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Sports team performance and revenue of out-of-stadium vending operations

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ABSTRACT
Using a novel data set on daily sales revenue, we examine how the Baltimore Orioles' performance affects a street vendor operating outside Oriole Park at Camden Yards. While fans respond positively to good team performance throughout the season, a win for the home team generally means lower revenue for the vendors outside the stadium. We find that economic benefits accruing to street vendors – and by extension to nearby hotels, restaurants, and bars – may only be maximized when the sports teams are bad, but not that bad.

I. Introduction

Considered by many to be the stadium that launched the retro movement in major league ball-park construction, Oriole Park at Camden Yards has been home to Major League Baseball's (MLB) Baltimore Orioles since it was opened in 1992. The subsequent nationwide push in stadium construction coincided with increasing calls for public funding of such development projects. Proponents can point to the positive overall economic impact on a city from unique entertainment opportunities made possible by having a professional sports team and a stadium (Agha 2013). But other studies, which examined sectors no finer than those at the two-digit SIC classification level within a city, generally paint a more nuanced picture.[1] Even today, long-running policy debates on how to regulate street vendors outside stadiums remain (cf. Ehrenfeucht 2016). Street vendors – along with restaurants, hotels, and other local businesses – generally benefit from the additional fans that a good team attract.[2] Yet little is known about how the economic impact of a publicly funded stadium construction project depends on the success of the team playing home games in the new space (Siegfried and Zimbalist 2000).

We attempt to address these gaps in the literature by focusing specifically on street vendors and looking directly at the impact of team success on their revenue. Based on a unique daily data set from a street vendor operating outside Oriole Park at Camden Yards in Baltimore, our results suggest that higher team and expected game quality lead to higher attendance and thus higher revenues for the vendors, while better game outcomes for Orioles fans are associated with lower sales. This result is consistent with the notion that sports fans' interests and behaviour are driven by both the team's short-term performance and long-term performance. In addition, the uncertainty of the outcome of a game and the hope of postseason play may have asymmetric influences (see O'Reilly, Nadeau, and Kaplan 2011; Kaplan, Nadeau, and O'Reilly 2011). Therefore, while professional sports teams need to be, as Neale (1964) argued in his seminal paper, 'good, but not that good', street vendors outside Oriole Park could benefit the most if the Orioles are bad, but not that bad.

II. Data and empirical results

Street vendors outside MLB stadiums enjoy a loyal customer base (Hess 2009). They offer packaged products like salted in-shell peanuts at competitive prices and convenient locations for baseball fans walking into and out of Camden Yards (Bromley 2000; Cross and Morales 2007). Permitted in the stadium, peanuts are perhaps the snack most uniquely associated with attending professional

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[1]In cities with professional sports teams, employment opportunities increase but earnings are lower for employees at restaurants and bars (Coates and Humphreys 2003).

[2]See, inter alia, Noll 1974; Horowitz 2007; Winfree and Fort 2008; Gitter and Rhoads 2010.

baseball games. Their purchase reveals much about fans' preferences and attitudes. Yet gathering data on these transactions is very difficult since they are primarily conducted in cash and are seldom recorded in any computer system. We digitized the personal records of one of the vendors. For the years 2012, 2014, 2016, 2017, and 2018, we have 330 daily observations on the sales revenue of peanuts.[3] We match these data with statistics on the Oriole games collected from baseball-reference.com.

The sales revenue R_t on any given day t is a function of the number of people in attendance A_t (in thousands) and their purchasing decisions. In our empirical analysis, we postulate that the former is independent of the outcome of the game but dependent on characteristics of the game that are known ahead of time, while the latter is determined on the game day.[4] Informed by previous research (Paul and Weinbach 2013; Anthony et al. 2014; Agha and Rhoads 2018), we let A_t be a function of team quality T_{t-1}, which includes the Orioles' win percentage, division rank, games behind first place, and current winning or losing streak.[5] The purchasing decisions are influenced by the game outcome G_t, which is a dummy variable indicating a win.[6] Since the team quality variables change after each game, the updated values T_t may also affect fans' purchasing decisions. Table 1 contains descriptive statistics for the continuous variables used in our analysis.

Below, we first estimate the effect of team quality on attendance:

$$\ln(A_t) = \alpha_1 + \beta_1 T_{t-1} + \delta_1 C_t + u_1, \qquad (1)$$

where C_t is a set of controls including dummy variables for a year, month, day of the week, sky condition, and opponent category, as well as the temperature and its square.[7] The sales revenue

Table 1. Descriptive statistics of continuous variables in our data set.

Variable	Observations	Mean	Std. Dev.	Min	Max
Revenue	336	669.93	299.63	145.00	1995.00
Attendance	336	25.78	9.70	7.92	46.69
Temperature	336	76.93	10.22	44.00	100.00
Rank	336	2.67	1.53	1.00	5.00
WinPercentage	336	50.40	13.39	22.86	100.00
Streak	336	0.07	2.63	−9.00	7.00
GamesBehind	336	8.41	15.97	−14.50	61.00

Revenue in US dollars. Attendance in thousands. Temperature in Fahrenheit.

depends on attendance, game outcome, and updated team quality variables:

$$\ln(R_t) = \alpha_2 + \beta_2 T_t + \gamma_2 G_t + \delta_2 C_t + \theta_2 \ln(A_t) + u_2. \qquad (2)$$

The 2015 riot in Baltimore City and the city's regulatory actions interrupted our vendor's operation in 2015. Afterwards, the vendor changed the location of the operation. This resulted in the loss of some loyal customers, whose walk to or from the stadium no longer brought them by the new location. The general pattern of foot traffic at the new location is also different. Considering the relatively smaller number of observations we have before 2015, we estimate the two models above first using data pooled over all the years and then only the years after 2015.

Table 2 shows the estimated coefficients of Equation (1). For brevity, the coefficients of the year, month, and day of week dummies are omitted from the table. The results are largely consistent when we compare the estimates based on the full sample and those based on the post-2015 sample. Sample size considered, we prefer to focus more on the full sample estimates. Consistent with the findings in the literature based on annualized average attendance data, higher team performance results in higher attendance even on a day-to-day basis. Other things the

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[3]There was a one-time price change from $3 to $5 introduced at the start of the 2014 season. We repeated our exercises using data on the quantities sold and reached the same conclusions.

[4]Oettinger (2001) examined sales revenue and effort choices for in-stadium vendors by similarly estimating the impact of various demand conditions. Serrano et al. (2015) found that game day demand responds positively to the quality of the teams playing. We include in our model team quality metrics that fans can easily acquire prior to and on game day.

[5]The term 'team quality' includes factors like games behind, that also depends on other teams' performance.

[6]Our preliminary analysis indicated that other aspects of the game outcome, such as the game length, runs, runs allowed, and innings, have no significant relationship with the sale revenue.

[7]Over the past decade, sporting venues, including Camden Yards, have continuously improved their concessions operations as well as their safety and security. Some of these changes are also relevant, such as the ones on concession menu and price. The year/month dummies help to control for some these factors, which are unobserved and/or difficult to measure. Sky conditions include sunny, cloudy/overcast, and drizzle/rain. The opponent categories are AL (American League Central and West division teams), AL East (Tampa Bay and Toronto), BOS (Boston), NL (All National League teams except for Washington), NYY (New York Yankees), WSN (Washington).

Table 2. Estimation results – models of game attendance.

Variable	Models of game attendance	
	Full sample	After 2015
Opponent Category		
AL East	−0.033	−0.089**
BOS	0.159***	0.144***
NL	0.136***	0.164***
NYY	0.145***	0.050
WSN	0.368***	0.354**
Rank		
2	−0.017	−0.049
3	−0.090*	−0.109
4	0.254**	0.283*
5	−0.033	−0.021
WinPercent	−0.002**	−0.002
Streak	0.004	0.009
GamesBehind	−0.006***	−0.007***
Constant	3.340***	3.294***
N	336	197
R^2	0.654	0.692
Adj. R^2	0.623	0.647
p-TeamQuality	0.001	0.019

The table shows the estimated coefficients. *p <.1; **p <.05; ***p <.01. Stars based on heteroscedasticity-robust s.e. p-TeamQuality is the p-value of the joint test of significance of the team quality variables. The base level of opponent category is AL, and that of rank is 1. Year, month, and day of week dummies omitted.

Table 3. Estimation results – models of sales revenue.

Variable	Models of sales revenue	
	Full sample	After 2015
ln(Attendance)	0.724***	0.751***
Temperature	0.036*	0.034
Temperature^2	−0.0003**	0.000
SkyCondition		
Cloudy/Overcast	−0.171***	−0.247***
Drizzle/Rain	−0.374***	−0.331***
Opponent Category		
AL East	0.014	0.016
BOS	−0.044	0.007
NL	−0.063	0.002
NYY	−0.145***	−0.054
WSN	0.065	0.108
Rank		
2	0.071*	0.063
3	−0.030	0.091
4	0.061	0.159
5	0.224*	0.313
WinPercent	0.005**	0.007*
Streak	0.014	0.024*
GamesBehind	−0.005**	−0.003
Win	−0.096**	−0.157**
Constant	2.796***	2.600***
N	336	197
R^2	0.784	0.725
Adj. R^2	0.759	0.673
p-TeamQuality	0.008	0.102
p-GameOutcome	0.048	0.023

The table shows the estimated coefficients. *p <.1; **p <.05; ***p <.01. Stars based on heteroscedasticity-robust s.e. p-TeamQuality is the p-value of the joint test of significance of the team quality variables. The base level of opponent category is AL, and that of rank is 1. Year, month, and day of week dummies omitted.

same, more people attend the game when the Orioles are fewer games behind first place or have a lower win percentage. The relatively small negative effect of win percentage on attendance is perhaps the result of fans' response to the wild card playoff race. The Orioles' chance for a wild card playoff spot additionally depends on the success of other teams in the American League. Interpreting the coefficients of the rank dummies is difficult since it is closely related to the other team quality variables and it changes infrequently – much of its effect may also be captured by the year/month dummies. In general, the team quality variables (T_{t-1}) are jointly significant and both models explain more than 60% of the variations in log attendance.

Table 3 shows the results of estimating Equation (2). The explanatory powers and the magnitudes of the coefficients are largely similar across the two sample periods. Our variables explain around 70% of the variations in sales revenue. Consistent with our intuition, higher attendance and better weather lead to higher sales. Interestingly, better game outcomes for the Orioles are generally associated with lower sales. Both a win and a higher rank (last place (5) vs. first place (1)) have a statistically significantly negative coefficient. The Win dummy variable has a coefficient of −0.096. The coefficient of WinPercent is 0.005 and

that of the GamesBehind variable is −0.005. So, even after factoring in the positive effect of a win (i.e., higher win percentage and possibly lower games behind), the net effect on sales remains negative. This may be the result of the fans staying inside the stadium longer to watch an Orioles win and shifting some of the purchases they might have otherwise made outside the stadium to inside the stadium. This is consistent with Coates and Humphreys (2003), who found that spending on sports is a substitute for spending in restaurants, bars, and hotels.

In addition, our results suggest that the fans of different teams may have different spending patterns. Tables 2 and 3 clearly show that the opposing team has a major influence on game attendance as well as sales revenue. For example, all else the same, New York Yankees games see higher attendance but lower sales. Perhaps Yankee fans attending games have increased uncertainty about rules permitting outside concessions in the stadium or they prefer the unique food offerings only found inside Oriole Park.

III. Concluding remarks

Using a unique daily data set from a street vendor operating outside Oriole Park at Camden Yards, we examined how the performance of the Baltimore Orioles relates to game attendance and the sales revenue of salted in-shell peanuts. Consistent with the uncertainty of outcome hypothesis that highlights the role of both short-run and long-run competitive balance, we find that better team performance in general helps the vendor's bottom line by attracting more fans to the stadium. However, on a per-game basis, the sales revenue tends to be higher if the Orioles lose. While it is difficult for us to ascertain the optimal level of 'goodness' from the perspective of the street vendor, our results highlight the importance of competitive balance, as fans seem to respond positively to the hope of a team's long-term success, even during periods of short-run losses. Together, these observations suggest that economic benefits accruing to street vendors – and by extension to nearby hotels, restaurants, and bars – may be maximized when the team is 'bad, but not that bad'.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Agha, N. 2013. "The Economic Impact of Stadiums and Teams: The Case of Minor League Baseball." *Journal of Sports Economics* 14 (3): 227–252. doi:10.1177/1527002511422939.

Agha, N., and T. Rhoads. 2018. "Reputation and the League Standing Effect: The Case of a Split Season in Minor League Baseball." *Applied Economics* 50 (41): 4447–4455. doi:10.1080/00036846.2018.1456646.

Anthony, T., T. Kahn, B. Madison, R. Paul, and A. Weinbach. 2014. "Similarities in Fan Preferences for Minor-League Baseball across the American Southeast." *Journal of Economics and Finance* 38 (1): 150–163. doi:10.1007/s12197-011-9214-7.

Bromley, R. 2000. "Street Vending and Public Policy: A Global Review." *International Journal of Sociology & Social Policy* 20 (1/2): 1–28. doi:10.1108/01443330010789052.

Coates, D., and B. Humphreys. 2003. "The Effect of Professional Sports on Earnings and Employment in the Services and Retail Sectors in US Cities." *Regional Science and Urban Economics* 33: 175–198. doi:10.1016/S0166-0462(02)00010-8.

Cross, J. C., and A. Morales. 2007. *Street Entrepreneurs: People, Place and Politics in Local and Global Perspective*. London, UK: Routledge.

Ehrenfeucht, R. 2016. "Designing Fair and Effective Street Vending Policy: It's Time for a New Approach." *Cityscape: A Journal of Policy Development and Research* 18 (1): 11–26.

Gitter, S., and T. Rhoads. 2010. "Determinants of Minor League Baseball Attendance." *Journal of Sports Economics* 11 (6): 614–628. doi:10.1177/1527002509359758.

Hess, D. J. 2009. *Localist Movements in a Global Economy: Sustainability, Justice, and Urban Development in the United States*. Cambridge, MA: MIT Press.

Horowitz, I. 2007. "If You Play Well They Will Come—and Vice Versa: Bidirectional Causality in Major-League Baseball." *Managerial and Decision Economics* 28: 93–105. doi:10.1002/mde.1308.

Kaplan, A., J. Nadeau, and N. O'Reilly. 2011. "The Hope Statistic as an Alternative Measure of Competitive Balance." *International Journal of Sport Finance* 6 (2): 170–184.

Neale, W. 1964. "The Peculiar Economics of Professional Sports." *Quarterly Journal of Economics* 78 (1): 1–14. doi:10.2307/1880543.

Noll, R. 1974. "Attendance and Price Setting." In *Government and the Sports Business*, edited by R. Noll, 115–158. Washington, DC: Brookings Institute.

O'Reilly, N., J. Nadeau, and A. Kaplan. 2011. "Do Fans Want Their Team to Be Competitive in the Short-Term (The Next Game) or the Long-Term (The Full Season), and Does the Answer Affect Management Decisions." *European Sport Management Quarterly* 11 (1): 73–86. doi:10.1080/16184742.2010.537365.

Oettinger, G. 2001. "Do Piece Rates Influence Effort Choices? Evidence from Stadium Vendors." *Economics Letters* 73 (1): 117–123. doi:10.1016/S0165-1765(01)00472-4.

Paul, R., and A. Weinbach. 2013. "Fireworks Saturation and Attendance in Minor League Baseball." *International Journal of Sport Finance* 8 (4): 312–326.

Serrano, R., J. García-Bernal, M. Fernández-Olmos, and M. Espitia-Escuer. 2015. "Expected Quality in European Football Attendance: Market Value and Uncertainty Reconsidered." *Applied Economics Letters* 22 (13): 1051–1054. doi:10.1080/13504851.2014.997919.

Siegfried, J., and A. Zimbalist. 2000. "The Economics of Sports Facilities and Their Communities." *Journal of Economic Perspectives* 14 (3): 95–114. doi:10.1257/jep.14.3.95.

Winfree, J., and R. Fort. 2008. "Fan Substitution and the 2004-05 NHL Lockout." *Journal of Sports Economics* 9: 425–434. doi:10.1177/1527002508316266.