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## ECON 43580 Project

### I.    Question

For many baseball fans, attending a rival team in the same market as their favorite team may be unthinkable. Especially with the rise of social media and the wider spread of information, baseball teams today can build strong fanbases. Many teams have been able to harness their brand equity in order to sell tickets and merchandise, resulting in more revenue.

However, even with strong fan loyalty, people may be more willing to attend a game if the home team has been playing well recently. People may also jump onto a team's bandwagon even if they did not support them in the past. In 2016, when the Chicago Cubs were on their way to winning the World Series, many people suddenly became supportive of the team even though they were notoriously bad in the past. That year, attendance at home games increased by about 10% from 2015. At the same time, attendance at Chicago White Sox games decreased from the previous year on average, but only slightly. This leads to the question: Does the quality of the performance of another team in the same market affect a team's attendance?

Currently, there are four major metropolitan areas with two Major League Baseball teams: Chicago, Los Angeles, New York, and the Bay Area. Because there

are multiple teams in very close proximity to each other, this increases competition and decreases each team's market power relative to teams in cities without a direct competitor. With this extra competition, some teams have proposed moved farther away. For example, there have been multiple proposals for the Oakland Athletics to move to San Jose, which would double the distance between them and the San Francisco Giants' stadium. In 2013, there were formal plans for the Athletics to move to San Jose, but the commissioner of MLB at the time, Bud Selig, prevented this action. The city of San Jose later filed a suit against Selig, but lost because the judges decided that the claims were barred by baseball's antitrust exemption.

The location of a professional baseball team has many implications. First when building a new stadium, much of the funding comes from subsidies paid for by taxpayers. However, the teams can also create a large amount of tax revenue for the cities through the sale of tickets, food, and merchandise. In order to create this return though, the market must have enough demand to support these sales. Therefore the question of whether having multiple teams can have negative ramifications can be an important factor when deciding where to relocate a team.

Additionally, baseball teams make a majority of their revenue from ticket sales. According to estimations by Bloomberg, ticket sales are baseball franchises' largest source of income and make up a third to a half of their revenue.[1] The second biggest source of income is usually media rights, followed by sponsorships and concessions. In 2013, the team that had the most revenue was the New York Yankees. Bloomberg estimated that they collected over $570 million, with $265 million coming from ticket

sales. Therefore, because attendance most likely has a significant impact on a team's top line, the effect of another team's performance in the same market may be an important consideration.

## II.    Literature Review

In recent years, many economists have tried to identify the most significant factors that affect Major League Baseball (MLB) games attendance. Lee (2016) split data about MLB attendance and observable factors into two separate time periods, 1904-1957 and 1958-2012, and then used a sequential test method in order to see if attendance factors had changed over time.[2] The paper found that in the early period, there were only a few major factors that heavily affected attendance. The significant factors were all measures of the home team's season performance. For the later period, there were additional factors that suggest that consumer tastes had evolved. Some of the new attendance factors included batting performance, outcome uncertainty, stadium-quality, and the quality of the visiting team. Other economists have also found that fan loyalty to the home team also significantly affects attendance.

In addition to factors about the team's performance, location of a team's stadium has also been shown to impact attendance. Winefree (2004) found that teams that closer attendance led to lower attendance relative to teams that are farther apart.[3] The paper also showed that when a team moved to a new location that already had an

existing baseball team, there was an additional initial reduction in attendance for the incumbent team.

Multiple papers have also shown that Major League Baseball teams consistently price in the inelastic portion of the demand curve. In addition to Winefree's aforementioned paper, Lee, Park, and Miller (2013) found that since most baseball teams price in the inelastic portion of the demand curve, this suggests that each team has monopoly power to some degree.[4] However, they argued this is more consistent with the idea that sports teams are not single-product firms with market power, but instead the producer of multiple products. Regardless, inelastic pricing may suggest that consumers are relatively price-insensitive and that their tastes about their preferred team in a duopolist market and team quality may be a better indicator of demand than price.

In other professional sports leagues, economists have found that when two teams are located nearby to each other, the demand for each team can be negatively affected by the other team's actions. Mills and Rosentraub (2014) used border-crossing data to determine the demand of Canadian consumers for an American National Hockey League team, the Buffalo Sabres.[5] Even though those located in Toronto were located closer to the Toronto Maples, they estimated that Canadians made up 15% of attendees at the Buffalo Sabres games. In addition, they also found fan substitution effects between both teams with respect to the quality of each team in addition to the price of tickets.

**III.    Data**

The data used is from [baseball-reference.com](baseball-reference.com), a site that provides data about Major League Baseball.

The data collected includes information about individual games of Chicago Cubs, Chicago White Sox, Los Angeles Angels, Los Angeles Dodgers, New York Mets, New York Yankees, Oakland Athletics, and San Fransisco Giants during the 2010 to 2019 seasons. I also used this data to join data about the team in the same market which includes information about the winning percentage of the same-market team before the date of the game of the original team. The winning percentage of the same-market team includes the win-loss data from any previous games in the season, but does not include information about games occurring on the same day since consumers will most likely buy tickets to a game before they know the outcome of the same-market team's game on the same day. I will be using on data on games where the selected team is considered the home team since the size of the fan base of an opposing team during an away game can greatly impact attendance.

*Description of Variables*

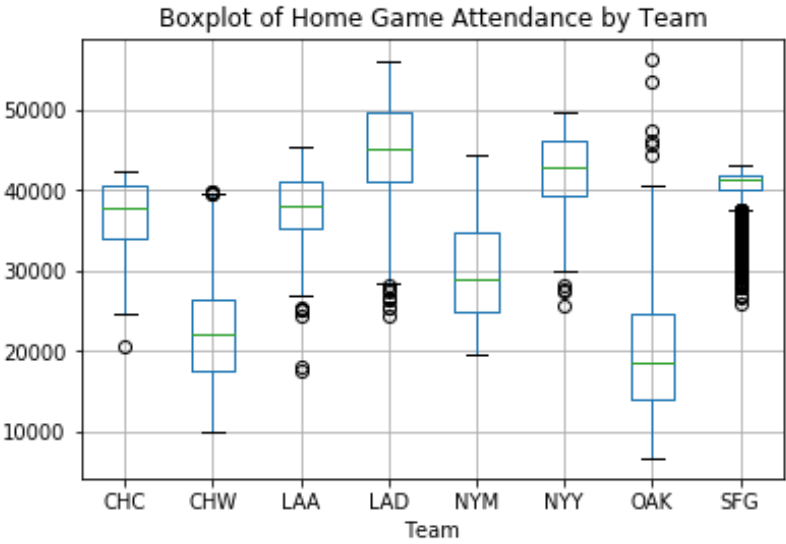| *Variable Name* | *Description* |
|---|---|
| Attendance | Number of tickets sold |
| GM_Num | Number of game for a team during a given season |
| Date | Date of game |

| Team | Team<br>    CHC = Chicago Cubs<br>    CHW = Chicago White Sox<br>    LAA = Los Angeles Angels<br>    LAD = Los Angeles Dodgers<br>    NYM = New York Mets<br>    NYY = New York Yankees<br>    OAK = Oakland Athletics<br>    SFG = San Fransisco Giants |
|---|---|
| Home | Binary dummy Variable<br>    1 if given team is home team<br>    0 if given team is away team |
| Opp | Opponent team |
| W/L | Whether the game was a win or loss<br>    W = win<br>    L = loss |
| W-L | Win-loss record as of date of game |
| GB | Games Back of Division/League Leader;<br>Computed as games over .500 of leader (W-L) minus games over .500 of team divided by 2 |
| Time | Time of Game |
| Night | Binary dummy variable<br>    1 if night game<br>    0 if day game |
| Streak | If positive, number of consecutive wins; if negative, number of consecutive losses |
| Game_Win | Binary dummy variable<br>    1 if win<br>    0 if loss |
| Wins | Total wins for a given team in a season up to and including game |
| Losses | Total losses for a team in a season up to and including game |
| Net_Wins | Wins - losses |

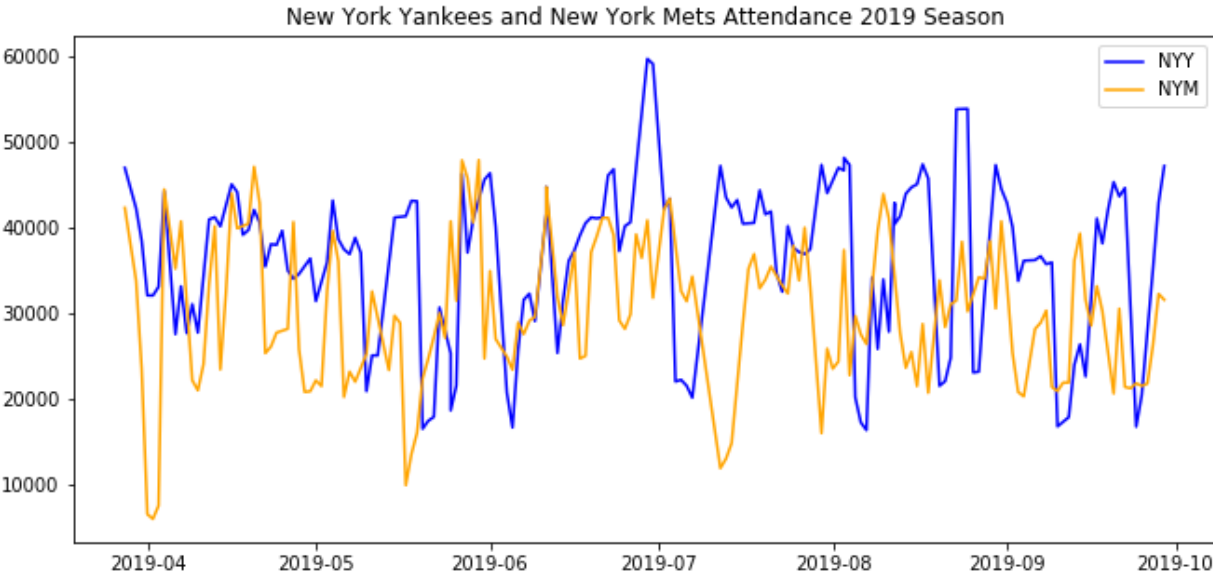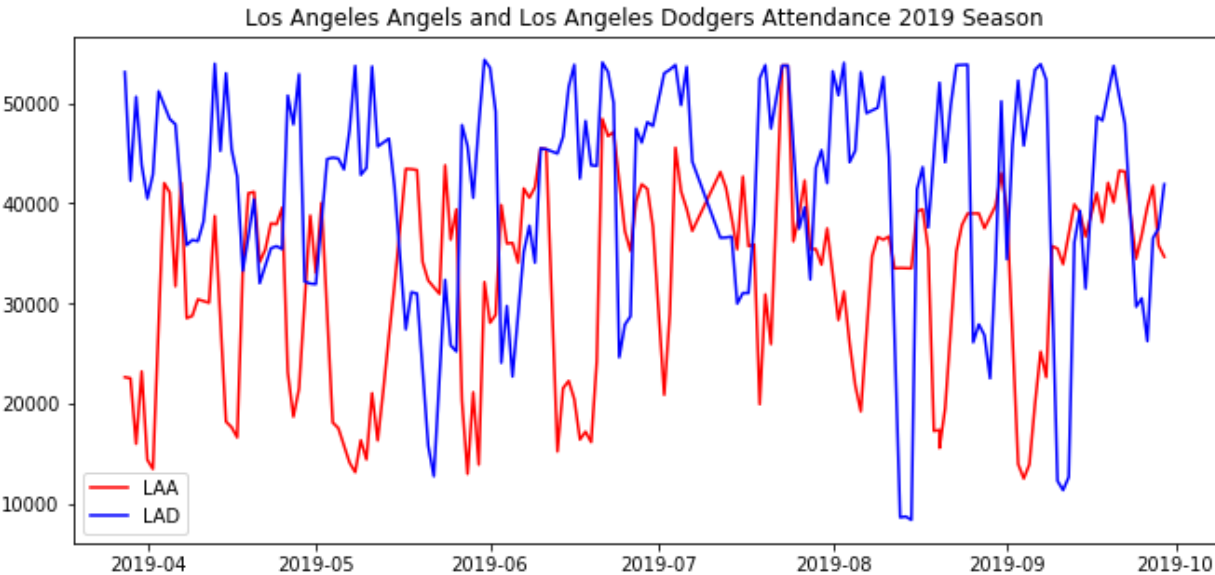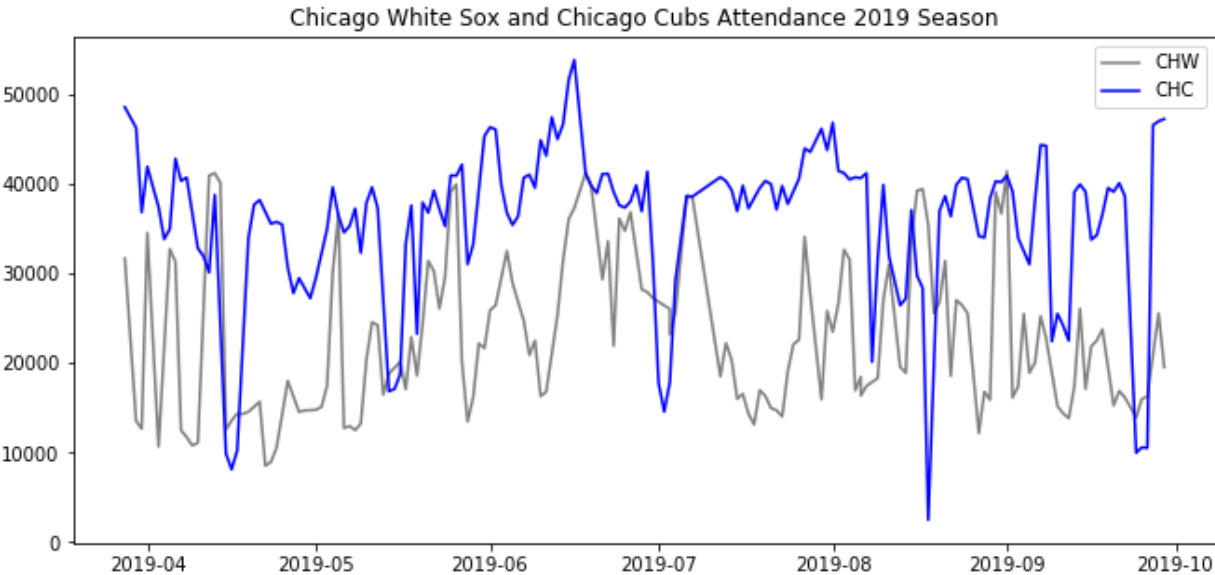| Win_Per | Wins divided by total games<br>    Represented as a whole number percentage<br>    Between 0 and 100 |
|---|---|
| Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday | Binary dummy variables (each is a separate variable)<br>    1 if specified day<br>    0 if not specified day |
| game_id | Unique game identifier |
| Date_Same_Mkt_Team | Date of closest previous game of same-market team |
| Net_Wins_Same_Mkt_Team | Net wins of same-market team at date of closest previous game |
| Win_Per_Same_Mkt_Team | Winning percentage of same-market team at date of closest previous game<br>    Represented as a whole number percentage<br>    Between 0 and 100 |
| Wins_Same_Mkt_Team | Total wins for the rival same-market team in a season prior to date of home team's game |
| Losses_Same_Mkt_Team | Total wins for the rival same-market team in a season prior to date of home team's game |
| date_diff | Number of days between game and closest game of same-market team |
| CHC, CHW, LAA, LAD, NYM, NYY, OAK, SFG | Dummy variables representing home team for a given game<br>    1 if specified team<br>    0 if not specified team |

## *Summary Statistics*

Table 1 -- Summary Statistics

|  | CHC | CHW | LAA | LAD | NYM | NYY | OAK | SFG |
|---|---|---|---|---|---|---|---|---|
| Home Game Attendance: Mean | 36888.64 | 22459.74 | 37858.71 | 44832.7 | 29965.51 | 42043.23 | 20058.65 | 40057.69 |
| Home Game Attendance: Standard Deviation | 4085.69 | 6526.02 | 4100.18 | 6405.55 | 6225.93 | 4873.77 | 7938.77 | 3293.38 |
| Win Percentage: Mean | 49.16% | 46.24% | 49.44% | 55.68% | 50.13% | 56.88% | 50.31% | 51.34% |
| Win Percentage: Standard Deviation | 10.62% | 8.67% | 7.49% | 8.49% | 8.52% | 8.00% | 8.18% | 8.88% |

Boxplot of Home Game Attendance by Team



## Graphs of Attendance in 2019 Season

New York Yankees and New York Mets Attendance 2019 Season

Chicago White Sox and Chicago Cubs Attendance 2019 Season



Los Angeles Angels and Los Angeles Dodgers Attendance 2019 Season

San Francisco Giants and Oakland Athletics Attendance 2019 Season
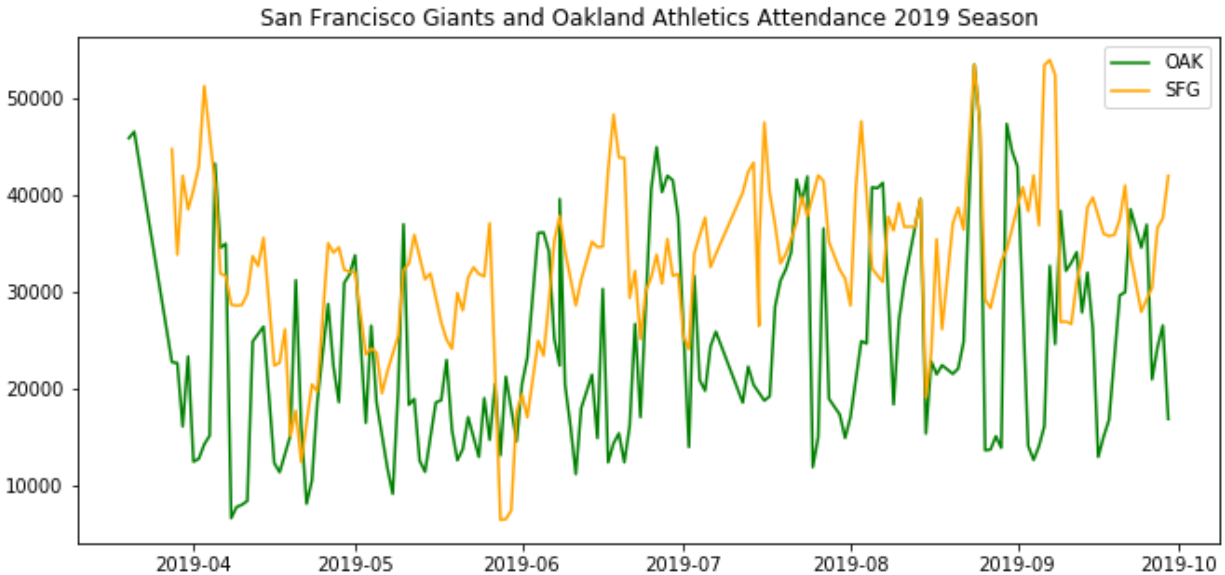
## IV.     Model

To estimate the effect of improved performance by a rival same-market team on the change in attendance at home games, I used Ordinary Least Square (OLS) method. The regression estimated that an additional win for the rival same-market team resulted in **...enter result** (See Table 2 models for future reference). The regression model is:

$$Attendance = \beta_0 + \beta_1 WinsBySameMarketTeam + \beta_2 LossesBySameMarketTeam + controls + u_i$$

*Main Variable of Interest*

Two measures of the quality of a team in the same market's performance were tested. The variable measuring the consecutive wins or losses for the same market team was not significant at the 0.01, 0.05, or 0.10 level when used by itself or in conjunction with the control variables. Therefore, I used the same-market team's

winning percentage as a proxy for their quality, which was significant at the 0.05 for all models and significant at the 0.01 level for five of the six models.

*Control Variables*

Many of the control variables were chosen because they were shown to be significant in previous economists' papers. The variable calculating winning percentage for the home team (Win_Per) measures the quality of performance for the home team. I also included the dummy variables for each home team since the fanbase for each team may be different sizes. I included the numbers of wins and losses for the home team, and they acted as another measure of quality for the home team. Finally, I also included characteristics about the game, such as time of day and day of the week because people may be more willing to attend a game at certain times.

## V. Results

| | | | Table 2 - Ordinary Least Squares Regression Output | | | |
|---|---|---|---|---|---|---|
| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Streak_Same_Mkt_Team | -43.6365 | | | | | |
| | (49.684) | | | | | |
| Win_Per_Same_Mkt_Team | | -64.0997*** | -44.8331*** | -28.0054*** | -20.1713** | -21.3123*** |
| | | (14.25) | (15.826) | (9.064) | (8.518) | (8.053) |
| Win_Per | | | 340.6958*** | 124.5626*** | 12.2678 | 12.5437 |
| | | | (16.962) | (10.377) | (13.782) | (13.358) |
| CHC | | | | -3048.706*** | -2924.325*** | -2889.383*** |
| | | | | (178.790) | (176.635) | (179.820) |
| CHW | | | | -17000*** | -16550*** | -16590 |
| | | | | (263.839) | (262.371) | (248.760) |
| LAA | | | | -1796.996*** | -1889.740*** | -1894.362*** |
| | | | | (190.447) | (190.963) | (188.835) |
| LAD | | | | 4225.193*** | 3832.8077*** | 3809.175*** |
| | | | | (251.065) | (246.212) | (245.882) |
| NYM | | | | -9757.203*** | -9455.926*** | -9491.010*** |
| | | | | (257.812) | (252.469) | (239.800) |
| NYY | | | | 1267.3238*** | 702.123*** | 697.246*** |
| | | | | (212.099) | (208.925) | (204.560) |
| OAK | | | | -19800*** | -19870*** | -19880*** |
| | | | | (301.801) | (299.565) | (281.160) |
| Wins | | | | | 127.2774*** | 124.303*** |
| | | | | | (8.741) | (8.375) |
| Losses | | | | | -116.284*** | -114.4338*** |
| | | | | | (9.158) | (8.752) |
| Night | | | | | | 147.363 |
| | | | | | | (176.375) |
| Tuesday | | | | | | 518.200*** |
| | | | | | | (275.013) |
| Wednesday | | | | | | 519.474*** |
| | | | | | | (275.668) |
| Thursday | | | | | | 946.294*** |
| | | | | | | (302.032) |
| Friday | | | | | | 3424.718*** |
| | | | | | | (263.764) |
| Saturday | | | | | | 5459.136*** |
| | | | | | | (280.593) |
| Sunday | | | | | | 3811.275*** |
| | | | | | | (299.608) |
| Constant | 34320*** | 37600*** | 19180*** | 35070*** | 39740*** | 37440*** |
| | (128.038) | (748.734) | (1240.088) | (733.235) | (816.761) | (822.133) |
| Sample Size | 6372 | 6372 | 6372 | 6372 | 6372 | 6372 |

Robust Standard Errors in Parentheses
*** $p<0.01$, **$p<0.05$, *$p<0.10$

Table 2  presents the main effects from estimating the regression of each model

with the final model being Model 6. Based on the final model, if the same-market team's

winning percentage increases by one percentage point, attendance for the home team would decrease by 21 people. This aligns with the idea that as a rival same-market team improves their performance, less people would attend the other team's game, likely because it is now more attractive to attend the same-market team's game. While the coefficient for the same-market team's winning percentage was statistically significant, the actual magnitude of the effect was very small. Even if a team increased their winning percentage by 30 percentage points, the attendance of the team in the same market would only decrease by 630 people. Considering that most baseball stadiums can hold 40,000 to 50,000 people, 630 people would only account for 1% to 2% of available seats. Because the effect of a same-market team's performance seems to be very small in magnitude, it is unlikely that teams need to worry about how that rival team is performing.

The biggest factors that affect attendance at a home game according to the final model is the home team and the day of the week. This is similar to what economists who have looked at factors affecting attendance at major league games have found in the past.

So when considering whether to relocate a team to a city where there is already a team there, their recent performance should most likely have very little consideration. Rather, it is probably more important to make sure that a franchise's brand equity is strong enough to attract fans to the games, especially in comparison to the team that is already in the market.

*Limitations*

It would have been very beneficial to have access to ticket prices for each game. Because tickets to events are normally considered to be discretionary spending, prices may have a large effect on how many people choose to buy a ticket. In addition, there may be some cross-price elasticities that are not accounted for in the final model that may result in omitted variable bias.

## VI.    Conclusion

An increase in the quality of the  performance of another team in the same market may have a marginally negative effect on a home team's attendance. The actual size of the effect is very small, so it is unlikely that baseball franchises are concerned about their ticket sales when same-market teams suddenly start winning. Rather, attendance seems to be affected more by which team is the home team, suggesting that brand equity and the size of a fan base may be more important.

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