International Journal of Sport Finance, 2017, **12**, 299-320,

The Impact of Video Coverage on Football Bowl Subdivision Attendance

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Abstract

Panel data of 2,243 regular season games for Football Bowl Subdivision teams during 2007–09 are used to examine the relationship between the extent of video coverage and stadium utilization. Results suggest that an advertising effect overwhelms a substitution effect generated by video coverage. After controlling for other variables, national video coverage has a significant and large positive impact on attendance as a percentage of stadium capacity, but the magnitude of this effect decreases as temperatures rise. Local coverage has a small positive impact only when a temperature-coverage interaction variable is not included. Regional coverage has no impact on capacity utilization.

Keywords: college football, game-day attendance, video coverage, stadium utilization

Introduction

Although a large number of studies have investigated the determinants of attendance at sporting events, relatively few have considered the impact of televised broadcasts. In the past few decades, fans' potential access to video broadcasts has proliferated and evolved from open-access over-the-air broadcasts via network television to access limited by subscription (e.g., cable, satellite television packages, pay-per-view) or access to the Internet (e.g., video streaming, smart phone applications).

Early studies of sporting event attendance typically have not included the impact of video coverage either because data on telecasts were unavailable or video coverage of an event may have been a rare occurrence during the period of study. Studies that do examine the issue for collegiate and professional football leagues in the US (American football rules) typically employ a dummy variable in a regression equation to capture whether there is a change in attendance for any event that is televised, ceteris paribus (Price & Sen, 2003; Welki & Zlatopper, 1994, 1999; Falls & Natke, 2014). No study has examined whether the geographic range of coverage (i.e., local, regional, or national) matters for attendance at college football games.

The direction of the expected relationship between video coverage and attendance is unclear. Video coverage allows a fan the opportunity to avoid the cost of attending an event in person and "substitute" a telecast for game attendance. As the cost of attendance rises (e.g., longer distances to travel, poor weather, greater opportunity costs) more fans will choose to stay at home and watch the event via video coverage.

However, there could be a positive relationship between video coverage and game-day attendance. The decision rights about which games to broadcast may be given to the broadcaster that has a strong incentive to choose events that are likely to attract the most viewers. The events chosen by this criterion are high-demand games. Measures of high-demand status (e.g., traditional rivalries, games between high-quality teams, games with conference title implications, games that are expected to be closely contested) are typically included in regression models of attendance. After controlling for these measures, video coverage may still exert a separate, significant, and positive impact on attendance via an "advertising" effect. Broadcasters promote these games by frequently reminding viewers of the broadcast in the weeks leading up to game day via short ads to targeted audiences (e.g., during broadcasts of other football games). To the extent that these promotions are effective in reaching a wider audience than a home team's regular stadium attendees and in conveying the importance of the game, televised games could have greater stadium attendance.

There has been a rapid increase in the types of video coverage available to broadcast college football games in the last 15 years: 1) over-the-air public access television (e.g., ABC, Fox, CBS, NBC); 2) cable television basic services (e.g., Charter, Comcast, Warner); 3) cable television premium services (e.g., ESPNU, Fox Sports); 4) satellite network television basic services (e.g., DirecTV, DishNetwork); 5) satellite network television premium services; 6) pay-per-view services; and 7) video streaming via the Internet (often provided by the athletic department or university). Contractual arrangements also vary across and within types. Some games are only available to local residents via local television affiliates or local cable providers. Others are available on a regional basis via networks. Some games are broadcast to a national audience. Some conferences have their own networks (e.g., the Big Ten Network) or a conference broadcasting agreement and some universities have individual contracts (e.g., Notre Dame, Texas). Every one of the teams in the Football Bowl Subdivision (FBS) broadcasts some, if not all, of its home games.

As the video broadcast landscape changes, several questions arise: 1) If there are substitution and advertising effects associated with video coverage then does one dominate the other when fans consider game-day attendance decisions? 2) Are there differential impacts on attendance based on the geographical range of the broadcast (i.e., local, regional, or national)? 3) Is the impact of video coverage on attendance strengthened or weakened by the weather conditions on game day (i.e., does weather increase the strength of the substitution effect?)?

We will attempt to answer these questions with data from three years of FBS regular-season home games. The study will contribute to the literature on college football attendance by being the first to examine the role of the extent of video coverage (local, regional, national) on attendance and consider interaction terms between video coverage and weather. This interaction may help delineate the advertising and substitution effects of broadcasts.

Video Broadcasting and Attendance

Some of the first empirical studies of video broadcasts and game-day attendance focused on professional rugby teams in Great Britain. Baimbridge et al. (1995) concluded that attendance decreased for televised games by approximately 25%. Carmichael et al. (1999) found a differential impact based on the day of the week: satellite television broadcasts reduced attendance at professional rugby matches on Friday nights but had no impact on attendance during mid-week or on holidays.

A number of studies also examined professional football telecasts in Great Britain. Allan (2004) tracked attendance for one team in the Premier League and concluded that satellite television broadcasts reduced attendance by 8%. Forrest et al. (2004) collected data across six seasons for the English Premier League and reported mixed results regarding broadcasts' impacts on attendance. When television broadcasts did reduce attendance, the authors estimated that attendance decreased by about 10%. Allan and Roy (2008) looked at one season in the Scottish Premier League and considered the impact of free-to-view broadcasts on three different audiences: 1) telecasts had no impact on "visiting" fans or home fans who are season tickets holders; and 2) "home" attendance decreased by as much as 30% for that portion of fans who "pay-at-the-gate" (i.e., those that did not purchase season tickets).

Forrest and Simmons (2006) discovered that free television broadcasts of Champions League matches reduce attendance at Division II matches by 21.4% and Division III matches by 15.8%. Telecasts through a Champions League subscription service had no significant impact on Division II matches but reduced attendance at Division III matches by nearly 6%. Solberg and Mehus' (2014) results support a substitute relationship between broadcasts and attendance. They examined a survey of Norwegian football fans and concluded that fans of clubs that were featured most often on television attended fewer matches.

In North American professional sports, Bruggink and Eaton (1996) concluded that game-day attendance at Major League Baseball (MLB) games was not affected by a national broadcast. However, local broadcasts had differential impacts depending on the league: American League team attendance decreased with local television broadcasts while National League games experienced an increase in attendance when broadcast locally. Lemke et al. (2010) studied the 2007 MLB season and reached similar conclusions: national broadcasts did not affect game-day attendance but attendance decreased if a game was not broadcast on local television.

Welki and Zlatopper (1994, 1999) examined game-day attendance in the National Football League (NFL) across three different seasons. In each study, results indicate that televised games experienced higher attendance than games that were blacked out.

The earliest studies of U.S. college football attendance used data at an aggregated level (i.e., season attendance by teams in Division I). Kaempfer and Pacey (1986) suggested that the number of television broadcasts for a team in a season and season attendance were complements based on an "advertising" effect—greater television exposure of National Collegiate Athletic Association (NCAA) football games cultivates a wider audience and boosts attendance. However, television appearances had no cumulative effect; the number of television appearances for a team in all previous seasons had no impact on the current season's attendance.

Fizel and Bennett (1989) also used season attendance data for Division I teams. Their results contradict those of Kaempfer and Pacey (1986)—the number of television appearances in a season led to a reduction in the team's attendance rate and an increase in a team's historical (cumulative) number of television appearances increased the attendance rate.

Price and Sen (2003) used game-day attendance as their unit of observation for a single season in Division I-A. They employed a dummy variable for televised games and concluded that television coverage increased game-day attendance by more than 5,000 fans. Another study (Falls & Natke, 2014) examined data from games in the FBS (or Division I-A) in a later period and reported similar results: video broadcasts of any type increased game-day attendance by over 1,300 people. However, Mirabile's (2015) study of neutral-site college football games concluded that national broadcasts of these games had no impact on game attendance.

In short, studies of U.S. college football attendance have demonstrated that 1) the advertising effect of video coverage is usually greater than the substitution effect; and 2) the strength of the advertising effect relative to the substitution effect is diminishing over time as a greater percentage of games are being televised or played at neutral sites. Studies of professional baseball attendance in the US indicate that a broadcast's extent of geographical coverage also matters: national coverage has no impact on attendance while there is conflicting evidence about the effect of local coverage.

Data Description

The data set is comprised of 2,243 games played at the home stadium by the 120 FBS football programs during the 2007–09 regular seasons. This period was chosen for a number of reasons: 1) the increasing frequency of video broadcasts during this period; 2) the wider availability of accurate information regarding telecasts on team websites than in earlier years; 3) since 2009 it has become increasingly difficult to distinguish between local, regional, and national broadcasts as more broadcasts are offered via satellite subscription and live streaming via hand-held devices; and 4) the number of teams that broadcast all of their regular-season home games in some format has increased substantially since 2009, which renders a differentiation between broadcast games and no-broadcast games meaningless for many teams if fans are not very sensitive to video quality.

It is an unbalanced panel because some schools (e.g., Florida International, Western Kentucky) joined the FBS from the Football Championship Subdivision (FCS, or Division I-AA) during the period and teams may play a different number of home games in any season. Bowl games, league championship games after the end of the regular season (e.g., the Southeast Conference), and games played at neutral sites are not included.

It is generally recognized that the number of college football games being televised has increased over the last 30 years. Table 1 demonstrates the extent of the proliferation. Fizel and Bennett (1989) identified that nearly 12% of Division I games (includes both I-A and I-AA games) were televised from 1980–85. Price and Sen's (2003) study of Division I-A teams found a televised rate of 18% in 1997. This rate accelerated to 78% in this study (2007–09). Several factors are at work in the acceleration process: the rapid growth of technological change that increased the number of channels televisions could accommodate; the growth of cable and satellite television sources and their subsequent demand for programming; and the financial pressures on universities and their athletic departments to increase revenues in the face of reductions in funding from state government sources.

Table 1. Frequency of College Football Games Televised in Previous Attendance Studies' Samples

Study	**Sample year(s)**	**Sample size**	**Percent of games televised**
Fizel and Bennett (1989)*	1980 – 1985	558	11.9
Price and Sen (2003)**	1997	596	18
Current study**	2007 – 2009	2,243	78.2

**Division I-A and Division I-AA games. **Division I-A games.*

Table 2 provides detailed information about the sources of video coverage. Of the 2,243 games examined in this study, 1,752 (78%) were televised and 137 (7.8%) of the games were televised across multiple sources. The most common source was cable television: when major ESPN and cable TV categories are combined, nearly 78% of all broadcasts were over cable television. Major network television was the second largest source with 14.2% of the games. Internet streaming, pay-per-view, and local TV were the least-used sources.

Table 2. Frequency of Source of Broadcasts of FBS Games, 2007 – 09

Source of broadcast	**Number of observations**	**Percent of televised games**	**Percent of all observations**
Major network TV	248	14.2%	11.1%
Major ESPN	421	24.0%	18.8%
Cable TV	941	53.7%	42.0%
Local TV	66	3.8%	2.9%
Pay-per-view TV	94	5.4%	4.2%
Internet video streaming	119	6.8%	5.3%
Total televised sources	1,889		

Table 2. (Cont.) Frequency of Source of Broadcasts of FBS Games, 2007 – 09

Source of broadcast	Number of observations	Percent of televised games	Percent of all observations
Number of games	2,243		
Number of televised games	1,752		78.1%
Games with multiple sources	137	7.8%	6.1%
Games not televised	491		21.9%

Table 3 provides some sample statistics for variables in the sample. Attendance averaged 46,082 while the average percent of stadium capacity used was 80.11. Among the economic variables, the mean real ticket price was nearly $19, state real per capita income $15,790, and real gas cost $65. Other measures in Table 3 worth noting are that nearly 11% of the games were not played on Saturdays, 16% were between teams identified as "rivals," 11% were against non-FBS opponents, more than 60% were with conference opponents, the average team participated in more than four bowl games in the last 10 years, and one-third of the FBS college stadiums are within 50 miles of an NFL city.

Table 3. Selected Sample Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Attendance	46,082	26,498	1,535	111,941
Stadium capacity	55,028	22,362	16,000	107,501
Percent of capacity	80.11	23.38	5.08	161.70
Real state disposable income per capita	$15,790	1,737	$11,956	$20,780
Real travel cost	$65.05	62.24	$0.25	$589.58
Real ticket price	$18.62	7.05	$4.30	$48.65
Cloud cover percentage	41.10	33.52	0	100
Precipitation	0.09	0.37	0.00	6.58
Feels like temperature	60.10	16.76	0.00	105.60
Season game number	6.32	3.49	1	13
Win advantage home	1.42	2.03	0	10
Win advantage visitor	1.32	1.94	0	10
Season wins	6.32	3.49	0	11
Traditional rival	0.16	0.37	0	1
Non-Saturday	0.11	0.31	0	1

Table 3. (Cont.) Selected Sample Statistics

Variable	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Non-FBS opponent	0.11	0.32	0	1
Conference game	0.61	0.49	0	1
Home aq conference visitor aq conference	0.30	0.46	0	1
Home aq conference visitor not aq conference	0.26	0.44	0	1
Home not aq conference visitor aq conference	0.05	0.21	0	1
Home not aq conference visitor not aq conference	0.39	0.49	0	1
Undergraduate enrollment	19,936	9,302	2,987	54,277
City population	1,490,745	2,347,993	21,493	12,874,797
State population/FBS teams	2,497,925	1,640,628	523,252	8,707,739
Lifetime winning percentage	53.16	8.21	26.09	71.94
Bowls in last 10 years	4.69	3.20	0	10
NFL team nearby	0.34	0.48	0	1
National TV (widest coverage)	0.65	0.48	0	1
Regional TV (widest coverage)	0.10	0.30	0	1
Local TV (widest coverage)	0.03	0.18	0	1
Home wins last 11 games	5.79	2.47	0	11
Visitor wins last 11 games	5.70	2.49	0	11
No video coverage	0.22	0.41	0	1

Few teams from an automatically-qualifying conference for Bowl Championship Series (BCS) purpose travel to play a non-automatic qualifying conference opponent (less than 5% of the games in the sample).[1] Teams from non-automatic qualifying conferences are much more likely to travel to play teams from conferences that automatically qualify for bowls in the BCS (more than 26%).

Empirical Model

Based on the review of the relevant literature and basic economic theory we estimated a random effects Tobit model with the following form.

$$A_{it} = \alpha + E_{it}\beta + G_{it}\Psi + D_{it}\lambda + V_{it}\Theta + e_i + v_{it} \qquad (1)$$

where A_{it} is attendance as a percent of the home team's official stadium capacity as reported to the NCAA.[2] Over the sample period, the NCAA allowed schools to measure game-day attendance in one of two ways: 1) the number of people in attendance (i.e., through the turnstiles at the stadium); or 2) tickets sold. Schools could choose between the two methods of calculating attendance but the NCAA data do not allow us to identify which method was used for any observation.

The E_{it}, G_{it}, D_{it}, and V_{it} are sets of variables containing economic characteristics, game attributes, demographic variables, and video-related variables, respectively, and α, β, Ψ, λ, and Θ are vectors of parameters to be estimated. In (1), $e_i + v_{it}$ is a residual in which e_i is a school specific residual, it differs across schools but is constant for any specific school, while v_{it} is a residual with the usual properties. The Tobit random effects model for panel data was chosen because some of the variables of interest are time invariant (e.g., proximity to an NFL franchise).[3] It is reasonable to assume that the school-specific component of the error term is distributed independently of the explanatory variables. A Tobit estimation procedure was used since approximately 28% of the games reported attendance at 100% or more of the stadium's capacity.

Economic Variables

One component of E is the state's real per capita disposable income.[4] Assuming most fans reside in the same state as the home team's main campus, we employ this variable as a proxy for a home fan's budget constraint.[5] If the demand for sporting events is a normal good, rising income should increase attendance.

Travel cost is an important factor in determining whether a fan chooses to attend a sporting event. Studies often use the mileage between the opposing teams' stadiums as a proxy for travel costs facing the visiting team's fans (costs are assumed to be proportional to distance; e.g., Leonard, 2005). Travel costs can vary substantially across time and regions of the US, as fluctuations in fuel prices affect not only ground transportation costs but also the price of air travel.

Travel cost for a specific game is calculated as the fuel cost of completing a round-trip via a private automobile between campuses of the opponents. The average fuel efficiency rating of the U.S. vehicle fleet is used to determine the number of gallons of fuel consumed, and the weekly average price of unleaded gasoline in the home team's region is used to calculate fuel cost.[6] Fleet fuel efficiency figures change across years and gasoline prices vary across weeks and regions. Each home game in the sample, therefore, will have a unique travel cost figure. This travel cost variable most accurately measures the cost of a visiting team fan, so we expect that the greater the travel cost the lower visitor attendance will be.

The third component of E is the real ticket price. When available, we collected two ticket price figures for sideline seats for each game: 1) the single-game price for the best available seat on the sideline that was not reserved for season-ticket holders; and 2) the average price per game if a fan purchased season tickets (i.e., the season ticket price divided by the number of home games in the season). If the single-game price was unavailable then the average price based on season tickets replaced it.

Game Attributes

Game attribute variables make up the components of G. Since weather may influence a fan's decision regarding attendance, the model includes three weather variables: precipitation (measured in inches), average cloud cover (percent), and the day's average "feels like temperature" (degrees Fahrenheit). This last variable takes into account air temperature, humidity, and wind speed to provide a better measure of the comfort level of fans in attendance. It is expected that colder temperatures, more cloud cover, and more precipitation will discourage attendance among the "fair-weather" fans.

The model specification also includes the season game number (i.e., the game's sequential order during a given season). The directional impact of this variable is uncertain. Early games may have less fan interest because less is at stake at that point in the season. As the season progresses, fan interest might be intensified by a team competing for improvement in the conference standings, for a conference championship, or for approaching bowl eligibility (i.e., six wins). On the other hand, teams that have struggled on the field may face a substantial decline in fan interest as the season progresses. The number of wins in the current season is another game-specific variable that measures the quality of the current team. We expect the more successful teams will attract greater attendance.

In this set we have also included the "win advantage home" and "win advantage visitor" variables. The first of these equals the absolute value of the difference between the number of home team wins in the last 11 games and the number of visitor team wins in the last 11 games when the home team has the better record and zero otherwise. The win advantage visitor variable is similarly defined except that it is this absolute difference when the visitor has the better record in the last 11 games and zero otherwise.

These are naïve measures of the uncertainty of outcome hypothesis that posits that fans are attracted to closely contested games (i.e., when the outcome is uncertain).[7] If both home and visiting team fans prefer a more competitive game, then a larger win advantage home measure will decrease attendance. A larger win advantage visitor measure will reduce attendance as well.

On the other hand, if fans believe their team will win (larger win advantage home) and prefer to see a home team win rather than a competitive game, then the variable should have a positive impact on attendance. The strength of this relationship, however, may be weakened if like-minded visiting team fans choose not to attend because of an anticipated loss. The win advantage visitor variable may have a positive impact on attendance if home fans are attracted by a higher-quality visiting team. Perhaps home fans are hoping for a big upset or simply want to see a team with a stronger winning reputation. Another possibility is that more of the visiting team's fans are likely to travel if they anticipate a visiting-team win.

This set of variables also contains the following dummy variables: "non-FBS opponent," "non-Saturday game," and "traditional rival."[8] It is expected that the first two of these variables would have a negative impact on attendance while traditional rivals should draw more fans, both home and visitor, to the game. Also in G is a set of binary variables indicating the conference affiliation of the participants.[9] For example, "Southeastern Conference participant" is one in which either the home team or visiting team is from the Southeastern Conference. We have no expectation as to the sign of these participant variables but they are intended as controls for characteristics specific to conference affiliation.

The number of bowl games for the home team in the last 10 years and the team's lifetime winning percentage are included in this set. These measure intermediate-term success and long-term success, respectively. Each is expected to be a positive influence on attendance.

College football fans' loyalties and expenditures also face competition from the professional level. If an NFL team is based in a city within 50 miles of a college team's main campus, the dummy variable NFL team nearby takes on the value of one; otherwise it is zero. We expect a negative sign.

Demographic Variables

The demographic set of variables (D) consists of the home university's undergraduate enrollment (in thousands), the population of the city where the campus is located (in hundred thousands), and state population (in millions) divided by the number of FBS schools in the state. The first two represent the closest potential audiences for a home game. State population alone does not account for divided loyalties (i.e., a state may have multiple FBS teams that vie for the loyalty and expenditures of football fans). All three variables are expected to exert positive effects on attendance.

Video Variables

The final set of independent variables, V, is composed of video-related ones. Data were collected from athletic department websites regarding both the source and extent of coverage. Six different sources were identified: major network television (e.g., ABC); major ESPN (e.g., ESPN, ESPN2, ESPN Classic); cable television (other than major ESPN); local television; pay-per-view television; and Internet video streaming.

Broadcasts were classified into three levels of coverage based on the widest distribution of the telecast(s). The "national video" dummy variable takes the value of one when the broadcast is accessible across the US. This includes national broadcasts on major television networks, games accessible via cable television subscriptions, national pay-per-view channels, and Internet streaming. The "regional video" dummy variable is one when the widest availability of the broadcast is on a regional basis (i.e., normally across 2–20 contiguous states) as determined by the firm with broadcast rights to the game. The geographic coverage of regional broadcasts (i.e., distance and population) varies widely due to influences such as conference membership, network affiliations, availability of cable television subscriptions, and satellite-TV reception (topography). The "local video" variable equals one when the broadcast is only available in the local market typically via local open-access broadcast stations. Local coverage is often limited to a 100-mile radius or less.

Estimation Process

There is a possible endogenous relationship between game attendance and television broadcasts: highly attended games are likely to be televised.[10] Both measures are positively related to the quality of the teams and the fans' demand to watch the games. This simultaneity issue was not explored via instrumentation for video broadcast. The authors are not aware of any estimation method that: 1) will allow instrumentation when a variable is binary; and 2) will produce reliable parametric estimates when there are two endogenous relationships with a censored dependent variable. The selection of an appropriate instrument for this problem is complicated by the simultaneity issue between ticket price and attendance and, therefore, the need for two sets of instruments.

The two equations were estimated using a two-step process within STATA. The first step used random effects panel estimation with ticket prices as a dependent variable to produce a set of estimated values (i.e., ticket price was instrumented because of the potential endogeneity of ticket price and attendance). The second step used the estimated ticket price values to estimate the random effects Tobit model since attendance could be a variable with a limited range of values.

It is unclear whether a telecast will increase or decrease attendance. A telecast could be a substitute for attendance, particularly when the marginal cost of attendance is great because of travel distances or expected poor weather. It is possible that broadcasts could increase game-day attendance by stimulating fan interest prior to the contest (i.e., an advertising effect). A growing trend in contracts between television networks and athletic conferences is to schedule some games for televising before the season starts based on traditional rivalries and expected fan interest. The remaining conference games on the television schedule are selected only a few weeks in advance to reduce the possibility of broadcasting a game with little fan interest and, hence, low television ratings. Therefore, contracts and business practice could produce a positive relationship between attendance and telecasts.

Given the data, we cannot identify for each televised game whether it was broadcast via specific game contracts with individual universities or via contract with the home team's athletic conference. Nor can we identify when broadcasters scheduled the broadcast—months, weeks, or days in advance of game day. However, the empirical relationship between attendance and the availability of a video broadcast may be dependent on the geographical pattern of broadcast coverage. Coverage by local open-access broadcasters is limited (i.e., in many cases within a 50-mile radius of the broadcasting station). Regional broadcasts cross several states and 1,000 miles or more in some parts of the US. National broadcasts cross four time zones on the continental US and six time zones if Hawaii is included (the University of Hawaii's team is a member of the FBS). It is uncertain if the geographical extent of coverage will alter the overall impact of a broadcast or how it will do so (i.e., strengthen or weaken an advertising effect). Perhaps the advertising effect will be stronger as the extent of coverage widens since more fans become aware of the game's importance.

The extent of substitution between game attendance and television viewing may be dependent on the weather; poor weather may encourage more fans to stay at home if the game is televised (i.e., a stronger substitution effect). We have included interaction terms between the level of coverage and the average "feels-like" temperature. The variable "national coverage temperature interaction" equals the average feels-like temperature if there is national coverage of the game and zero otherwise. The regional and local video interaction terms follow this same pattern. If poor weather increases the magnitude of the substitution effect associated with video broadcasts, then these interaction terms should be negative.

Empirical Results

We instrumented the ticket price variable because of its possible endogeneity with the dependent variable (attendance) and, following the suggestion of Noll (2011), we used the stadium capacity as the instrument.[11]

Column two of Table 4 (Model 1) presents the results when only the level of video coverage is included in the regression model.[12] Two of three economic variables have the anticipated sign. A $1 increase in the real ticket price will reduce stadium utilization by almost 7%. The own-price elasticity, calculated at the means, is -1.62. This value is similar to that found in a study of FCS attendance (-1.90; Falls & Natke; 2016). While

Table 4. Tobit Results for Percent of Capacity

Independent Variable	**Model 1**	**Model 2**
real state disposable income per capita	-.000546	-.00058
	(.000389)	(.000385)
real travel cost	-.053***	-.0521***
	(.0132)	(.013)
real instrumented price	-6.974***	-6.841***
	(1.625)	(1.596)
average cloud cover	-.021*	-.0224**
	(.0116)	(.011)
precipitation	-3.419***	-3.386***
	(.907)	(.904)
average feels like temperature	-.1000**	-.104*
	(.0463)	(.057)
season game number	-2.992***	-2.948***
	(.264)	(.256)
win advantage home	-.822***	-.800***
	(.182)	(.177)
win advantage visitor	1.801***	1.803***
	(.343)	(.347)

Table 4. (Cont.) Tobit Results for Percent of Capacity

Independent Variable	**Model 1**	**Model 2**
season wins	5.208***	5.169***
	(.465)	(.463)
traditional rival	20.654***	20.247***
	(3.772)	(3.710)
non-saturday game	-4.377***	-4.502***
	(1.056)	(1.068)
non FBS opponent	.242	.206
	(.937)	(.933)
conference game	4.716***	4.567***
	(1.749)	(1.737)
home aq team, visitor non-aq team	-2.901***	-2.895***
	(.875)	(.874)
home non-aq team, visitor aq team	-.328	-.322
	(1.172)	(1.151)
home non-aq team, visitor non-aq team	-3.756*	-3.557*
	(2.047)	(2.023)
Southeast Conference participant	17.898***	17.629***
	(3.273)	(3.247)
Pacific 12 Conference participant	14.159***	14.251***
	(3.826)	(3.800)
Big 12 Conference participant	35.507***	35.512***
	(7.254)	(7.182)
Mountain West Conference participant	-3.146	-3.031
	(2.169)	(2.226)
Mid-American Conference participant	-18.087***	-17.865***
	(2.933)	(2.928)
Atlantic Coast Conference participant	8.502***	8.824***
	(3.216)	(3.192)
Big East Conference participant	7.007***	7.240***
	(2.756)	(2.753)
Conference USA participant	-8.955***	-8.791***
	(2.428)	(2.411)
Western Athletic Conference participant	-3.995	-3.677
	(2.614)	(2.597)

Table 4. (Cont.) Tobit Results for Percent of Capacity

Independent Variable	Model 1	Model 2
Sun Belt Conference participant	-13.346***	-13.108***
	(2.914)	(2.889)
Independent participant	21.031***	20.986***
	(3.687)	(3.624)
undergraduate enrollment	1.000***	1.050***
	(.290)	(.285)
city population	-.125**	-.123**
	(.0568)	(.0557)
state population/FBS in state	.871	.817
	(.794)	(.770)
life win percentage	1.562***	1.550***
	(.305)	(.303)
bowls in last 10 years	6.971***	6.859***
	(1.285)	(1.268)
NFL team nearby	-15.890***	-15.679***
	(4.708)	(4.662)
national video coverage	5.739***	19.421***
	(1.486)	(6.268)
regional video coverage	1.581	1.040
	(2.127)	(7.940)
local video coverage	4.409**	-7.373
	(2.149)	(7.633)
national coverage temperature interaction		-.223**
		(.090)
regional coverage temperature interaction		.0133
		(.118)
local coverage temperature interaction		.185
		(.117)
constant	84.314***	84.099***
	(16.187)	(17.058)
chi square	4048.03***	9432.54***

,,*** indicates significance at the 10%, 5%, and 1% levels, respectively.*

real travel cost is statistically significant, its small coefficient implies a weak influence on attendance; the elasticity of stadium capacity use to real travel cost is -0.043 when calculated at the means. This variable attempts to measure the travel cost for fans of the visiting team and for many games, the visiting team fans represent 10% or less of the stadium capacity. An inelastic relationship between these variables was also found in two other studies (Falls & Natke, 2014, 2016). Fans appear to be far more sensitive to changes in ticket prices than they are to changes in travel costs.

All three weather-related variables are significant. Collectively, they suggest that warmer, wetter, and cloudier days will result in lower stadium use. An additional one inch of rain will reduce stadium utilization by 3.5 percentage points, while a 10-degree increase in temperature will decrease capacity use by one percentage point. Stadium utilization falls as the season progresses as shown by the significantly negative coefficient on season game number. This apparent loss of fan interest can be more than offset by winning during the season, playing a traditional rival, or playing a conference game. Playing a non-Saturday game causes a reduction of stadium utilization of approximately 4.3 percentage points.

The coefficient of the win advantage home variable implies that if the home team is one win better over the last eleven games than the visiting team, then stadium utilization is reduced by slightly less than 1%. If the winning records are reversed (i.e., win advantage visitor equals one) then stadium use is increased by almost 2%. These results could be driven by the preferences of home fans or visiting fans. The win advantage home coefficient is negative, suggesting that home fans do not want to see large mismatches on the field even when their team is expected to win (support for the uncertainty of outcome hypothesis) or that fewer visiting fans are likely to attend if the visiting team is more likely to lose. The win advantage visitor coefficient is positive, suggesting that home team fans want to see more successful visiting teams or that more visiting fans will attend the game if the visiting team is expected to win. This is consistent with the finding of Leonard (2005), which shows that visitor ticket sales were positively associated with the quality of both the home and visiting teams.

A team from an automatic-qualifying conference can expect to use less of its stadium when hosting a non-automatic-qualifying conference team compared to having a visiting team from an automatic-qualifying conference. When the game is between two teams from non-automatic-qualifying conferences, stadium utilization is lower than when both are from automatic-qualifying conferences. Conference affiliation matters. Having a team from the Atlantic Coast Conference, Southeastern Conference, PAC-12 conference, the Big 12 Conference, Big East, or an independent participant in the game increases stadium utilization relative to having a Big Ten participant. Five of the other participant dummy variables are significantly negative (Mountain West, Mid-American, Conference USA, Western Athletic, and Sun Belt).

Two of the three demographic variables are significant but have opposite signs. Having an additional 1,000 undergraduate students increases the stadium use by one percentage point while having an additional 1 million residents of a nearby city reduces stadium utilization by about 1.25 percentage points. Both measures of long-term home-team performance—bowls in the last 10 years and lifetime winning percentage—positively impact the percent of the stadium used for a game. One additional bowl game increases stadium utilization by almost 7%. However, having an NFL team nearby reduces the stadium use by more than 15%.

The focus of this study is the impact of video coverage on attendance. The results imply that both local coverage and national coverage have positive impacts on attendance relative to no video coverage of the game, although the magnitude of this impact is greater for national coverage than local coverage (i.e., coefficient of 5.739 vs. 4.409). Regional coverage has no impact on stadium attendance. These results could be explained by the behavior of home-team fans. Televised coverage of a game could affect attendance via both a substitution (negative) and an advertising (positive) effect. The positive coefficients for local and national coverage suggest that the advertising effect is greater than the substitution effect. For local fans of the home team, television coverage of any variety may increase the marginal benefit of attendance while the marginal travel costs are negligible.[13] Any television coverage designates a game as more important so more local fans attend. For fans residing at greater distances from the stadium (i.e., those that face greater travel costs), the advertising effect has to be strong enough to offset the higher marginal cost of attendance. Perhaps a nationally televised game may generate an advertising effect strong enough for a significant number of distant fans to attend the game.

Regression results suggest that the strength of the advertising effect varies across geographic broadcast coverage: national and local coverages have a positive impact on attendance while regional coverage has no influence. These differential impacts may simply reflect a statistical anomaly: regional and local broadcasts represent small proportions of the total sample (10% and 3%, respectively). More observations in these categories might alter the size and significance of these coefficients. In addition, nearly one-third of the local coverage observations (32%) were of two teams (Boise State University in Idaho and the University of Hawaii). The local coverage subsample also has a higher proportion of observations in a non-automatically qualifying conference than the overall sample. Other characteristics of the local or regional coverage subsamples could be driving the regression results.

In Model 2, we included interaction terms between temperature and video coverage.[14] The results for the non-video related variables are generally consistent with those from Model 1. The addition of the interaction terms results in a large increase in the magnitude of the coefficient of the national video coverage variable (i.e., it more than triples in size). The regional coverage and local coverage variables are insignificant as are their interaction terms.

The temperature-national coverage interaction term is significantly negative, which suggests that the positive impact of national coverage decreases as the temperature rises. At the sample's mean feels-like temperature of 60 degrees, capacity utilization is predicted to increase by 6.041 percentage points when the game is nationally televised. This is nearly identical to the impact of national television coverage variable in the first model (5.739) without an interaction term. Table 5 presents the estimated net impact of national television coverage at alternative temperatures. Note that the "break-even" temperature is nearly 88 degrees Fahrenheit. About 2% of the games in the sample experienced temperatures that high on game day, which indicates that the net effect of national coverage is positive for most games.

Table 5. Combined Impact of National Television Coverage in Model 2

Temperature (degrees Fahrenheit)	National TV dummy variable	Interaction term: TV and temperature	Combined impact
0	19.421	0	19.421
10	19.421	-2.23	17.191
20	19.421	-4.46	14.961
30	19.421	-6.69	12.731
40	19.421	-8.92	10.501
50	19.421	-11.15	8.271
60	19.421	-13.38	6.041
70	19.421	-15.61	3.811
80	19.421	-17.84	1.581
90	19.421	-20.07	-0.649
100	19.421	-22.30	-2.879

National television coverage alone raises attendance, holding other influences constant. This provides support for the advertising effect of wide-ranging television coverage. However, national coverage also makes fans' attendance decisions more sensitive to temperature. The slope of the demand function relative to temperature increases in magnitude from -0.104 without national television to a combined slope of -0.327 (average feels-like temperature plus national coverage interaction term) with national coverage—over three times larger.

Higher temperatures may signal rising opportunity costs of attending football games. About 90% of the games in the sample were held on a Saturday. Weekends typically provide more alternative leisure activities for fans than weekdays. The marginal cost of attending a football game may be high since, for fans facing substantial travel distances, it often involves giving up two days of activities rather than one. Warmer weather may increase the expected marginal benefits of other leisure activities relative to football attendance. When a television broadcast is widely available, the opportunity cost of alternative leisure activities decreases and fewer fans choose to attend the game. Football fans can enjoy the alternative leisure activities and still watch the game on television. Games broadcast only in the local market may draw additional fans from within the regional broadcast area but outside the local broadcast boundaries. In this case, more fans may choose to attend rather than miss an opportunity to see their favorite team play.

Two studies of MLB addressed the geographic distribution of television coverage. Both Lemke (2010) and Bruggink and Eaton (1996) employed a dummy variable approach and concluded that national television broadcasts had no impact on MLB game attendance. Their conclusions on local television broadcasts differed. Lemke found a positive impact while Bruggink found a positive impact for National League teams and a negative impact for American League teams. Differences among their findings and those of this study may be attributable to several factors. First, local television broadcasting in MLB covers a larger geographical area (e.g., an entire state via cable television subscription) than the local designation for college football used in this study (usually less than a 100-mile radius). The MLB local broadcast is more like the regional designation used in this study. Second, the broadcasting contracts also vary substantially. MLB negotiates a national television contract with broadcasters and each team has the right to negotiate a local television contract. All 162 games in the regular season (both home and away) are broadcast on the local network unless they are chosen for a national broadcast. National coverage usually supplants the local coverage (i.e., prevents the local broadcaster from airing the game). In college football, all broadcasting contracts are negotiated by both by the conference or the individual teams. Their contracts typically cover home games only rather than all games in the regular season (i.e., usually 4–7 games). Third, the 32 MLB teams are located in cities among the largest urban areas in the US. The 120 college football teams in this study are often located in smaller urban areas or non-urban locations.

Our results support the contention that a positive advertising effect exists when a game is video broadcast and that it is strong enough to offset a substitution effect. Previous studies of attendance at U.S. college football games concluded that video coverage leads to higher attendance. Price and Sen (2003) suggested it leads to an increase of approximately 5,000 fans, while Falls and Natke (2014) estimate about 1,300 more people. These results suggest that an advertising effect more than offsets the impact of any substitution effect associated with video coverage, and this net positive impact is decreasing over time as more games are broadcast. Mirable (2015) found that national television coverage of college football bowl games held at neutral sites had no impact on attendance, suggesting that a substitution effect was of sufficient magnitude to offset any advertising effect. This outcome is not surprising given that many fans must travel 500 miles or more to attend a bowl game and face high travel costs.

Summary and Conclusions

The major contribution of this study is analysis of the relationship between the extent of video coverage and stadium utilization using a panel data set of FBS teams. National video coverage has a significant and large positive impact on stadium capacity used (an advertising effect) but the magnitude of the impact falls as the temperature rises. A net positive impact of national coverage holds for about 98% of all games in the sample. At the sample's mean temperature of 60 degrees, a national telecast leads to a 6% increase in stadium capacity used. A nationally televised game also makes fans' attendance more sensitive to changes in temperature—the combined slope coefficient for temperature in Model 2 is three times the size of that in Model 1.

The empirical results from Model 2 suggest that: 1) the advertising effect of national televised coverage is strong (increases attendance by over 19% of capacity); 2) this strong advertising effect is dissipated by warmer weather (i.e., fans may substitute other recreational activities for game attendance as temperatures rise); and 3) local and regional televised coverage has no significant impact on game-day attendance.

Local coverage has a small positive impact only if a temperature coverage interaction variable is not included in the model. Regional coverage of a game apparently has no impact either on its own (intercept adjustment) or as an interaction term with temperature.

Teams and conferences that can increase the number of their games that are nationally televised could attract more fans via an advertising effect. One way to accomplish this is to negotiate contracts with broadcasters to increase geographical coverage. This has the potential to increase team and conference revenues via the broadcasting contract itself as well as higher game-day attendance with its accompanying revenue streams from ticket sales, parking fees, concessions, team merchandise sales, etc.

Among other findings is that higher travel costs for visiting fans, as measured by the real cost of a round trip between campuses using a private car with average fuel efficiency, reduce stadium utilization. However, attendance appears to be insensitive to changes in travel cost: an elasticity of -0.043. Higher ticket prices also reduced the percent of stadium capacity used. All of the team performance variables (i.e., season wins, lifetime winning percentage, number of bowl appearances in the last 10 years) were highly significant and had a positive influence on stadium utilization. The presence of an NFL franchise within 50 miles of the home team's main campus exerts negative impact on stadium utilization. The season game number was consistently a negative influence on capacity utilization, indicating that fan interest wanes as the season continues. This diminishing interest is more than offset by a team winning additional games during the season.

These results are consistent with those found in other studies of U.S. college football attendance, which find a positive effect for television coverage for home games. Only Mirable (2015) reported no impact of national video coverage on attendance for games played at neutral sites, which generally require fans from both teams to travel substantial distances to attend.

However, these results for U.S. college teams are contrary to those found in studies of European professional leagues (e.g., soccer and rugby), which generally conclude that fewer fans attend games that are televised. These disparate conclusions might be explained by a few fundamental differences in the markets: geographic size of video coverage, population density, travel distances, availability of public transportation, and the nature of fan bases for professional versus collage/amateur contests.

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Endnotes

[1] During the period of study (2007–09), five of the conferences in the FBS (i.e., the Power Five) exerted considerable power in influencing the governing body of the FBS (i.e., the NCAA) and the team selection process for the bowl games at the end of the regular season. Each bowl has a local organizing committee that offers invitations to teams based on the expected financial outcome (i.e., there is competition among bowl organizing committees to attract the best possible matchups in order to earn substantial profits and ensure the bowl's survival). Members of the Power Five consist of some of the oldest and largest (e.g., student enrollment, financial

resources) universities in the US. Power Five conferences negotiated contracts with some of the most prominent and most lucrative postseason bowl games (e.g., Rose Bowl) that granted status to elite teams from the Power Five conferences as "automatic-qualifiers" for these games. Less prominent bowl games negotiated contracts with Power Five conferences to guarantee teams for their bowl games as well (e.g., the third- and fourth-place conference teams). Still other bowls recruited opponents from among the remaining teams of the Power Five or teams from the other conferences in the FBS.

Any team that is a member of a Power Five conference has been identified as an "aq" (i.e., a team from an automatic-qualifying conference for a bowl game). Teams not in a Power Five conference are identified as "non-aq." We expect "aq" teams to attract more fans than "non-aq" teams, other things constant.

[2] Stadium capacity is that reported by the NCAA. Capacity is not the physical limits of the stadium since the calculated capacity utilization frequently exceeds 100%. Open-admission student sections and standing-room-only sales could account for many of these cases of "over-capacity." We checked the validity of any observation that exceeded 110% of the NCAA-reported stadium capacity. In all cases, supplementary information indicated that the attendance figures were valid.

[3] We chose to use the random effects Tobit model for panel data in STATA to estimate the coefficients. Tobit was chosen because of the limited dependent variable issue. Random effects estimation methods are appropriate when some independent variables do not change over time. In addition, there is no Tobit fixed-effects panel estimation procedure in STATA. We chose an upper bound of 100% of the stadium capacity when implementing the Tobit estimation procedure. There were 621 observations in which stadium capacity was equal to or greater than 100 percent, or 28% of the sample.

[4] All monetary measures used in the analysis are converted to real figures using the monthly Consumer Price Index for the state where the stadium is located.

[5] This assumption does not hold true for every team but, we believe, is a good approximation for many teams. Individuals with some tie to the university are more likely to attend a home game.

Many of these universities are state-supported institutions (i.e., they receive funding from their state's government). They also charge lower tuition for in-state residents and draw the majority of their students from within the state. In many cases, a large percentage of the alumni of these universities also reside in the state. Central Michigan University, for example, draws 94% of its undergraduate students from the state of Michigan and 63% of its alumni (136,638 people) live in the state.

[6] Gasoline prices are available for seven regions in the US: New England, East Coast, Central Atlantic, Gulf Coast, Midwest, Rocky Mountain, and West Coast.

[7] Many of the fans who attend college football games may use unsophisticated methods to determine the expected competitiveness of the game. A simple comparison of win-loss records is all that might be used by these fans since this information is widely available at a low cost. As suggested in the literature, there may be other more accurate measures of competitiveness (e.g., betting odds or performance rankings) than those used here.

[8] Traditional rivals are identified by games in which a trophy is awarded to the winner (e.g., the Paul Bunyan Trophy) or the game has a widely recognized name (e.g., Iron Bowl).

[9] The default category is a Big Ten conference game—one of the Power Five conferences.

[10] The data was divided into two groups: games that were televised and those that were not. A simple test of the difference in means was conducted. The results are displayed in the following table.

	Video sample	Non-video sample	Probability value of difference in means t-test
Observations	1,752	491	
Mean percent of capacity	84%	67%	0.00000
Mean stadium capacity	57,647	45,682	0.00000
Percent of sell-out games	31%	8%	0.00000
Mean ticket price	$41.43	$30.98	0.00000

These results provide some crude measure of the magnitude of the simultaneity between televised games and stadium attendance: televised games tend to be played in larger stadiums, use a larger portion of the stadium's capacity, are more likely to be sold-out, and charge higher ticket prices. The magnitude of this bias when all other variables are controlled for in the regression equations is difficult to measure.

[11] The authors also used an alternative set of data to instrument ticket prices. The Equity in Athletics website (*http://ope.ed.gov.athletics/*) provides a comprehensive set of data on athletic department operations, including measures of revenue and cost. Statistical testing indicated, however, that stadium capacity did a better job of instrumenting ticket prices than any other set of alternative instruments.

[12] There are several endogeneity issues in the estimation process: 1) ticket price and attendance; 2) video coverage and attendance; and 3) video coverage and game quality. The first is easiest to address via an instrumental variable estimation process since this is a classic demand-supply modeling issue and price and attendance are considered continuous variables. The second is more difficult to address since another set of variables would be used in the instrumentation equation, as well as because of the following questions: 1) Since the video variables are dummy variables, would their coefficients be an estimate of the probability of a game being televised or do they represent something else? 2) If instrumented values of a video variable can be constructed, how would one interpret the coefficients in the final equation? 3) Is it reasonable to assume that fans base attendance decisions on the probability of a game being televised or only after they know for certain that it will be televised? The third issue is also difficult to address. Broadcasters may choose games to televise based on their inherent quality or their uncertainty of outcome. Here arises the problem of identifying and estimating the underlying relationships. Skrok (2016) suggested that the inconclusive evidence for the outcome uncertainty hypothesis "originates in the inherent connection between quality, balance (or probabilities of results), and uncertainty."

[13] The travel cost variable in the equation measures the travel cost of the visiting team's fans. The model specification does not include a measure of the expected travel costs for fans of the home team. It is assumed that home team fans are more likely to live closer to the stadium than fans of the visiting team and, therefore, face lower travel costs. While this is not true in all cases, we expect this generally to be true. It is common for regional state universities to have the majority of its alumni living within the state boundaries.

[14] We also explored including interaction terms between precipitation and television coverage. Precipitation may encourage more fans to stay home if television coverage is available. Empirical results showed that all interaction terms were insignificant. This result could be explained by: 1) only 5% of games had more than one-half inch of precipitation; 2) precipitation was measured in a 24-hour period rather than the specific period in which the game was played. Fans are likely to base attendance decisions on the anticipated precipitation during game time rather than the actual precipitation for the whole 24-hour period of game day. The ex ante probability of precipitation and the timing of precipitation are not captured by the variable used in this analysis.