

# The Effect of Having an On-Campus College Football Stadium on Attendance



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## 1 Introduction

Every Saturday in the fall, college football stadiums are flooded with fans ready to experience the pageantry of college football. But not all major college teams – which we define as schools that are eligible for the College Football Playoff (also known as the Division I Football Bowl Subdivision of the NCAA) – have their own stadium on campus to call home. There are countless reasons why a school would not have its own stadium, such as budgetary or space limitations, but understanding this impact on game-day attendance can be beneficial to athletic departments, colleges, and the cities in which they are located.

While college football, like the NFL, depends less on gate revenue than it used to, attendance still can be a significant source of revenue for athletic departments. An on-campus facility also gives a university the chance to show off its campus to prospective students who attend the game or even watch the game on TV. It can also help the university strengthen its ties with alumni who return to campus and – in the case of state universities – impress state legislators who control university budgets. (See, e.g., Humphreys 2006; Clotfelter 2019.) While an extensive literature, pioneered by Robert Baade (see especially Baade and Dye 1988a, b, 1990), indicates

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that stadiums of any kind are not a good investment for a city, local officials might still prefer an on-campus facility if it attracts more fans.

In this paper, we use data from the 2019 football season for the 127 colleges that are eligible for the College Football Playoff – and hence can be regarded as “big-time” programs – to test for a relationship between attendance on game day and the location of the home team’s stadium. No matter how we specify the estimating equation, we fail to reject the null hypothesis that there is no relationship. We therefore conclude that the location of the stadium has no discernable effect on attendance at big-time college football games.

The next section of this paper provides a review of the relevant literature. While many studies deal with attendance at sports events, only a handful deal explicitly with attendance at college football games. In Section 3, we construct a theoretical model that shows what variables are relevant for our study and why they are relevant. We also provide an empirical framework to test the hypothesis that an on-campus stadium increases attendance. Finally, this section presents and describes the data we use in our analysis. Section 4 presents the results of our analysis. A conclusion follows.

## 2 Literature Review

Few, if any, areas in economics generate such universal agreement as the proposition that sports facilities do not contribute significantly to the local economies surrounding them. A generation of research, starting with the pioneering work of Baade and Dye (1988a, b, 1990) and extending through the recent work of Bradbury (2022), has almost uniformly borne this conclusion out. (Agha and Rascher (2021) reach similar findings for the impact of minor league baseball stadiums.)

Unfortunately, while the literature on professional sports is vast, relatively little attention has been paid to the economic impact of intercollegiate sports. Two studies, however, find little difference from the impact of professional sports. Baade et al. (2008, 2011) find that college football games have little to no positive impact on the local economies and – in some cases – might be economically harmful. In more narrowly focused studies, Coates and Depken (2009, 2011) find that college football games have no significant impact on local tax revenues.

This paper, however, asks a slightly more nuanced question than “does a college football team boost the local economy?” Instead, we ask whether the location of the stadium might affect attendance and thus impact whatever economic effect the football games have. Fortunately, there is also a vast literature on attendance demand in professional sports, dating back at least to Neale (1964). The studies evaluate a wide array of factors that potentially affect attendance and cover sports leagues ranging from Spain’s *La Liga* (Buraimo and Simmons 2009) to Japan’s Nippon Professional Baseball (Leeds and Sakata 2012). Here, too, the literature on the demand for intercollegiate sports is relatively sparse, with only four (relatively) recent papers dealing directly with the demand for college football attendance: Price and Sen (2003), Leonard (2005), Falls and Natke (2014), and Augustin et al. (2018).

Perhaps the most prominent factor in studies of attendance is the quality of the game. Knowles et al. (1992) are perhaps the first to claim that fans want to see their team win – but not win too often. The possibility that fans might be turned off by a team that wins too frequently is known as the uncertainty of outcome hypothesis (UOH). A survey by Borland and MacDonald (2003) set the optimal likelihood of a home victory at about 60%. Recent studies have challenged the UOH. Coates et al. (2014), for example, find little evidence to support the UOH. Instead, they find that loss-averse fans derive utility from how their team performs relative to reference points.

Winfrey et al. (2004) argue that Major League Baseball teams that are located closer together must share the market, resulting in lower attendance for each team. Falls and Natke (2014) adapt this to college football by including a dummy variable that indicates whether an NFL franchise is within 50 miles of the college. Leonard's model of college football demand (2005) also accounts for a geography-based variable, though he uses the distance between the home team and the visiting team.

Most of the studies of attendance at professional sports events focus on major league teams, with the implicit understanding that attendance at lower levels of the sport will be less and perhaps dependent on different factors. However, even the highest level of college football, the Power 5 conferences, has a clear hierarchy regarding performance and attendance. It is therefore important to capture these differences in a study of attendance. Price and Sen (2003), for example, use dummy variables to indicate the conference of the home team.

The most relevant previous paper for our study – Augustin et al. (2018) – comes at attendance from an unusual angle, investigating the impact of beer sales on the demand for college football. They find a negative correlation between attendance and the availability of beer at college football games. However, they stop short of asserting a negative, causal relationship between beer sales and attendance.

Unfortunately, the four studies of college football cited above all focus on game-by-game attendance. Hence, many of the variables that they use, such as the weather on game day, whether the game is a rivalry game, and whether the game is televised, are irrelevant for our study, which focuses on average annual attendance.

### 3 Model and Data

Ideally, we would perform a difference-in-differences analysis to see whether schools that move their stadiums on or off campus experience a change in attendance; data limitations preclude utilizing a panel study like Falls and Natke (2014). Only a couple of Group of 5 schools have made such a switch over the last decade. The University of Pittsburgh was the last Power 5 school to make such a move, and it did so in 1999. Indeed, the median number of years that a Power 5 school has occupied its present stadium is 89.5 years. While Group of 5 schools tend to have shorter tenures, they have been in their present homes for a median of 51 years. The data thus do not support the use of difference-in-differences techniques.

Assume that a typical fan's utility is a function of the number of local college's football games she attends ( $g$ ) and the amount of a composite commodity ( $x$ ) she consumes:

$$U = U(g, x) \quad (1)$$

The fan is limited by her income ( $M$ ) and the cost of attending a game. (For simplicity, we assume that  $x$  is the numéraire.) We divide the cost of attendance in two. The first part is the literal price of tickets to the game ( $p$ ). The second part is the transaction cost of attending the game ( $t$ ). This includes the opportunity cost of the time spent getting to and from the stadium:

$$M = (p + t)g + x \quad (2)$$

Given this framework, it is easy to show that the fan maximizes utility where:

$$\partial U / \partial g / \partial U / \partial x = p + t \quad (3)$$

The optimal number of games the fan attends is thus a function of the marginal utility of attending a game, the price of admission, and the time-cost of attending the game.

The marginal utility of attending – and hence the optimal number of – games could rise if games were more entertaining to the home audience. As established in the literature, this is a function of the likelihood of a victory and the quality of the opponent. The quality of the experience might also be enhanced by a superior facility. (See Schreyer and Ansari 2022, for a useful survey of the literature.)

The taste for attending a game would also affect the marginal utility. Schools with a long history of football – particularly a successful history – will be more attractive than schools that do not share that tradition. On the other hand, the existence of alternative forms of entertainment, such as the presence of a nearby professional team, would lessen the taste for attending a college game and reduce the optimal number of college games consumed.

The existence of an on-campus stadium could affect several of the above factors. Attending a game on campus might enhance the atmosphere surrounding the game, especially for present students and alumni. Even casual fans might prefer attending a game at a facility devoted to the team rather than one devoted to, say, the local professional team.

While a centrally located, off-campus stadium might be neither more nor less convenient for the nonstudent, the time-cost of attending a game off campus could be significantly greater for present students, who represent a large portion of the potential audience for many teams.

We test the hypothesis that, all else equal, on-campus stadiums draw larger crowds with the basic equation:

$$ATT_i = \beta_0 + \beta_1 WP_i + \beta_2 TOTWINS_i + \beta_3 NFL_i + \beta_4 CAP_i + \sum_j \gamma_j CONF_{ij} + \beta_5 ONC_i + \varepsilon_i \quad (4)$$

The dependent variable in Eq. 4 is the annual attendance at home games for school  $i$  in the 2019 football season. While more recent data are available, the 2020 and 2021 seasons were both severely affected by the coronavirus pandemic. We use both the absolute level of attendance and the natural logarithm of attendance as dependent variables.

$WP_i$  is the winning percentage of team  $i$ . Coates, Humphreys, and Zhou (2014) cite the likelihood of a home victory along with outcome uncertainty as a determinant of attendance. The overall performance of the home team captures the former effect. Because both current and recent attendance could affect the taste for attendance, we use winning percentage for both the present year and the previous year. We enter  $WP_i$  as a number ranging from 0 to 1000 rather than from 0 to 1 so we can interpret  $WP_i^2$ . This term, however, is never significant and thus is not included here.

$TOTWINS_i$  is the total number of wins a college accumulated by 2021. This figure reflects both length of a school's history (Notre Dame has more wins than Central Florida) and the school's winning tradition (Michigan has more wins than Indiana).

The taste for attending a college might also be affected by the presence of a professional team nearby. Following Falls and Natke (2014), we capture proximity to a professional franchise with  $NFL_i$ , a dummy variable that equals one if an NFL team played its home games within 50 miles of the university. While we suspect the impact of this variable is negative, the presence of a professional team could also reflect a greater taste for football among the local population. This might offset the negative substitution effect.

Some schools might be capacity constrained and able to draw more fans than their facility can accommodate. For this reason, we include the seating capacity of each stadium,<sup>1</sup>  $CAP_i$ .

We also include a series of dummy variables to capture the impact of being in a particular conference. Major college football, by which we mean schools eligible for the College Football Playoff, is divided into two unequal parts, the Power 5 conferences and the Group of 5 conferences. The Power 5 conferences (ACC, Big 12, Big Ten, Pac-12, and SEC) dominate the college football landscape and generally are far more popular than the less prestigious Group of 5 conferences (AAC, C-USA, MAC, MWC, and Sun Belt). We use both conference dummies and an indicator of belonging to a Power 5 conference to capture this effect.

Our variable of interest is an indicator of whether the school played its games on campus in 2019,  $ONC_i$ . A positive coefficient indicates that an on-campus stadium leads to greater attendance.

<sup>1</sup>In regressions not shown here, we used percent of capacity as a measure of attendance. The explanatory power of this regression was low, and few explanatory variables were statistically significant. Results are available upon request.

Stadium age, undergraduate enrollment, and postseason rankings for 2018 and 2019 as well as preseason rankings for 2019 are also used as explanatory variables. We anticipated that aging facilities might discourage attendance, while a larger student population and a better team (or at least the expectation thereof) would increase attendance.<sup>2</sup> However, all these variables proved to be consistently insignificant and are not shown here.

We identify college stadiums using the *Active Cities* and *HERO Sports News* website. Data on attendance come from NCAA records. Team records for 2018 and 2019 as well as overall wins are from the college football portion of [sports-reference.com](https://sports-reference.com) (SRCFB 2022). The distance from NFL teams is determined using Google Maps.

Means of relevant variables appear in Table 1. We show means for the total sample and for the Power 5 and Group of 5 subsamples, which are almost identical in size. As expected, attendance is much higher for Power 5 schools, which play in much larger stadiums.

Group of 5 schools win slightly less than 50% of their games, while Power 5 schools win well more than 50% of their games. This seeming anomaly probably has two causes. First, Power 5 schools tend to have a winning record against Group of 5 schools. Second, both sets of schools are likely to have winning records against schools that do not participate in the College Football Playoff (schools in the Football Championship Subdivision or FCS). The Power 5 schools are likely to dominate FCS schools more than Group of 5 schools, contributing to the differential in winning percentage. Because Power 5 schools are both older and more successful, they also have more total wins. Finally, Power 5 schools are more likely to play on campus than Group of 5 schools, though the vast majority of Group of 5 schools (almost 80%) also play on campus.

While we do not cite city size in Table 1, there appears to be no pattern in the population of the cities with stadiums on or off campus. Schools with off-campus stadium are in small towns, such as Kent, OH (population 28,000), midsize cities, such as Mobile, AL (population 186,000), and large cities, such as Philadelphia (population over one million).

**Table 1** Relevant means

Variable	Total	Power 5	Group of 5
NFL team nearby	0.197	0.203	0.190
Stadium capacity	52,491	67,434	37,511
Winning percentage	52.6	55.4	49.8
Total wins	472	647	295
Stadium on campus	0.827	0.859	0.794
Average attendance	42,056	61,785	22,013
Number of observations	127	64	63

<sup>2</sup>Ranking might have a distinct impact from a team's win-loss record if some teams play against other strong teams, while others do not.

## 4 Results

Table 2 shows four sets of regressions: two using the absolute level of attendance and two using the natural logarithm of attendance. The results show a clear nonlinear relationship between attendance and the explanatory variables, as the semilog specification has more significant coefficients and a much higher adjusted  $R^2$ . We therefore focus on the semilog results.

The first set of regressions contains a full set of conference dummies, with Conference USA of the Group of 5 as the default category. These show that most of the Group of 5 conferences do not differ from C-USA in attendance, with only the Mid-America Conference (MAC) differing from zero. In contrast, all the Power 5 conferences show a positive impact, as expected. The impact ranges from less than 40 percentage points for the Pac-12 to over 70 percentage points for the SEC.

The presence of a nearby NFL team does not affect attendance at college football games, which could imply that the two appeal to different audiences or that the two effects described above offset one another.

Most of the remaining control variables have a statistically significant impact on attendance, and those that are significant have the anticipated impact. Increasing stadium capacity by 1000 increases attendance by 0.6 percentage points. While winning percentage in the present season is statistically insignificant, winning percentage in the previous season increases present attendance. This suggests that most attendees purchase their tickets before the season begins. Attendance is also greater for schools with stronger football traditions.

Finally, schools with stadiums on campus do not see any boost in attendance relative to schools with off-campus facilities. The coefficient is small and nowhere close to statistically significant.

The results for the more parsimonious specification are similar. Proximity to an NFL team remains statistically insignificant. The impact of lagged winning percentage is identical, while that of stadium capacity and total wins increases only slightly. Being a member of a Power 5 conference increases attendance by over 38%. Being in the Mid-American Conference reduces attendance relative to other Group of 5 conferences by 27%, while the Southeastern Conference had attendance over 34% higher than other Power 5 conferences.

Once again, the coefficient for having an on-campus stadium was statistically insignificant at any reasonable significance level. The uniform failure of this variable to have any discernable impact on attendance leads us to conclude that having a stadium on campus does not lead to higher attendance.

**Table 2** Determinants of attendance

Variable	Linear specification		Semilog specification	
	Full conference dummies	Power 5 dummy	Full conference dummies	Power 5 dummy
NFL team in city	-1259.2 (-0.25)	-2111.7 (-0.43)	0.022 (0.33)	0.015 (0.23)
Stadium capacity (000 s)	293.1 (1.99)	350.5 (2.61)	0.006 (3.48)	0.007 (4.17)
Winning percentage	111.7 (0.10)		0.011 (0.74)	
Lagged winning percentage	1451.4 (1.35)	1434.7 (1.57)	0.031 (2.21)	0.036 (2.95)
Total wins in 2020	32.714 (1.95)	30.676 (2.18)	0.0008 (3.38)	0.0008 (4.31)
Power 5 school		11,216.0 (1.89)		0.384 (4.87)
ACC	8855.7 (0.87)		0.410 (3.04)	
Big 12	16,288.9 (1.47)		0.542 (3.70)	
Big Ten	18,872.5 (1.72)		0.503 (3.45)	
PAC12	4108.9 (0.68)		0.383 (2.77)	
SEC	39,358.9 (3.40)	25,422.5 (3.71)	0.717 (4.67)	0.244 (2.68)
American	452.2 (0.05)		0.093 (0.74)	
MAC	-3444.1 (-0.38)	-3950.3 (-0.57)	-0.234 (-1.96)	-0.272 (-2.92)
Mountain west	-2569.2 (-0.28)		-0.006 (-0.05)	
Sun Belt	4595.3 (0.50)		0.068 (0.56)	
Independent	4108.9 (0.34)		0.096 (0.59)	
On-campus stadium	1272.21 (0.23)	3004.8 (0.57)	0.033 (0.44)	0.041 (0.58)
Constant	-7183.5 (-0.73)	-8572.4 (-1.11)	9.205 (70.49)	9.235 (89.98)
Adjusted R <sup>2</sup>	0.5579	0.5758	0.8109	0.8171
Number of observations	127	127	127	127



## 5 Conclusion

Universities have many reasons for wanting to play games on campus. Reasons range from attracting prospective students, enhancing campus life for present students, and strengthening ties with alumni. Local governments might also have a stake in the location of a school's home stadium. If an on-campus facility attracts more out-of-town fans, the benefits to the local economy might rise as well.

We have shown that one reason for moving games on campus – improving game-day attendance – does not hold. Regardless of our specification of the dependent variable or the combination of explanatory variables we use, the impact of an on-campus stadium does not come close to any reasonable standard of statistical significance.

While this finding undercuts one justification for on-campus stadiums, building a stadium on-campus might still be worthwhile if it stimulates applications and alumni donations. Whether stadium location affects these factors, however, is beyond the scope of this study.

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