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Abstract

Abstract: Professional sports franchises have used the lure of economic riches as an incentive for cities to construct new stadiums and arenas at considerable public expense. An analysis of taxable sales in Florida cities demonstrates that none of the 6 new franchises or 8 new stadiums and arenas in the state since 1980 have resulted in a statistically significant increase in taxable sales in the host metropolitan area. In addition, using the numerous work stoppages in professional sports as test cases, again no statistically significant effect on taxable sales is found from the sudden absence of professional sports due to strikes and lockouts.

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Introduction

Spectator sports are big business. The "Big Four" professional leagues in the U.S. and Canada – Major League Baseball (MLB), the National Football League (NFL), the National Hockey League (NHL), and the National Basketball Association (NBA) – attract over 120 million fans to games each year, with television viewing audiences many times this number. Of particular interest to economists is the sports facility building boom that has occurred in the past twenty years. Since 1987, 78 major league stadiums and arenas have been constructed at a cost of $22.6 billion (in 2005 dollars), of which $16.0 billion was financed with public funds (Baade and Matheson, 2006).

Many attempts have been made to quantify the economic impact of a professional franchise on a host city. Interest groups attempting to develop public backing for a publicly financed stadium or arena frequently commission economic impact studies that report large contributions from professional sports teams to local economies. For example, the Oregon Baseball Campaign, a group dedicated to bringing MLB to Portland, reported that "a MLB team and ballpark would generate between $170 and $300 million annually in gross expenditures to the state of Oregon" (Oregon Baseball Campaign, 2002) while a similar analysis completed for the Virginia Baseball Authority stated that a "a major league baseball franchise and stadium in northern Virginia would pump more that $8.6 billion into the economy over 30 years," or $287 million annually. The St. Louis Regional Chamber and Growth Association estimated that the Cardinals brought $301 million in annual economic benefits to the region with another potential $40 to $48 million in benefits from a post-season appearance (St. Louis Regional Chamber and Growth Association, 2000). Of course, baseball is not the only sport to provide rosy economic impact numbers. A study of the NFL's New Orleans Saints estimated the impact of the team on

the state at $402 million in 2002 (Ryan, 2002), and the Seattle Seahawks of the NBA claimed that they pump $234 million into the area's economy annually (Feit, 2006).

Public finance economists, on the other hand, are in nearly unanimous agreement that the figures produced by sports boosters are wildly inflated. Many studies, including Rosentraub (1994), Baade (1996), Siegfried and Zimbalist (2000), and Coates and Humphreys (1999) to name just a few, have examined the economic impact of stadium construction. Without exception, these studies have found that new stadiums provide little or no net economic stimulus to the communities in which they are located. Others such as Porter (1999), Baade and Matheson (2001), Coates and Humphreys (2002), and Baade, Baumann, and Matheson (2005a) have examined sports "mega-events" such as the Super Bowl, World Series, and All-Star Games. Again, these researchers find that boosters' estimates of the economic impact of large sporting events exaggerate the true economic impact of these events by up to a factor of ten.

Labor disputes serve as a natural experiment for determining the economic impact of professional sports on host communities. If franchises do indeed provide large positive impacts on local economies then their sudden absence due to work stoppages should result in observable corresponding negative effects on the city. Several previous studies examine the impact of sports on their local metropolitan areas using strikes and lockouts as test cases. Zipp (1996) examines the effect of the 1994 MLB strike on 17 metropolitan statistical areas (MSA), and he later extends his work to cover the effect of this strike on spring training venues in Florida (Zipp, 1997). Baade and Matheson (2005) examine the 1981 and 1994/95 MLB baseball strikes using personal income data to arrive at an average net annual economic impact of a MLB team on a host city of between $16.2 million and $132.3 million, or somewhere between one-twentieth and one-half of the typical figures suggested by baseball's boosters. Coates and Humphreys (2001)

present the most comprehensive analysis of the economic consequences of sports strikes and lockouts. Their analysis of real per capita personal income finds no statistically significant effects from the strikes in MLB in 1972, 1981, and 1994, and strikes in the NFL in 1982 and 1987.

The existing studies of sports labor interruptions have two major weaknesses. First, all four previous studies examined the 1994/95 baseball strike, but only Coates and Humphreys (2001) examine a sport other than baseball. To the best of our knowledge, no other study has examined the effect of labor stoppages in the NBA and NHL.

Second, a major difficulty of measuring the economic impact of sports teams is that even the impact of large businesses may be hard to isolate within the large, diverse metropolitan economies in which they reside. For example, even if a MLB franchise does result in a $300 million boost to the host city, this is less than 0.1 percent of the annual personal income of a large metropolitan area like Los Angeles. Any income gains as a result of a franchise would likely be obscured by normal fluctuations in the region's economy. This is problem is further compounded if the labor interruption lasts for only few months or less. Even if the effects of a labor dispute are large in the time period immediately surrounding the strike, this impact is likely to be obscured if annual data is used to estimate the effect. Coates and Humphreys (2001) and Baade and Matheson (2005), two studies that examine the *ex post* economic impact of labor interruptions in sports, both suffer from this limitation. For example, Coates and Humphreys (2001) attempt to ascertain the impact of the 1972 MLB strike, which lasted only 13 days, using annual per capita income data. Using annual data, it is unlikely that even careful analysis of such a brief labor dispute will yield useful results.

The Data

In lieu of annual income or per capita income data, this paper uses taxable sales data, which are available monthly, to estimate the economic impact of sports labor interruptions on local economies. These data include just over 25 years of monthly sales tax data (January 1980 through June 2005) for every county in Florida. Florida is an ideal candidate for this analysis since two of its cities have teams from each of the "Big Four" American professional sports. In addition, each of the major labor interruptions since 1982, the 1982 and 1987 NFL strikes, the NHL's 1994/95 lockout and 2004/05 strike, the 1998/99 NBA lockout, and the 1994/95 MLB strike, has impacted at least one franchise in Florida. Only two other labor interruptions in the Big Four have resulted in the loss of games, and this paper does not analyze the 1972 and 1981 MLB strikes because Major League Baseball did not expand into Florida until Miami gained a team in 1993.

In order to maximize the chance that the economic effects of the events can be isolated, i.e., to minimize statistical "noise," it is crucial to find data as specific to the area in which the mega-events occurred and with the highest frequency possible. Florida provides monthly data on taxable sales for individual counties, and these data meet our criteria. In the analysis, taxable sales from several counties are added together corresponding to the three specific Florida metropolitan statistical areas (MSAs) that will be examined: Miami-Fort Lauderdale-West Palm Beach, Tampa-St. Petersburg, and Orlando.

Since the current gross domestic products of large MSAs in Florida such as Miami or Tampa exceed $50 billion in nominal terms, even the effects of a potential major economic event such as a strike can be obscured by the normal economic fluctuations of these large, diverse economies. Many factors including the local, regional and national business cycle, state and

federal government policies, monetary policy and inflation, international factors, consumer and business confidence, wealth effects, and a host of other ingredients tend to influence taxable sales. In order to prevent these other factors from clouding the true effects of the labor interruption, it is essential to find a method to account for them.

One method for filtering much of the "noise" is to analyze the change in taxable sales in the MSA as a percent of the taxable sales in the rest of Florida. Since it is reasonable to assume that many of these exogenous factors will affect the economies of the individual counties and the state in a similar way, this method serves to account for the economic impact of all the variables that the county and state have in common. The MSA/state ratio, therefore, is influenced only by economic events that are unique to one area or the other. While a strike may affect areas peripheral to the MSA in which the team regularly plays, the vast majority of the economic activity occurs within the neighborhood of the relevant sports venue. Therefore, a strike, if significant, should affect the MSA/state taxable sales ratio during the time period immediately around the strike.

The Model

In order to examine the impact of the individual sporting events on taxable sales in the relevant MSAs of Florida, we use intervention analysis on an ARIMA model as outlined in Box and Tiao (1975). Others have employed similar techniques to analyze a wide array of questions in sports economics ranging from the effects of the most recent players' strikes on Major League Baseball attendance (Schmidt and Berri, 2002; Matheson, 2006) to the effects of mega-sporting events on taxable sales in host cities (Baade, Baumann, and Matheson, 2005a). Intervention

analysis provides a formal test for the change in the mean of a series as a result of an exogenous shock at a specific point in time.

The general intervention ARIMA(P,D,Q) model for the taxable sales ratio is

$$y_t^* = \beta_0 + \sum_{p=1}^{P} \Phi_p \; y_{t-p}^* + \sum_{q=0}^{Q} \Theta_q \; \varepsilon_{t-q} + \sum_{m=1}^{12} \alpha_m \; S_m + \beta_1 z_t$$

where y_t^* is the first-differenced taxable sales ratio in time period t, P is the number of lagged values of y_t^* in the model known as the autoregressive (AR) dimension of the model, ε_t is an error term, Q is the number of lagged values of the error term representing the moving average (MA) dimension of the model, and z_t is an independent variables representing a variety of sports variables and other exogenous economic events such as a natural disaster. D is the number of times y_t is differenced to create y_t^*. The model also includes a vector, S_m, of monthly dummy variables to account for seasonal variation in taxable sales. The coefficients for these seasonal variables are not included in the regression results in Tables 1-3 but are available from the authors upon request.

Augmented Dickey-Fuller tests on the taxable sales ratio for all four MSA time series indicate that the original data series follow non-stationary paths. In all three cases, it is possible to reject the existence of a unit root through first differencing of the original data. Therefore we set D equal to one in all three ARIMA models. Next, the autoregressive and moving average dimensions of the models must be determined through estimation and diagnostic testing using maximum likelihood estimation (MLE). The "optimal" numbers of AR and MA components differ by MSA and are shown in Tables 1-3.

Finally, we include a vector of independent variables, z_t. We identify one non-sports occurrence that affected the taxable sales ratio for the Miami MSA to improve the fit of the model. Hurricane Andrew, which devastated the South Florida economy in 1992, had a dramatic

effect on taxable sales in the Miami MSA. Taxable sales initially fell in the area in the wake of the storm, then surged as residents rebuilt homes and replaced damaged property, and finally returned to their normal levels after about 18 months. This pattern is modeled using three intervention variables: an initial penalty during the month of the storm (August 1992), a convex "ramp" (above pre-storm levels) that lasted for three months after the storm, and fifteen-month linear decline beginning at the peak of the aforementioned ramp. See Baade, Baumann, and Matheson (2005b) for details and a sensitivity analysis of this specification.

The labor interruption variables in z_t include the NBA lock-out from November 1998 through January 1999, the MLB strike in August and September 1994 and April 1995, the NFL strikes in October and November 1982 and October 1987, and the NHL strikes from October 1994 through January 1995 and October 2004 through April 2005. When strikes carried over into the off-seasons of their sports, only the months during which regular season games were lost were counted as strike periods. Of course, not every labor interruption occurred at the beginning or end of a month. The results in Table 1 designate labor interruption months as those where at least half of the games were lost. Alternative specifications were attempted and made little difference in the results.

We also include controls for franchise expansions, which represent the entry of sports franchises in a similar way that labor interruptions represent a temporary exit. The franchise variables in z_t include the expansion of the NBA into Miami (Heat, November 1988) and Orlando (Magic, November 1989), the expansion of the NHL into Miami (Florida Panthers, October 1993) and Tampa (Lightning, October 1993), and the expansion of MLB into Miami (Florida Marlins, April 1993) and Tampa (Devil Rays, April 1998).

Finally, we also include controls for stadium and arena construction. The NFL stadiums constructed in Florida during our sample frame are Raymond James Stadium in Tampa (September 1998) and Dolphins Stadium (originally Joe Robbie Stadium) near Miami (September 1987). In the NHL, we include controls for the BankAtlantic Center in the Miami metropolitan area (October 1998), the St. Petersburg Times Arena in Tampa (October 1996), and the Tampa Thunderdome (April 1990) which was used by the Tampa Bay Lightning of the NHL until the 1996-97 season and subsequently renamed the Tropicana Dome and used for the expansion Tampa Bay Devil Rays of MLB. In the NBA, we include controls for the TD Waterhouse Centre (originally Orlando Arena, February 1989) and American Airlines Arena in Miami (January 2000). There is not a separate control for the Miami Arena, which was constructed prior to the 1988 NBA season as the home of the newly expanded Miami Heat, because the timing of the expansion and construction is too close to estimate each effect separately.

If professional sports have a positive impact on a region's economy, then one should expect a consistent pattern of increasing taxable sales following franchise expansions and the construction of new stadiums and a pattern of decreasing taxable sales ratios during periods of labor disruptions. In fact, none of the 24 coefficients on the sports-related variables was statistically significant at even the ten percent level. Furthermore, only 9 of the 13 franchise expansions and new stadiums have positive coefficients and only 7 of the 11 labor disruptions have negative coefficients, so that the even the signs on the coefficients pointed in the "correct" direction in only two-thirds of the examples. All in all, the models suggest that professional sports have little effect on tax revenues in host cities.

Conclusions

Professional sports leagues, franchises, and civic boosters, have used claims of significant economic windfalls as an incentive for host cities to construct new stadiums or arenas at considerable public expense. In the past, league and industry-sponsored studies have estimated that the presence of a professional sports franchise increases economic activity by hundreds of millions of dollars in host cities. Our analysis, using professional sports lockouts and strikes as test cases, fails to support these claims. Our detailed regression analysis of taxable sales in Florida over the period from 1980 to mid-2005 reveals that none of the labor disruptions in the big four professional leagues have been associated with any statistically significant reductions in taxable sales and none of the franchise expansions or new stadiums have been associated with any statistically significant increases in taxable sales. These results certainly place doubt on boosters' claims of huge economic impacts associated with professional sports teams. Cities would be wise to view with caution economic impact estimates provided by sports boosters, who have a clear incentive to inflate these estimates.

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Table 1: *(Sample 1980.1 - 2005.6) Intervention Analysis*: Miami

Dependent variable: $y_t^* = \Delta$(taxable sales ratio)

Variable	coefficient	std. err.	*t*-statistic
Constant	0.00911**	0.00330	2.76
Hurricane Andrew – initial penalty	-0.0244**	0.0112	-2.17
Hurricane Andrew – convex ramp	0.0589**	0.0132	4.48
Hurricane Andrew – linear decline	0.0706**	0.0118	5.98
NFL Strike 1982	0.00273	0.00753	0.36
NFL Strike 1987	-0.00739	0.00740	-1.00
NBA Strike 1998/99	-0.00987	0.00717	-1.38
NHL Strike 1994/95	0.00353	0.00746	0.47
NHL Strike 2004/05	-0.00739	0.00739	-1.00
MLB Strike 1994/95	-0.00319	0.00673	-0.47
Joe Robbie Stadium, NFL, 9/1987	0.01089	0.01004	1.08
BankAtlantic Center, NHL, 10/1998	0.00510	0.01014	0.50
American Airlines Arena, NBA, 1/2000	0.00120	0.00933	0.13
MLB Expansion, 4/1993	0.01089	0.00958	1.14
NHL Expansion, 10/1993	0.00795	0.01006	0.79
NBA Expansion, 11/1988	-0.00066	0.00937	-0.07
AR(1)	-0.651**	0.0557	-11.70
AR(2)	-0.344**	0.0556	-6.19
MA(12)	0.177**	0.0566	3.12
log Likelihood	928.0662		

Notes: All taxable sales ratios have been first-differenced.

The coefficients are reported with their associated t-statistic for the null hypothesis that the estimated value is equal to zero. ** and * represent statistical significance at the one percent and ten percent significance levels respectively.

Table 2: *(Sample 1980.1 - 2005.6) Intervention Analysis*: Tampa

Dependent variable: $y_t^* = \Delta$(taxable sales ratio)

Variable	coefficient	std. err.	*t*-statistic
Constant	-0.00178	0.00111	-1.60
NFL Strike 1982	-0.00235	0.00421	-0.56
NFL Strike 1987	0.00381	0.00879	0.43
NHL Strike 1994/95	0.00014	0.00236	0.06
NHL Strike 2004/05	-0.0020	0.00211	-0.96
Raymond James Stadium, NFL, 9/1998	-0.00162	0.00410	-0.40
Tropicana Field, MLB/NHL, 3/1990	-0.00058	0.00252	-0.23
St. Pete Times Forum, NHL, 10/1996	0.00156	0.00334	0.47
MLB Expansion, 4/1998	-0.00672	0.00338	-0.20
NHL Expansion, 10/1993	0.00259	0.00369	0.70
AR(1)	-0.863**	0.0487	-17.70
AR(2)	-0.675**	0.0590	-11.44
AR(3)	-0.482**	0.0717	-6.73
AR(4)	-0.435**	0.0793	-5.49
AR(5)	-0.208**	0.0678	-3.08
log Likelihood	1233.633		

Notes: All taxable sales ratios have been first-differenced.

The coefficients are reported with their associated t-statistic for the null hypothesis that the estimated value is equal to zero. ** and * represent statistical significance at the one percent and ten percent significance levels respectively.

Table 3: *(Sample 1980.1 - 2005.6) intervention analysis*: Orlando

Dependent variable: $y_t^* = \Delta$(taxable sales ratio)

Variable	coefficient	std. err.	*t*-statistic
Constant	-0.00873**	0.00183	-4.77
NBA Strike 1998/99	-0.00152	0.00573	-0.27
TD Waterhouse Centre/ Orlando Arena, 2/1989	0.00258	0.0165	0.16
NBA Expansion, 11/1989	0.00005	0.0101	0.05
AR(1)	-0.735**	0.0454	-16.19
AR(2)	-0.620**	0.0679	-9.13
AR(3)	-0.489**	0.0807	-6.06
AR(4)	-0.239**	0.0738	-3.24
AR(5)	-0.191**	0.0534	-3.58
log Likelihood	1142.873		

Notes: All taxable sales ratios have been first-differenced.

The coefficients are reported with their associated t-statistic for the null hypothesis that the estimated value is equal to zero. ** and * represent statistical at the one percent and ten percent significance levels respectively.