College Football Attendance in the Long Run: Division II

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A balanced panel (52 teams over 38 years) is used to estimate fixed- and random-effects models for average season attendance. All variables are either stationary or cointegrated. Independent variables measure economic conditions, demographic characteristics, and team performance. Contrary to expectations, attendance is an inferior good while travel cost (real gas price per mile driven) is insignificant. Greater undergraduate enrollment increases attendance. Attendance decreases with rising county population in both models – one at ten percent probability. More wins in the current season and a greater number of playoff appearances in the last ten years increase attendance. Lifetime winning percentage is insignificant.

Keywords: U.S. college football, attendance, time series, panel regression

INTRODUCTION

Large television contracts negotiated by conferences and teams in the last twenty years have changed the landscape of the Football Bowl Subdivision (FBS) in the U.S. However, teams in Division II typically have very limited media exposure beyond the local area. Stadium attendance remains a major source of revenue for many Division II football programs and athletic departments.

Despite the importance of ticket sales revenue for Division II football teams, attendance at this level has drawn little interest in the empirical economic literature. The few studies that examine attendance (Wells, et.al., 2000; DeSchriver and Jensen, 2002; Natke and Thomas, 2019) take a similar approach as FBS studies (e.g., Price and Sen, 2003; Falls and Natke, 2014) and generally support the importance of economic, demographic, game characteristic and team performance variables in driving game-day football attendance.

Schreyer and Ansari (2021) report that most sports attendance studies focus on game-day attendance while a much smaller group uses total season or average season attendance as the dependent variable for a variety of sports and leagues (e.g., Alvarado-Vargas and Zou, 2019; Lee, 2018; Mills and Fort, 2018). Paul et.al., (2012) examines a sample of FBS teams.

Stadium attendance for Division II football programs generate revenue from ticket sales but also potentially produces associated revenue streams: parking, concessions, and souvenirs (Coates and

Humphreys, 2007; Krautmann and Berri, 2007; Chastain et.al., 2017); state government annual appropriations to public universities (Alexander and Kern, 2010; Humphreys, 2006); fund raising (Cohen, et.al., 2011; Martinez et. al., 2010); and student recruitment (Tucker, 2005; Perez, 2012; Caudill, et.al., 2018). Businesses in the local economy benefit from the influx of fans (Baade, et.al., 2008; Lentz and Laband, 2009; Coates and Depken, 2011). The magnitudes of these revenue impacts are influenced, in part, by stadium capacities which vary widely in Division II: from 1,200 seats for Assumption University to 23,000 at the Pro Football Hall of Fame Field at Fawcett Stadium in Canton, Ohio which is the home field for both Malone and Walsh.

Attendance also can alter fan behavior. Home-field advantage becomes stronger with an increase in the number of home-team fans in the stadium. This, in turn, could improve home team performance, enhance fans' game experience, and encourage more fans to return for additional games thereby creating habit persistence.

Absent from the economic literature is a study of Division II over decades to identify the long-run influences on football attendance. This study uses a balanced panel of 52 Division II teams across 38 years (1982-2019) to examine three major influences on attendance: economic conditions, demographic characteristics, and team performance. Game characteristics, typically included in game-day models, are omitted since the focus is average season attendance. Stationarity tests are conducted, and variables identified as non-stationary are tested to determine if they are cointegrated with attendance. Regression models are estimated using fixed- and random-effects panel methods which control for cross-section and time-series effects.

This study contributes to the literature in the following ways. First, this is one of a few studies of Division II attendance. Second, the data extends over 38 years, far longer than any previous study of Division II and longer than most attendance studies regardless of sport. Third, the time series properties of regression variables are examined. No previous study of Division II has tested for stationarity and cointegration. In addition, corrections for serial correlation in the models are made. Fourth, multiple measures of team performance are used that cover three periods: short, intermediate and long term. Fifth, few sports attendance studies have considered the impact of macroeconomic variables according to Schreyer and Ansari (2021). The period under study is sufficiently long to encompass a strong trend of economic growth with several full business cycles. Real per capita income is used to determine if Division II football attendance is a normal or inferior good.

GAME-DAY FOOTBALL ATTENDANCE IN DIVISION II

Empirical stadium attendance studies that employ regression analysis typically select independent variables from four categories: economic, demographic, team performance, and game characteristics. Table 1 presents brief descriptions of three studies of Division II game-day football attendance and Table 2 displays some common variables in these studies' regression equations. The earliest study (Wells, et.al., 2000) surveyed all athletic directors about a wide range of factors in a single season (1998) and reported a response rate of 61 percent. There may be some self-selection bias. Of the 23 variables collected via survey, they included 12 in the reported ordinary least squares regression equation. Among the conclusions are that the team's current and past seasons' winning percentages, and student enrollment all positively impact attendance. Some game specific characteristics also have significant influences: placement of the game in the season, game time, promotions, and ticket prices.

TABLE 1
STUDIES OF DIVISION II GAME-DAY FOOTBALL ATTENDANCE

Authors	Sample size	Sample period	Dependent variable(s)	Estimation method(s)	Some major findings
Wells, Southall and Peng (2000)	457	1998	game-day attendance	OLS	Attendance higher early in season; increases with season wins, higher general admission ticket price, lower student ticket price; higher enrollment, homecoming games
DeSchriver and Jensen (2002)	1302	1994, 1996, 1999	Log of game-day attendance	OLS	Attendance higher early in season; increases with higher ticket prices, lower travel cost, higher enrollment, higher precipitation, homecoming games
Natke and Thomas (2019)	6245	2001-2009	game-day attendance	random effects	Attendance higher early in season; increases with team performance, higher ticket prices, lower travel costs, higher enrollment, rivalry games

DeSchriver and Jensen (2002) collected data via survey over three years (1994, 1996, 1999) and report similar response rates as Wells et al. (2000). They estimate four regression equations via ordinary least squares: one for each season and one which pools observations across years. Some of their findings concur with Wells et al. (2002). Exerting positive impacts on attendance are better team performance (current or previous season winning percentage), student enrollment, promotions and ticket prices. They also concur that attendance decreases as the season progresses. Among unique findings are: attendance decreases as travel cost, as measured by mileage, increases; city population exerts no impact; and, unexpectedly, attendance rises when rain or snow is present on game day.

TABLE 2
SELECTED COEFFICIENT ESTIMATES FROM GAME-DAY DIVISION II FOOTBALL ATTENDANCE STUDIES

Variable[a]	Wells et al.	DeSchriver and Jensen	Natke and Thomas
Income	NE	NE	+
Travel cost	NE	-	-
Season wins	+	+	+
Ticket price	+	+	+
Playoffs last 10 years	NE	NE	+
Life wins	NE	NE	NS
Enrollment	+	+	+
Population	NE	NS	NS
Sample size	457	1302	6245

[a] Variables may be measured differently. Sample size in brackets. Equations include other independent variables. +: significant and positive; -: significant and negative; NS: Not Significant at 5% level; NE: Not Estimated in regression equations.

Natke and Thomas (2019) use a sample of all Division II teams over nine years (2001-09) and panel regression methods (random effects). Some conclusions confirm results of the previous studies and some are unique. Significant coefficients include ticket price (positive), real travel cost (negative), undergraduate enrollment (positive), season wins (positive), home team wins in the last eleven games (positive), playoffs in the last ten years (positive), and season game number (negative). Visiting team characteristics also are significantly positive influences on attendance: conference member, rival, Football Championship Subdivision team, a historically black college opponent. State population and lifetime winning percentage are insignificant. There is weak evidence that attendance is a normal good.

THE MODELS

A balanced panel (52 teams across 38 years) is used to estimate regression models for average season attendance (i.e., total home season attendance divided by the number of home games). Fans are predicted to attend a game when the expected marginal benefit exceeds the expected marginal cost. The regression model takes the general form:

$$A_{it} = \alpha + E_{it}\beta + D_{it}\lambda + P_{it}\xi + e_{it} \quad (1)$$

where A_{it} denotes attendance. E_{it}, D_{it} and P_{it} are sets of independent variables, specifically, economic conditions, demographic characteristics, and team performance, respectively, and α, β, λ and ξ are parameters to be estimated. The residual, e_{it}, has the usual white noise properties.

Given the period length, some variables may be non-stationary, and this could lead to poor regression results. Standard tests are used to determine which independent variables are stationary. Subsequently, non-stationary variables are tested for cointegration with attendance. Two panel regression procedures generate parameter estimates: random effects and fixed effects.

The impact of stadium capacity on attendance has been an issue in the literature. Some studies measure game-day attendance relative to stadium capacity and employ estimation methods for limited dependent variables (e.g., Tobit) to avoid specification error in the model. This is appropriate when a substantial portion of games in the data set reach the capacity constraint (Falls and Natke 2014). This study ignores this possible censoring issue for two reasons. One, most games in Division II do not come close to the official stadium capacity. DeSchriver and Jensen (2002) cite evidence that capacity is rarely reached. Second, the official stadium capacity often underrepresents the "effective" stadium capacity. Many stadiums in Division II have formal seating on only one or two sides of the playing field allowing for a sizeable "overflow crowd". Therefore, the official stadium capacity does not accurately measure the physical limits on attendance. A sample of all Division II teams from 2001-2019 indicates that less than ten percent of games reach their official capacity limits (Falls et al., 2022b).

DATA

The data constitute a balanced panel of 1976 observations: 52 Division II teams which played at least one regular season home game in each of 38 seasons (1982-2019). Teams that joined or left this division in any sample year were excluded. Games played outside the regular season or at neutral sites were omitted.

The models include measures of economic conditions. A state's annual per capita real income is used as a measure of fans' budget constraints. Most often people attending a game are fans of the home team and many are state residents. Recreational services are expected to be a normal good. U.S. real income displays a general upward trend during the sample period, suggesting rising football attendance. The sample period experienced several business cycles. A recession could reduce football attendance by a decrease in real income and be reinforced by a change in consumer expectations: households which expect a drop in future household income or face increasing uncertainty of future income may reduce spending on recreational activities.

Travel cost is measured by the per-mile, inflation-adjusted fuel cost of driving a private automobile. This cost is derived from data on the national average weekly price of gasoline over a three-month period (September-November) and the U.S. vehicle fleet's average fuel efficiency for a given year. Fuel efficiency can rise or fall across years as the composition of the vehicle fleet changes (e.g., a higher proportion of light trucks and SUVs). Fuel efficiency changes slowly over time whereas gasoline prices fluctuate widely over the period. Increases in real travel cost is expected to decrease attendance.

College football studies that include ticket price in their models reach differing conclusions. Some find no impact on attendance (Falls and Natke, 2014; Price and Sen, 2003), some find a positive relationship (DeSchriver and Jensen, 2002; Falls and Natke, 2016; Fullerton and Miller, 2017; Natke and Thomas, 2019), while others find a negative impact (Price and Sen, 2003; Falls and Natke, 2016). Other studies exclude ticket prices (Eddy et al., 2011; Groza, 2010; Mirabile, 2015; Paul, et.al., 2012). Paul et al. (2012) claim that excluding ticket prices creates no omitted variable bias in their regression equations.

Demographic measures are undergraduate enrollment and county population which are expected to exert a positive impact on attendance. Students and county residents live close to the stadium and are more likely to have strong attachments to the college (e.g., employees, alumni) than people more distant from campus. The strength of the county population's positive impact on attendance, however, may be mitigated by another factor: more populous counties offer a greater quantity and variety of leisure-time activities which serve as substitutes for Division II football games. County population, therefore, could have a negative impact on football attendance.

Team performance is measured across three periods: short run, intermediate term, and long run. The season winning percentage measures current success, the number of playoff appearances in the previous 10 years measures intermediate performance, and lifetime winning percentage measures long-run team success. Regardless of measure, greater on-field success is expected to generate higher football attendance.

SOME DATA LIMITATIONS AND INTERPRETATION ISSUES

The attendance figures reported by the NCAA could be a turnstile count or ticket sales which could confound accurate interpretation of regression results. In addition, many Division II schools allow students, via a student identification card, to attend without paying an entrance fee. The magnitude of any biases in reporting attendance are unknown in any previous study of Division II.

State real per capita income may be an inaccurate measure of fans' budget constraints. Some Division II fans are willing to travel long distances to attend a game. Unlike Division I teams, however, a greater portion of fans are likely to be local residents. Some campuses lie geographically close to a state boundary which could reduce the influence of choosing the "home" state to measure income, particularly if the bordering states have substantially different incomes. Some states with strong college football cultures may have per capita incomes lower than the national average while some states with higher personal incomes may have lower interest in college football. These offsetting cultural and demographic characteristics may lead to the conclusion that attendance at Division II football games is not influenced by real income. In addition, specific areas of large states (e.g., Texas) could have widely divergent per capita incomes.

In theory, ticket prices should reflect the demand for a game relative to capacity constraints. In practice, they do not. In the early years of our sample, reported ticket prices for a team might be constant for five years or more. This stability of prices may lead to the conclusion that prices do not influence attendance. In recent years, more Division II athletic departments have begun imitating Division I practices of charging different prices depending on seat location and opponent in an attempt to increase ticket revenue. This variance in the setting of prices over time make the interpretation of results more difficult. In addition, the mere collection of accurate price data is difficult since most Division II teams have only recently posted information on prices.

Previous studies of Division II attendance conclude that higher ticket prices are associated with higher attendance (DeSchriver and Jensen, 2002; Natke and Thomas, 2019). These counterintuitive results could be created by the impact of rising demand on both price and stadium capacity over time. Given the difficulty

of assembling accurate and consistent ticket prices for all teams in our sample across four decades, we have chosen to exclude this variable from the regression models.

There are issues with the measurement of travel cost. A local measure of gas prices is preferred over a national one. However, only a national measure is available for the entire sample period as regional gas prices are unavailable for 1980-1992. Opportunity cost may comprise the overwhelming share of the total cost of attendance rendering travel cost insignificant. The time commitment for non-students on a weekend may be substantial and students with employment may lose income by attending a game.

Changes in conference affiliation could influence the relationship between a team's success and attendance. Teams moving from a weak conference to a stronger one may experience a decrease in their season winning percentage but an increase in attendance as they face better-quality opponents and, possibly, get more visiting team fans. Teams moving from a strong conference to a weaker one may increase their winning percentage but suffer a decrease in attendance. There is conflicting evidence on the impact of conference realignment on attendance in Division I (Groza, 2010; Falls and Natke 2020). There are no corresponding empirical studies for Division II. We choose not to explore this issue in the current study.

DESCRIPTIVE STATISTICS

Table 3 presents descriptive statistics for selected variables. Season attendance ranges from a low of 1,250 fans (Bowie State in 1986) to a high of 121,337 (Clark Atlanta in 1994) with an average of 20,868. The mean average home attendance is 4,087 with a range of 400 (Bemidji State in 1987 and Western State in 2002) to 20,223 (Clark Atlanta in 1994).

TABLE 3
SUMMARY STATISTICS FOR VARIABLES ACROSS 52 TEAMS OVER 38 YEARS

variable	mean	standard deviation	minimum	maximum
season attendance	20,868	13,145	1,250	121,337
average home attendance	4,087.12	2,465.72	400	20,223
real state personal income per capita	16,545.22	3,090.11	9,484	30,934
mean US real gas price	1.02	0.27	0.65	1.59
real gas price per mile driven	0.05	0.01	0.03	0.08
season win percentage	52.19	23.49	0	100
playoffs in the last 10 years	1.29	1.97	0.00	10.00
county population	238,688	341,288	9,929	2,231,999
undergraduate enrollment	5,976.85	4,006.30	305	22,209
life win percentage	52.10	8.20	0.00	73.58
observations	1976			

Average state real income per capita is $16,545 (low of $9,484 in Alabama in 1982 and a high of $30,934 in Connecticut in 2019). The mean real gas price is $1.02, ranging from a low of $0.65 in 1986 to a high of $1.59 in 2012. Average real gas price per mile driven is $0.050 with lowest value $0.032 in 1998 and highest value $0.079 in 1982.

County population averages 238,688 (low of 9,929 for Gunnison County [Western State] in 1987 and a high of 2,231,999 for Wayne County, Michigan [Wayne State] in 1982. Mean undergraduate enrollment is 5,977 students (low of 305 for Livingstone in 2001 and a high of 22,209 for Grand Valley State in 2016).

Teams, on average, have a lifetime winning percentage of 52.1% and appeared in 1.29 playoff games in any 10-year period. Bowie State has the lowest lifetime winning percentage (31.78% in 1987) while

Grand Valley State has the highest (73.58% in 2019). Valdosta State began playing in 1982 and has a lifetime winning percentage of zero starting that season. Thirteen teams had undefeated seasons over the sample period while forty-two teams had zero season wins.

TIME-SERIES CHARACTERISTICS OF THE DATA

A variety of tests are used to determine whether variables have a unit root over the 38-year period of the sample: Levin, Lin and Chu, 2002; Harris and Tzavalis, 1999; Breitung and Das, 2005; Im et.al., 2003; Choi, 2001; Hadri, 2000. Overall results, presented in Table 4, suggest the following variables are stationary: average home attendance, real gas price per mile driven, season win percentage, and last season's win percentage. The other variables are not stationary at a ten percent significance level: state real personal income per capita, playoffs in last ten years, life winning percentage, undergraduate enrollment, and county population.

TABLE 4
UNIT ROOT TESTS*

variable	L-L-C	H-T	I-P-S	B	F	H
average home attendance	yes	yes	yes	yes	yes	no
state personal income per capita	no	no	no	no	no	no
real gas price per mile driven	yes	yes	yes	no	yes	no
season win percentage	yes	yes	yes	yes	yes	no
past season's win percentage	yes	yes	yes	yes	yes	no
playoffs in last 10 years	no	no	na	no	no	no
life win percentage	yes	yes	no	no	no	no
undergraduate enrollment	yes	no	no	no	no	no
county population	yes	no	no	no	no	no

*yes = stationary at a probability value of at least 90 percent. L-L-C: Levin-Lin-Chu; H-T: Harris-Tzavalis; I-P-S: Im-Pesaran-Shin; B: Breitung; F: Fisher; H: Hadri

Nonstationary variables were tested for a long-run equilibrium relationship (cointegration) with attendance: Kao, 1999; Pedroni, 1999; Westerlund, 2005. Results presented in Table 5 strongly conclude that cointegration exists between attendance and the non-stationary independent variables. Since all variables are either stationary or are in a long-run equilibrium relationship they will be entered into the following regression equations without taking first differences.

Since the panel spans 38 years serial correlation is likely for some of the variables. Table 6 presents the results of alternative serial correlation tests: bias-corrected Born and Breitung (2016) Q(p) test, heteroskedasticity-robust Born and Breitung (2016) HR-test, and Inoue and Solo (2006) LM-test. Two tests, the Q(p) and HR, suggest strong serial correlation for three variables: real income per capita, season win percentage and county population. Results from the LM test are unreliable for all variables. Each regression model will be corrected for serial correlation prior to estimation.

TABLE 5
COINTEGRATION TESTS

Cointegration test	Kao t statistic	p-value	Pedroni t statistic	p-value	Westerlund t statistic	p-value
Dickey-Fuller	6.28	< 0.001				
Modified Dickey-Fuller	5.14	< 0.001				
Augmented Dickey-Fuller	6.34	< 0.001	2.9589	0.0015		
Unadjusted Dickey-Fuller	7.27	< 0.001				
Unadjusted-modified Dickey-Fuller	5.65	< 0.001				
Phillips-Peron			1.42	0.0773		
Modified Phillips-Peron			4.91	< 0.001		
Variance ratio					-2.1462	0.0159

Tests for cointegration: state real personal income per capita, playoffs in the last 10 years, life win percentage, undergraduate enrollment, and county population. Null: no cointegration.

TABLE 6
PANEL SERIAL CORRELATION TESTS

Serial correlation test	Q(p) statistic	p-value	HR statistic	p-value	IS-LM statistic	p-value
average home attendance	15.45	< 0.001	0.70	0.483	na	na
state real personal income per capita	318.18	< 0.001	-15.05	< 0.001	na	na
real gas price per mile driven	0.00	1.000	na	na	na	na
season win percentage	157.66	< 0.001	7.88	< 0.001	na	na
playoffs in last 10 years	63.01	< 0.001	na	na	na	na
life win percentage	30.70	< 0.001	-1.34	0.179	na	na
undergraduate enrollment	34.89	< 0.001	-0.86	0.388	na	na
county population	6.65	0.036	-2.41	0.016	na	na

Tests for panel serial correlation over time: average home attendance, state real personal income per capita, real gas price per mile driven, season win percentage, playoffs in the last 10 years, life win percentage, undergraduate enrollment, and county population. Null: no serial correlation. STATA IS test results for all variables are unreliable; all three test results for real gas price per mile driven are unreliable.

EMPIRICAL RESULTS

Random-effect (assuming heterogeneity is itself a random variable) and fixed-effect (assuming heterogeneity is constant) techniques are used to estimate the average season attendance regression equation. The estimated coefficients and model statistics are reported in Table 7.

TABLE 7
FIXED AND RANDOM EFFECTS REGRESSION RESULTS FOR AVERAGE HOME ATTENDANCE

	Fixed effects			**Random effects**		
independent variable	**coefficient**	**standard error**	**p-value**	**coefficient**	**standard error**	**p-value**
state personal income per capita	-0.0847	0.0234	< 0.001	-0.0967	0.0204	< 0.001
real gas price per mile driven	2311.27	4196.85	0.582	3875.92	3609.95	0.283
season win percentage	9.05	3.37	0.007	9.78	3.38	0.004
playoffs in the last 10 years	95.75	39.26	0.015	117.40	36.73	0.001
life win percentage	-4.54	23.87	0.849	8.48	14.76	0.566
undergraduate enrollment	0.3344	0.0459	< 0.001	0.1678	0.0347	< 0.001
county population	-0.0028	0.0010	0.007	-0.0009	0.0005	0.074
constant	3686.59	738.81	< 0.001	3603.73	863.75	< 0.001
F	14.91					
probability(F)	< 0.001					
Wald Chi-square				89.47		
probability(chi-square)				< 0.001		
observations	1976			1976		

Corrected for serial correlation.

Most coefficients are consistent in sign, magnitude and probability values across the two equations. The coefficients of the economic variables in these panel models exhibit unexpected outcomes. Contrary to expectations, real income exerts a negative and significant influence on attendance: reducing attendance by 85 and 97 persons per an additional $1,000 in real per capita income. This suggests that Division II football is an inferior good: more fans attend when real incomes fall. The cause of this outcome is unclear. If real per capita income measures the opportunity cost of attendance then rising incomes increase the total cost of attendance and attendance decreases. Alternatively, rising real income may generate more close recreational substitutes for weekend Division II college football games. With more recreation options, some potential fans may choose to attend college games at nearby schools or participate in other recreational activities. Yet another possible explanation: there may be a negative correlation between a state's real income and its preferences for college football in our sample.

The real gas price per mile driven coefficient is statistically insignificant in each equation. If Division II football fans reside close to the stadium or are prone to ridesharing, then travel costs are a small portion of the total cost of attendance and may not exert an independent significant impact. The opportunity cost of attendance may be high for potential attendees: for non-students the time commitment on a weekend day and lost wages for students with weekend employment. If the opportunity cost of attendance is a much higher share of the total cost of attendance than the direct travel cost then real gasoline prices exert little influence on the attendance decision.

The coefficients for short run and intermediate term team performance are positive and statistically significant suggesting that a recent team success influences attendance in the expected direction. Short-term performance has the largest impact: one more season win can raise average attendance by 83 to 89 people based on an eleven-game regular season. Over a six-game home schedule, one additional win adds about

500 people to season attendance. An additional playoff game appearance in the last ten years increases average attendance by 96 to 117 fans. A team with ten playoff appearances in the last ten years can expect average attendance to be 1000 fans higher than teams with zero. The magnitude of these impacts can be substantial given that the average season attendance in the sample is around 4,000. Lifetime winning percentage is insignificant in both models. Apparently, fans do not consider long-term team performance when making attendance decisions. Overall, there is some evidence of habit persistence among fans both within and across seasons. Habit persistence may be stronger in the early portion of the season before fans can accurately assess the quality of the current team. Establishing a winning reputation through playoff appearances increases attendance although habit persistence seems limited to the intermediate period.

Among demographic variables, undergraduate enrollment exhibits the strongest impact on attendance. An additional 100 undergraduate students generate a 17 to 33 person increase in attendance. Some of the additional fans may be non-students: the result of a broader potential game audience via students' networks of friends, family and acquaintances. Also, current undergraduate enrollment might be a proxy for the alumni population, a group with stronger ties to the institution than the general population.

County population exerts a negative influence on attendance in both the fixed-effect and random-effect regression, but magnitudes are small: an additional 1,000 county residents lead to a 1 to 3 person decrease in attendance. The coefficient's probability value in the random-effect model is over seven percent. Some studies of college football attendance also find an inverse relationship between attendance and population measures (Paul et al., 2012; Falls and Natke 2014, 2017). Greater county populations provide a wider potential audience for football games but also generate more substitute recreational activities for potential fans. These recreational opportunities include other college football games, athletic events at all levels of competition, arts and music entertainment, and outdoor recreation. Apparently, the impact of recreational substitutes for Division II teams outweighs the potential audience effect.

Although the results from the two models are very similar, two specification tests are conducted to determine if one estimation method is preferred over the other. Results of these tests are presented in Table 8. The tests indicate that the fixed effects model is preferred as it produces both consistent and efficient coefficients.

TABLE 8
SPECIFICATION TESTS: FIXED EFFECTS (FE), RANDOM EFFECTS (RE), ORDINARY LEAST SQUARES (OLS)

Test	Chi-square statistic	p-value	conclusions
Hausman: FE vs. RE	-23.90	na*	Fixed effects model is not only consistent but also efficient
Breusch-Pagan: RE vs. OLS	7,293.67	< 0.001	Heterogeneity exists across teams

*na: probability values are not available for negative chi-square statistics.

COMPARISONS WITH OTHER LONG RUN STUDIES

Table 9 offers brief descriptions of three long-run studies across different divisions (Division II, FCS and FBS) which use similar models and estimation techniques for a common dependent variable: average season attendance. The only common conclusion across the three studies is that greater team success during the season raises average attendance. Other variables influence attendance in different ways across the football divisions. FBS games are a normal good while FCS and Division II games are inferior goods. Real gas price per mile driven is insignificant for Division II and the FBS while, unexpectedly, positive for the FCS. There is mixed evidence that post-season appearances (playoff or bowl games) increase regular season attendance: positive for both random and fixed effects models for Division II; positive for the FBS in the random effects model; not significant for the FCS in either model. There are mixed results for lifetime winning percentage as well: not significant for Division II; positive for the FBS random effects model; and

positive for both FBS and FCS models. Undergraduate enrollment is significant and positive for Division II but insignificant for the other divisions. Only in the Division II fixed effects regression is county population significant (negative).

TABLE 9
COEFFICIENT ESTIMATES FROM THREE LONG-RUN FOOTBALL ATTENDANCE STUDIES*

Independent variable[a]	**Div II**	**FCS**	**FBS**	**Div II**	**FCS**	**FBS**
	FE	FE	FE	RE	RE	RE
income	-	-	+	-	-	+
unemployment rate	NE	-	NE	NE	-	NE
real gas price per mile	NS	+	NS	NS	+	NS
season wins: ratio or %	+	+	+	+	+	+
power ranking	NE	NE	+	NE	NE	+
playoffs or bowls last 10 years	+	NS	NS	+	NS	+
life win %	NS	+	NS	NS	+	+
enrollment	+	NS	NS	+	NS	NS
county population	-	NS	NS	NS	NS	NS
observations	1976	2318	3960	1976	2318	3960

*Falls et al. 2022a, 2022b, 2022c. [a] Variables may be measured differently. Equations may include other independent variables, e.g., conference controls. +: significant and positive; -: significant and negative; NS: Not Significant at 5% level; NE: Not Estimated in regression equations.

These results suggest that there are substantial differences in fan attendance behavior across divisions that athletic departments should consider when making decisions. However, one pervading conclusion is that winning college football teams draw more fans to the games. All three measures of team performance are consistently positive across all divisions when they are significant. Better current season performance boosts average attendance across all divisions and models. Winning football teams are rewarded with higher attendance in the current season and, perhaps, in future seasons through the habit persistence among fans. Each division displays some evidence that more post-season appearances or greater lifetime winning percentages boost attendance.

SUMMARY AND CONCLUSIONS

A balanced panel data set comprised of 52 college football teams that were members of Division II during the entire 1982-2019 period is used to examine potential long run influences on average stadium attendance. Tests conclude that all variables are either stationary or cointegrated. Two regression methods are employed, fixed effects and random effects, using measures of team performance, economic conditions, and demographic characteristics.

Results demonstrate that team performance strongly increases season attendance. When controlling for economic and demographic factors, more wins in the current season and more playoff appearances in the last ten years increase average game attendance. There is no evidence of long run habit persistence among fans: lifetime winning percentage is insignificant in both models. Higher undergraduate enrollment increases attendance in both models, The coefficient for county population is negative in both models although with a probability value over seven percent int the random effects model. The performance of the two economic variables is mixed: real per capita income has an unexpected negative sign (indicating an inferior good) while the travel cost measure (real gas price per mile) is never significant. A specification test concludes that the fixed effects model is superior to the random effects model.

The results of this study also display some consistencies with two previous game-day studies of Division II and two long-run studies of the FBS and FCS. All studies demonstrate that team performance matters whether measured in the short-, intermediate- or long-run. Other common independent variables used across the studies display inconsistent patterns either in terms of coefficient signs or levels of statistical significance. For example, football games are normal goods for FBS fans but inferior ones for fans of FCS and Division II teams.

This study confirms the results found in numerous previous empirical works that winning college football teams exert a strong positive influence on attendance regardless of the period over which team performance is measured. Although current athletic directors and coaches have the most direct control over short run success, there is some evidence that habit persistence is part of fans' attendance decisions. Building and maintaining team success on the field is important for increasing attendance now and in the future.

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APPENDIX 1: DATA SOURCES

Season attendance: NCAA website for attendance records (https://www.ncaa.org/sports/2013/11/19/ncaa-football-attendance.aspx) and annual football record books (https://www.ncaa.org/sports/2013/11/19/ncaa-football-records-books.aspx; https://www.ncaa.org/sports/2013/11/19/ncaa-division-ii-iii-football-records-books.aspx). Individual team websites.
Home games per season: NCAA website and annual football record books (see URLs above)
State real personal income per capita: Bureau of Economic Analysis
Gasoline prices: U.S. Department of Energy
Vehicle fleet fuel efficiency: Office of Highway Policy Information annual reports
Season win percentage: calculated from NCAA data
Playoffs in the last 10 years: calculated from NCAA website, NCAA annual record books and team websites
Life win percentage: calculated from NCAA data
Undergraduate enrollment: Integrated Postsecondary Education Data System (IPEDS)
County population: U.S. Census

APPENDIX 2: TEAMS IN THE SAMPLE

American International
Angelo State
Ashland
Augustana (SD)
Bemidji State
Bloomsburg
Bowie State
California (PA)
Central Missouri State
Clarion
Clark Atlanta
Colorado Mines
East Stroudsburg
Edinboro
Elizabeth City State
Fayetteville State
Ferris State
Fort Valley State
Grand Valley State
Indiana (PA)
Johnson C. Smith
Kentucky State
Kutztown
Livingstone
Lock Haven
Michigan Tech
Millersville
Minnesota - Duluth
Minnesota State - Mankato
Missouri S&T (Rolla)
Morehouse
Northern Michigan
Northwest Missouri State
Saginaw Valley
Shippensburg
Slippery Rock
Southern Connecticut State
St. Cloud State
Texas A&M - Commerce
Texas A&M - Kingsville
Truman
Tuskegee
Valdosta State
Virginia State
Virginia Union
Wayne State (MI)
West Alabama
West Chester
West Georgia
Western State
Winona State
Winston-Salem