeles exempted four hotels located at the Staples Center/L.A. Live complex from the 14% TOT: the 878 room JW Marriott LA Live and the 123 room Ritz-Carlton Los Angeles, both located 0.2 miles from the Staples Center, opened in 2010 and were fully exempted from the TOT for 20 years; the 174 room Courtyard Los Angeles LA Live and 219 room Residence Inn Los Angeles LA Live, located 0.21 miles from the Staples Center, both opened in 2014 and were exempted from 50% of the TOT for 25 years. The results above show that revenues earned by hotels within 4 miles of the Staples Center/L.A. Live complex do not increase as a result of sports events and concerts held in the Staples Center. However, hotels near the arena experience some increased demand relative to hotels located farther from the arena as a result of sports events and concerts, and in some cases hotel operating performance declines on game days at hotels located more than one mile from the arena.

The results here can be used to estimate the forgone TOT revenues from exempted hotels. From Table 2, hotels within 1 mile of the Staples Center had an average daily room rate of \$107 and average daily room revenue of about \$489,000, the largest values among the three areas surrounding the arena. Together, the two hotels fully exempted from taxes have 1,001 rooms. Based on sample averages, these rooms generate \$76,046 in taxable revenues per day, or \$27,688,338 in taxable revenues per year on average. At a 14% TOT rate, this would generate \$3,876,367 in TOT revenue per year from the two exempted hotels. Over 20 years, using a 3% discount rate, that amounts to \$57,670,000 in forgone TOT revenues from these two hotels over the 20-year exemption period.

The two hotels exempted from 50% of the TOT have 393 rooms which generate \$29,856 in taxable revenues per day, or \$760,945 in TOT revenue per year. Over 25 years, using a 3%

TABLE 7
Regression Results—Canceled Kings Games

	Average Daily Rate		Rooms Rented		Room Revenue	
	(1)	(2)	(1)	(2)	(1)	(2)
Canceled Kings Games	2.345*** (0.747)	-2.542 (1.381)	60.81 (52.77)	-240.8** (105.1)	13.84 (7.682)	-54.39*** (13.96)
1–2.49 mile donut × Canceled Kings Games		6.543*** (1.669)		673.2*** (121.3)		109.7*** (15.47)
2.5–3.99 mile donut × Canceled Kings Games		8.290*** (1.489)		227.3** (110.7)		96.37*** (15.01)
Observations	16,160	16,160	16,160	16,160	16,160	16,160
R ²	.715	.716	.848	.849	.731	.732

Notes: All models include the same game/concert indicator and explanatory as Tables 3 as well as year, month, and day-of-week fixed effects. Robust standard errors in parentheses. Observations = 16,160.

** $p < .05$.

*** $p < .01$.

discount factor, that amounts to an additional \$13,250,000 in forgone TOT revenues.

In total, the City of Los Angeles exempted 1,394 rooms in four hotels from the 14% TOT. Donut 1 contained an average of 6,498 total rooms per year over the sample period. In other words, the City exempted about 21.4% of the rooms in hotels closest to the Staples Center/L.A. Live complex from the TOT. This is, on average, more rooms than were located in donut 3 over the sample period. From Tables S3 and S4 hotels in donuts 2 and 3 rented fewer rooms and earned lower revenues when games and concerts occurred in the Staples Center relative to hotels in donut 1. All hotels in donuts 2 and 3 pay the TOT, but 21% of the rooms in donut 1 are exempt. This spatial displacement of hotel guests toward the Staples Center on game and concert days increases the forgone TOT revenue.

The city claimed that new hotels would not open in the area absent tax breaks. During the period January 2010 to July 2015, approximately the same time period over which these four new hotels were exempted from the TOT, five new hotels opened in Hollywood, an area northwest of the Staples Center/L.A. Live complex just outside the 4-mile outer ring on Figure 1. These five new hotels contained about 600 rooms and were not exempted from the TOT, suggesting that new hotel development was possible in Los Angeles during this period without tax breaks.

XII. CONCLUSIONS

We analyze the impact of regular season professional sports events and concerts held at the Staples Center in Los Angeles on local tourism

demand. The identification approach relies on the exact timing of home games and concerts which depends on league-wide scheduling objectives in the NBA and NHL and constraints outside the control of teams and local hotels. The exact timing of games should be exogenous to unobservable factors affecting local hotel demand. We also analyze the impact of lockouts and work stoppages in sports leagues, which represent natural experiments in this setting, on tourism. If hotel operating performance changes during strikes and lockouts, this would represent evidence that professional sporting events impact nearby tourism demand.

We find little evidence supporting the idea that a heavily used, sports-focused local economic development project substantially impacts local hotel demand. Average daily room rates (ADR) decline on days when the Lakers, Clippers, or Kings are playing in the Staples Center. Average daily rooms rented and daily room revenues decline on NHL game days and increase modestly on NBA game days. Depken and Stephenson (2018) report small declines associated with NBA games played in Charlotte. The results reported here show that this result does not reflect the relatively small number of NBA games played in Charlotte. Adding more NHL and NBA games to an arena will not generate more local economic impact in terms of increased hotel room demand.

Also, supporters of sport-led local economic development also claim that building a new facility will generate consumption-based agglomeration effects in near the new facility. Hotel demand would likely reveal evidence of agglomeration effects, if they exist. We find no spatial patterns in

the effects of the Staples Center on nearby hotel demand consistent with the presence of agglomeration effects, casting doubt on these claims.

In the case of concerts, large declines in ADR and rooms rented at hotels between 1 and 4 miles from the arena offset small increases near the arena, making the net impact of concerts on all hotel operating outcomes negative across the area. This represents new evidence supporting a lack of economic benefits generated by events in sports facilities. No evidence of temporal spillover effects was found for any events in the arena.

NBA and NHL games generate heterogeneous impacts on local hotel performance. NHL games generate spatial displacement, reducing rooms rented at hotels and room revenues in hotels located between 1 and 2.5 miles from the arena, as well as a negative net impact on hotel operating performance in the area. NBA games also generate spatial displacement, in the form of increased rooms rented and room revenue at hotels located relatively far from the arena, between 2.5 and 4 miles. Depken and Stephenson (2018) report evidence of spatial displacement at large geographic scales. This evidence suggests that spatial displacement operates at much smaller geographical scales, underscoring the need to additional research using high-frequency, spatially disaggregated data to better understand this outcome.

ADR falls on days when NBA teams play in the arena, reducing the impact of slightly higher average daily room rentals on daily room revenues associated with NBA games. This pattern may reflect out-of-town game attendees avoiding traffic around the arena on game days, or choosing to stay in relatively cheaper hotels located a bit farther from the facility. When taken together, the overall impact of both concerts and games on nearby hotel operating performance is clearly not positive. Despite intensive use, events in the Staples Center do not drive increases in tourist spending on hotel rooms near the facility.

In addition, the results show that hotel performance near the Staples Center improved during several prolonged work-stoppages in the NHL and NBA during the sample period. This also provides no support for the idea that an intensively used sports facility will increase tourist spending on rooms in nearby hotels. It may reflect a negative impact of professional sports events on demand from other visitors not interested in sporting events because of the increased local traffic, noise, and crowds generated by games.

Our findings have important public policy implications. In particular, they provide no support for the idea that sports facilities generate increases in nearby hotel room demand through attracting new visitors to an area. While sporting events and concerts clearly attract some out-of-town visitors, the lack of increases in rooms rented likely reflects the idea that out-of-town sports and music fans rent hotel rooms that would have been rented by other visitors absent the events in the arena.

Our results also provide no support for the idea hotel room taxes should be used to finance new sports facility construction projects, a common financing mechanism used throughout the United States. While proximate hotels may benefit from sporting events in an arena, reductions in operating performance at other not-so-close hotels implies an uncertain overall impact on hotel room revenues and tax revenues. In the case of the Staples Center, the granting of waivers from the Los Angeles TOT to hotels located at the arena reduced the likelihood of an increase in total hotel tax revenues. The city granted tax exemptions to hotels that benefited the most from the increased hotel room demand at the Staples Center/L.A. Live complex and, based on our results, hotels subject to this tax experienced lower room revenue, reducing hotel tax revenues.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.
Appendix S1: Supporting information