Taxing the Opposition: Cactus League Attendance and the Efficiency of the 'Cubs Tax'

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Abstract

In 2010, a plan to finance a new spring training stadium for the Cubs through a ticket surcharge on all games in the Cactus League was proposed. We find that the Cubs increase attendance when they are the away team by about 37%. Thus, the surcharge would be economically justified as long as the price elasticity of tickets is less than 0.32, which many prior studies find to be the case. This tax provides one of the few examples in which the cost of a subsidized stadium would be born primarily by the group that benefits the most from the arrival of the subsidized team.

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The economic justification of publicly funded sports facilities has been one of the most active areas of research in sports economics. Potential channels through which the presence of a sports team might provide economic benefits include increases in employment (Coates & Humphreys 2003), hotel occupancy (Lavoie & Rodriguez 2005; Porter 1999), tourism (Baumann, Matheson, & Muroi, 2009), sales tax (Coates & Depken, 2006; Baade, Baumann, & Matheson, 2008), property values (Dehring, Depken, & Ward, 2007), and apartment rents (Coates, Humphreys, & Zimbalist, 2006).

With the exception of property value analysis, where the economic analysis is more mixed (Carlino & Coulson, 2004; Tu, 2005), the few studies that have provided economic justification for publicly funding stadiums are often reports conducted by consulting firms hired by the groups hoping to attract a professional sports team to their

city by providing a subsidized stadium (Coates & Humphreys, 2008). More important-ly, the channels mentioned above that bring economic benefits to local economies lack the ability to fully justify the public subsidy, and some studies even find negative impact on local employment and tax revenue (Baade & Dye, 1990).

In this paper, we examine an alternative approach to financing a sports stadium in which the construction of the stadium would be funded by a surcharge on all ticket sales in the league. In 2010, the Cubs felt that their current spring training stadium in Mesa, Arizona, was inadequate, and they began to explore options for getting a new stadium. Like many teams looking for a way to get someone else to pay for a new sta-dium, they threatened to relocate to Naples, Florida, that had offered to pay for a new stadium for the Cubs (Nelson, 2012a). Unlike if the threat had been to obtain a new stadium in Glendale or Tucson, this threat would involve the team leaving the Cactus League for the Grapefruit League. Thus, the other teams in the Cactus League would no longer play the Cubs.

One proposal designed to keep the Cubs in the Cactus League was to pay for the new stadium using the funds generated by an 8% surcharge on all Cactus League tickets, even those games that didn't involve the cubs (Walsh, 2010). The Cubs have a large fan base living in a cold-weather climate that is willing to travel to Arizona to see the Cubs play. When they come to Arizona, the Cubs fans attend games both at the Cubs' stadi-um as well as games played in other teams' stadiums, most of which are in the Phoenix metropolitan area. As a result, the surcharge placed on the price of opposing team's tickets may be compensated by the increased attendance that these teams experience when playing the Cubs. This may provide one of the few cases in which the costs of a subsidized stadium are born primarily by the groups that benefit the most directly from the stadium.

Our analysis is based on the attendance at all Cactus League games during the 2007-2010 spring-training seasons. We include a set of measures that control for the quali-ty of the game and test the degree to which attendance increases when the Cubs are playing. We find that when the Cubs are the visiting team attendance increases by 37%. Based on some basic calculation, we estimate that the 8% surcharge on opposing team's tickets would have been economically justified as long as the price elasticity for baseball tickets is less than 0.32. We provide some discussion at the end of the paper about what the actual price elasticity might be and find that about half of the estimates from past studies for the price elasticity of baseball attendance are less than 0.32.

Literature Review

This paper builds on a large set of papers that examine different factors that influence attendance at sporting events, in particular attendance at baseball games. Typically, studies of baseball choose a number of variables that should influence attendance such as team success (Fort & Roseman, 1999; Rascher, 1999; Meehan, Nelson, & Richardson, 2007), playing an interleague opponent or team rival (Butler, 2002; Gillette & Palmer, 2007; Davis, 2009; McDonald & Rascher, 2000), or whether a certain star player is play-ing (Rascher, 1999; Gitter & Rhoads, 2011). Also of importance might be weather (Bruggink & Eaton, 1996; Meehan et al., 2007), promotions (Gifis & Sommers, 2006), or the availability of alcohol (Chupp, Stephenson, & Taylor, 2007). Many of these fac-tors are not relevant to our study. For example, alcohol sales are not limited and teams

rarely run promotions during spring training. Team success during spring training is unlikely to be important; however, the team's performance during the last year is likely to be relevant. We control for factors such as the quality of the stadium, the type of opponent, and whether the game was played at night or on the weekend.

Spring training games have a lot in common with minor league baseball games. The stadium sizes are similar to those that accommodate AA or AAA baseball teams as opposed to major league teams. Although the fans may not care about the outcome of the game as much as they do for a major league game (Siegfried & Eisenberg, 1980), Gitter and Rhoads (2010) have found evidence that winning percentage does have a positive impact on attendance for minor league teams.

One of the only papers to examine the factors that influence attendance at spring training games is Donihue, Findlay, and Newberry (2007), who use data from the Grapefruit League in Florida in 2002. They find that the team's record during the previous year, the size of the city, and the size of the stadium all influence attendance. One major difference between the Grapefruit League and the Cactus League is that the games in the Grapefruit League are spread out all over the state of Florida while the games in the Cactus league are mostly in the Phoenix Metropolitan area. In Appendix Table A1 we provide a list of the locations and distance from Phoenix of each team's stadium in the Cactus League.

Data

The data that we use in this paper come from box scores and standings available at espn.com. These measures include how many games behind the home and away team are on the day of the game, the number of championships the team has won in the past three years, and whether the teams are division rivals. There is also a measure of whether the game involves split squads, a unique feature of spring training games where only a part of the team is sent to play. We also have information on the date and time of the game. Additionally, we use data from baseball-reference.com to calculate the number of players on each team who played on the All-Star team the year previous.

Other sources of our data are baseball websites such as springtrainingmagazine.com and springtrainingonline.com that include stadium characteristics and other measures of the quality of the game. These websites specialize in news and information regarding both leagues, including pages on specific teams that record the capacity and age of each stadium and how long each team has been at the stadium.

These websites also provide information on ticket prices. However, only a few teams charge for "premium" games, so that a team's ticket prices vary little during a season.[1] In addition, the ticket prices at a particular stadium vary based on seat quality and while these websites provide information on prices by section, no information is given on the number of seats in each section. Other researchers also discuss the difficulty of putting proper weights on the ticket prices by seat quality and admit this as a weakness when using ticket prices in an attendance regression.

In Appendix Table A2 we provide an example of the within stadium variation in price using data on ticket prices from the 2010 season for each team. In terms of variation across teams, the lowest price tickets vary across teams from $4-$8 and the highest price tickets vary from $17-$40. There is also considerable variation across prices of tickets for a specific team with prices ranging from $7 to $26 for Cubs games (with

Table 1. Summary statistics.

	Cubs	w/o Cubs	All
Stadium			
Attendance	10,067	6,427	6,989
	(2593.3)	(3163.2)	(3349.7)
Capacity	11,799	10,921	11,057
	(1569.7)	(2225.5)	(2160.0)
Years at Location	11.87	11.41	11.48
	(5.02)	(6.66)	(6.43)
Stadium Age	15.63	19.27	18.71
	(14.05)	(20.18)	(19.40)
Quality of Game			
Split Squad	0.23	0.20	0.20
	(0.42)	(0.40)	(0.40)
Total Division Championships	1.96	1.06	1.20
	(1.09)	(0.97)	(1.04)
Division Rivals	0.13	0.23	0.21
	(0.33)	(0.42)	(0.41)
Total Number of All-Stars	5.40	3.99	4.21
	(3.15)	(1.74)	(2.08)
Games Behind-Home	8.94	11.96	11.49
	(9.29)	(9.63)	(9.64)
Games Behind-Away	8.72	11.94	11.44
	(9.21)	(9.62)	(9.62)
Time of Game			
Evening	0.03	0.07	0.06
	(0.16)	(0.26)	(0.25)
Weekend	0.49	0.48	0.48
	(0.50)	(0.50)	(0.50)
N	112	614	726

Notes: The "Cubs" column includes all games in which the Cubs are either the home or away team. The "w/o Cubs" column includes all games in which the Cubs were not playing.

5 different categories of pricing) and $7 to $40 at Dodgers games (with 6 different categories of pricing).

Results

The empirical approach and control variables that we include are similar to Donihue, Findlay, and Newberry (2007). We use a log-linear regression specification where the dependent variable is the log of attendance. This provides a natural interpretation to our coefficients that can be easily compared to the effect of the 8% surcharge on each ticket. The drawback of the log-linear specification is that the coefficients of any binary variables require a slight transformation to be interpretable as a percent change. In

all of the tables we use the approach based on Halovorsen and Palmquist (1980) to report the percent change in attendance for each coefficient, which involve exponentiating each of the coefficients. Lemke, Leonard, and Tlhokwane (2010) find very little difference in the results of using the log or levels of attendance and as a robustness check we will provide similar evidence.

The control variables that we include in our model include characteristics of the stadium and the quality of the game (listed in Table 1). Our primary specification is a combined measure of the quality of the two teams. As an additional approach we include each of these measures separately for the home and visiting team. Since the teams in the Cactus League mostly play in the Phoenix metropolitan area, variables describing the home team's metropolitan area are not very useful and are not included.

In Table 2, we provide the main results of our paper. These regressions include all of the control variables from Table 1 as well as year and week-in-season fixed effects. In the first column, we include a dummy variable for whether the Cubs are one of the teams playing in the game (with no distinction between whether they are the home or away team). We also include separate dummies for the Los Angeles Dodgers and the Arizona Diamondbacks, two of the other most popular teams in the Cactus League. Our main coefficient of interest is thus interpreted as the difference in attendance when the Cubs are playing and when both teams consist of one of the other 13 teams in the Cactus League (excluding the Cubs, Dodgers, and Diamondbacks).

The coefficient in the first column of Table 2 indicates that games in which the Cubs are playing have attendance that is 41% higher than the typical game (in which one of the three most popular teams are not playing). In comparison, games in which the Dodgers are playing have attendance that is 27% higher and games in which Arizona is playing are 20% higher than the typical game involving other teams.

In the second column of Table 2, we split our results to show the difference in attendance for games in which the Cubs are playing in their own stadium and those in an opposing team's stadium. We find that while the attendance at Cubs games is higher when they are playing in their own stadium, the Cubs still produce a 37% increase in attendance while they are playing in opposing team's stadiums. In column 3, we enter each of the controls separately for the home and visiting team. The result is very similar, with the increase in attendance during Cubs games in other stadiums being 36%.

Our other covariates have similar results to those found by Donihue, Findlay, and Newberry (2007). We find that games on the weekend, at night, and towards the end of spring training generally have better attendance, while games between poorer quality teams generally have lower attendance. All of our other covariates match those of Doninue, Findlay, and Newberry except for years at location, where we find an increase in attendance of about 2% for every year.[2]

The major difference in the coefficients for our control variables is the effect of ticket prices. The coefficients from Donihue, Findlay, and Newberry imply an elasticity of -1.2. While our empirical models in Table 2 do not include price as a control, when we include the log of price as a control variable, the coefficient on the log of the price of tickets suggests an implied price elasticity of -0.112 (with a standard error of 0.160).

A major challenge with this price elasticity is that while prices during the regular MLB season vary from game to game, spring training ticket prices, with the exception of a few teams, are constant throughout a particular spring training season. In order

Table 2. Change in log attendance based on which teams are playing (2007-2010).

	(1)	(2)	(3)
Cubs	0.408**		
	[0.076]		
	{50.4%}		
Cubs Home		0.460**	0.463**
		[0.124]	[0.133]
		{58.4%}	{58.9%}
Cubs Away		0.372**	0.352**
		[0.039]	[0.035]
		{45.1%}	{42.2%}
Arizona	0.205**		
	[0.033]		
	{22.8%}		
Arizona Home		0.199**	0.180*
		[0.041]	[0.069]
		{22.0%}	{19.7%}
Arizona Away		0.202**	0.196**
		[0.035]	[0.036]
		{22.4%}	{21.7%}
Dodgers	0.264**		
	[0.059]		
	{30.2%}		
Dodgers Home		0.375**	0.397**
		[0.088]	[0.102]
		{45.5%}	{48.7%}
Dodgers Away		0.184**	0.164*
		[0.051]	[0.057]
		{20.2%}	{17.8%}
Observations	726	726	726
R-squared	0.660	0.664	0.668

Notes: Each regression contains controls for all of the variables listed in Table 1 along with year and week-in-season fixed effects, rain and temperature controls, and a dummy for if the stadium is in Tucson. In column 3, we include these control variables separately for the home and away team. Standard errors in parenthesis and percent change in attendance in brackets. ** $p<0.01$, * $p<0.05$.

to exploit the variation across seasons for each team, we also estimate the same regression as before, but with team fixed effects. In this case, our estimates provide an implied elasticity of -0.135 but this estimate is less precise with a standard error of

0.437. In the next section, we provide some additional insight about the price elasticity of baseball game attendance based on estimates from past studies.

Was the Tax Justified?

The benefit principle of taxation implies that taxes should be paid by those who benefit from the project. In a stadium setting the most obvious way to meet this measure of equity would be to impose a user fee on the consumers attending the game. However, this approach defeats the purpose to the team of getting someone else to pay for the stadium. Other taxes have attempted to tax businesses that benefit from the stadium especially those related to tourism such as rental cars, hotels, and restaurants. The surcharge on all games in the Cactus League provides a potentially more equitable tax since the costs of the tax are born by some of the groups that stand to benefit the most by keeping the Cubs in the Cactus League.

The other teams in the Cactus League objected to the tax on their games. Four teams boycotted the 2010 Cactus League kickoff breakfast in protest of the tax (Walsh, 2010). Depending on the elasticity of demand for tickets, the other teams should have been willing to pay for the Cubs stadium if it meant keeping the Cubs as a possible away team. There are 16 teams in the Cactus League, so the Cubs are the away team once every 15 games.[3] By dividing the increased attendance when the Cubs are the away team (37%) by 15, we find that having the Cubs in the league would raise average attendance across all games by 2.5%. The tax would have increased prices of all tickets by 8% (even for games not involving the Cubs). Thus in order for the tax to have had a neutral effect on attendance, the price elasticity of demand for baseball tickets would need to be less than 0.32.

As noted in the previous section, the type of price variation available in the spring training leagues makes it difficult to estimate the exact price elasticity of tickets in the Cactus League using our data. In addition, since the stadiums where the Cactus League teams play are so close together (making them easy substitutes for one another), esti-

Table 3. Summary of past estimates of price elasticity of baseball attendance

Study	League	Years	Empirical Strategy	N	Elasticity
Donihue, Findlay, and Newberry (2007)	Grapefruit League	2002	Semi-log, Censored Tobit model.	298	-1.25
Winfree, McCluskey, Mittelhammer, and Fort (2004)	MLB	1963-1998	Non-linear GLS	884	-0.055
Hadley and Poitras (2002)	MLB	1991-2001	Partial-log	308	-0.210
Depken (2000)	MLB	1990-1996	Log-log	174	-0.454
Coffin (1996)	MLB	1962-1975	Level-Level	740	-0.106
Coffin (1996)	MLB	1976-1992	Level-Level	740	-0.677
Domazlicky and Kerr (1990)	MLB	1969-1980	Log-log	252	-0.230

mates based on variation in prices across teams would not provide an accurate estimate of how much attendance would change if all teams raised their prices at the same time.

To provide some additional insight about the elasticity of demand for baseball tickets, we summarize some of the estimates from past studies on baseball attendance in Table 3. For each study, we include the league, years, empirical strategy, and estimated elasticity of demand. We find that four of the seven studies that are included in the list in Table 3 find an elasticity of demand that is smaller than the 0.32 required for the Cubs tax to have been economically justified. In addition, the lower estimates for the elasticity of demand are based on those studies that use the most years of data.

Ultimately, the proposed surcharge tax on all Cactus League tickets was not used to finance the Cubs stadium. Instead, Proposition 420 was passed in November of 2010 allowing the city to spend up to $84 million on the stadium and an additional $15 million on other infrastructure. The funding would come from a bond that would be paid off using unspecified general taxes and funds from selling city-owned land (Nelson, 2010).

Conclusion

It has been rare for past studies to find evidence of an economic justification for publicly provided sports stadiums. Some of the channels through which this economic justification is thought to operate are through employment, tourism revenue, sales tax, and property value. All of these are situations in which local citizens who may or may not directly enjoy viewing the sporting events might indirectly benefit from the economic effects of having a nearby sports stadium.

In contrast, we examine the economic justification for a tax in which other teams that participate in a particular league are asked to help finance the stadium for another team in the league. We find that the proposed Cubs tax of an 8% surcharge on all tickets in the Cactus League may have been economically justified because other teams experience a large increase in their own-stadium attendance when they play the Cubs. We find that a similar argument could be made about other popular teams such as the Diamondbacks and Dodgers. The Cubs tax possibly provides one of the few examples in which the cost of a subsidized stadium would be born primarily by a group that benefits greatly from the presence of the subsidized team.

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Endnotes

[1] In the Cactus League, only four teams charged for premium games: the White Sox (5 games), Giants (Fri-Sun), Dodgers (5), and Reds (6).

[2] To make Table 2 more compact and the main results more transparent, we only report the coefficients for our main variables of interest. We have included the coefficients for most of the other control variables in Appendix Table A3.

[3] At the time of the study there were only 15 teams in the Cactus League, however, the Cincinnati Reds moved to Arizona in the spring of 2010. While they were not included in the estimation that determined the impact of the Cubs, their being in the league lessened the per-team impact, as each team plays the Cubs less often.

Appendices

Table A1. Cactus Team Location.

Team	Stadium	City	Distance to Phoenix (miles)
Arizona Diamondbacks	Salt River Fields	Scottsdale	9.11
Chicago Cubs	HoHoKam Stadium	Mesa	14.19
Chicago White Sox	Camelback Ranch	Glendale	8.98
Cincinnati Reds	Goodyear Ballpark	Goodyear	16.4
Cleveland Indians	Goodyear Ballpark	Goodyear	16.4
Colorado Rockies	Salt River Fields	Scottsdale	9.11
Kansas City Royals	Surprise Stadium	Surprise	22.76
Los Angeles Angels	Tempe Diablo Stadium	Tempe	7.9
Los Angeles Dodgers	Camelback Ranch	Glendale	8.98
Milwaukee Brewers	Maryvale Baseball Park	Phoenix	0
Oakland Athletics	Phoenix Municipal Stadium	Phoenix	0
San Diego Padres	Peoria Sports Complex	Peoria	13.13
San Francisco Giants	Scottsdale Stadium	Scottsdale	9.11
Seattle Mariners	Peoria Sports Complex	Peoria	13.13
Texas Rangers	Surprise Stadium	Surprise	22.76

Notes: Distance is calculated using Google Maps Distance Calculator.

Table A2. Ticket Variation in the 2010 season.

Team\Price	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	40
Rockies	x					x		x			x	x	x	x														
Diamond-backs		x		x	x	x					x	x	x		x													
Angels		x				x				x					x	x					x							
A's			x				x								x				x			x						
Mariners			x					x					x				x	x										
Padres			x						x					x		x	x	x		x								
Royals				x						x				x			x	x		x								
Texans				x						x				x			x			x								
Cubs				x						x						x					x		x					
Giants					x				x			x			x	x		x				x						
Indians					x				x						x					x				x				
Brewers					x					x		x					x											
White Sox					x										x						x		x				x	x
Dodgers					x										x						x		x				x	x

Notes: Each X represents the ticket price of a different level of tickets. This table documents the variation in prices both within a stadium and across stadiums within a season.

Table A3. Coefficients from control variables in Table 2.

	(1)	(2)
Capacity (logged)	0.919***	0.874***
	[0.209]	[0.242]
Years At Location	0.025**	0.026***
	[0.008]	[0.008]
Stadium Age	-0.006**	-0.006**
	[0.002]	[0.002]
Split Squad	-0.083**	-0.088**
	[0.028]	[0.028]
Total Division Championships	-0.028	-0.029
	[0.022]	[0.023]
Division Rivals	-0.014	-0.011
	[0.018]	[0.018]
Total Number of All-Stars	0.002	0.002
	[0.006]	[0.006]
Games Behind-Home	-0.008***	-0.007**
	[0.002]	[0.002]
Games Behind-Away	-0.003**	-0.003**
	[0.001]	[0.001]
Evening	0.196***	0.206***
	[0.049]	[0.044]
Weekend	0.287***	0.287***
	[0.023]	[0.023]
Observations	726	726
R-squared	0.666	0.669

Notes: These are the coefficients for the main control variables in the first two columns of Table 2. Not reported are the year and week-in-season fixed effects.

Table A4. Change in attendance based on which teams are playing (2007-2010).

	(1)	(2)	(3)
Cubs	2,841**		
	[671.4]		
Cubs Home		3,259*	3,369*
		[1,084]	[1,131]
Cubs Away		2,482**	2,283**
		[339.3]	[279.4]
Arizona	1,265**		
	[190.0]		
Arizona Home		1,393**	1,204*
		[190.8]	[405.2]
Arizona Away		1,192**	1,132**
		[216.6]	[230.1]
Dodgers	1,732**		
	[536.2]		
Dodgers Home		2,656*	2,873*
		[855.3]	[938.7]
Dodgers Away		1,057**	867.3*
		[274.4]	[340.9]
Observations	726	726	726
R-squared	0.655	0.659	0.668

Notes: Each regression contains controls for all of the variables listed in Table 1 along with year and week-in-season fixed effects, rain and temperature controls, and a dummy for if the stadium is in Tucson. In column 3, we include these control variables separately for the home and away team. Standard errors in parenthesis. ** $p < 0.01$, * $p < 0.05$.