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The Effects of Beer Sales on Attendance at Collegiate Football Games

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Abstract

Collegiate sports have become increasingly popular in recent years with college football seeing, arguably, the greatest rise in popularity. This has led to an increased number of Football Bowl Subdivision (FBS) bowl games, which now culminate in a college football playoff. Universities are constantly developing new and innovative ways to increase revenue. One potential solution receiving increased consideration is the option of selling beer throughout stadiums. Previous research has separately focused on aspects of beer consumption and factors that influence collegiate sport attendance, but not in the same study. Thus far, studies focusing specifically on the topic of how beer sales affect attendance have been lacking. The purpose of this study is to examine whether or not the sale of beer inside FBS collegiate stadiums affects attendance. Our results indicate there is a negative correlation between beer availability and attendance. No significant difference was found as to whether or not stadium location, on or off-campus, affects attendance figures.

The Effects of Beer Sales on Attendance at Collegiate Football Games

Collegiate sports have become increasingly popular in recent years with college football seeing, arguably, the greatest rise in popularity. This has led to an increased number of Football Bowl Subdivision (FBS) bowl games, which now culminate in a college football playoff. Even as college football continues to grow, universities are finding it difficult to keep their attendance rates steady (Solomon, 2015). Attendance rates at the FBS level have been decreasing since 2008. Further, the conferences that make up what is known as the Power Five, the Big Ten (B10), Big Twelve (B12), Atlantic Coast Conference (ACC), Southeastern Conference (SEC), and the Pacific Twelve (PAC-12), have collectively seen a decrease in attendance since 2008. Similarly, student attendance rates at the FBS level have seen a 7.1% drop since 2009 (Cohen, 2014).

Universities are constantly developing new and innovative ways to increase attendance. Changes include making Wi-Fi accessible in stadiums, readily available and more efficient public transportation, improved and expanded food and drink options, and a host of other improvements (James, 2016). One potential solution that is receiving increased consideration is the option of selling of beer throughout stadiums. As of 2014, there were 32 FBS universities that sold beer in their football stadiums whether on or off campus (McWhinnie, 2015). In 2015, both the University of Maryland and the University of Texas at Austin began to sell beer at home football games, increasing the number to 34 (Malone, 2015). The State University of New York at Buffalo is currently contemplating whether or not to sell beer in their stadium. It has been reported, and believed by many, that not only would beer sales increase revenue, but it would also increase student attendance (McWhinnie, 2015). The University of Louisiana-Lafayette, which began selling beer in its stadium in 2013, reported a 34.1% rise in student attendance in the first year.

Previous research has focused on the aspects of beer consumption and factors that influence collegiate sport attendance separately up to this point. Studies focusing specifically on the topic of how beer sales affect attendance have been lacking thus far. The purpose of this study is to examine whether or not the sale of beer inside FBS collegiate stadiums, both on and off campus, affects attendance.

Review of Literature

Factors that Affect Attendance

Many studies have been done on factors that affect attendance and from these we gather our independent variables. These factors are based on either game competitiveness or material factors (Noll, 1974; Meehan et al. 2007; Lemke et al. 2009). Game competitiveness factors include the following for each team playing: winning percentages, playoff appearances, games back in the division, and number of league championships. For this study, we have included home and away win percentages, home and away Football Power Index, whether or not the opponent is within the same conference, whether or not the opponent comes from a Power Five conference, and the number of weeks the home team has been in the Associated Press (AP) Top 25 Poll. This last variable is used in attempt to measure the historical presence of a team, similar to that of number of league championships.

Material factors have included date of game (weekend/weekday), time of game (day/night), weather conditions, population, and income per capita of the region (Noll, 1974; Meehan et al. 2007; Lemke et al. 2009). In accordance, this study includes all of the aforementioned variables with some adaptations. For population, included is both the population of the county that the institution is in and the total home campus enrollment. Also added is the variable of whether or not the game is nationally broadcasted, which has been shown to have an attendance effect (McEvoy & Morse, 2007). Lastly, the variable of whether or not beer is available is added to examine its effect on attendance.

Beer Sales and Attendance

In 1996, the University of Colorado-Boulder banned the sale of beer at home football games in an attempt to lower the rate of excessive consumption on campus (Bormann & Stone, 2001). This event, known as the Folsom Field Beer Ban, resulted in 29% of season ticket holders deciding not to renew their tickets for the following season. The study found that students at the university were even more dissatisfied than the season ticket holders. Both parties stated their level of fan enjoyment at games would be greatly altered by this decision. This suggests that policies put in place to govern alcohol consumption at collegiate football games do affect ticket sales. This “beer ban” continued for nineteen years until the university decided to once again allow beer to be sold in the stadium. During this ban, the program saw its low attendance figures climb slowly until the lifting of the ban in 2015. The dissatisfaction and subsequent drop in ticket sales due to a decreased level of fan enjoyment is intriguing as Wann (1998) found that alcohol use has no significant relationship with sport fandom.

Chastain, Gohmann, and Stephenson (2015) examined the effect of beer availability on overall attendance in college football in what is the first and only study of its kind to date. The study examined 29 universities associated with the following Group of Five conferences (commonly referred to as the mid-majors): the Mid-American Conference (MAC), Western Athletic Conference (WAC), and the Sun Belt Conference. After running both ordinary least squares analyses and instrumental variable estimations, the investigation found that no significant relationship existed between beer availability and attendance. The conclusions drawn suggested that the addition of beer sales would have limited benefits for a university. The objective of this study is to build upon Chastain, Gohmann, and Stephenson's work by incorporating additional variables and including additional FBS institutions.

While there have been multiple studies examining the promotion and sale of beer on attendance in Minor League Baseball, discrepancies in the results seem to be common. For example, no relation was found between beer sales and attendance in Minor League Baseball by both and Paul, Paul, Toma, and Brennan (2007) and Paul, Paul, and Holihan (2008). In contrast, Paul, Toma, and Weinbach (2009) and Cebula (2013) stated that both discounted beer prices and the sale of beer itself were found to have a positive relationship on attendance in Minor League Baseball. Further, a similar study found that beer sales and attendance in Minor League Baseball did possess a positive relationship, but one that was not statistically significant (Chupp, Stephenson, & Taylor, 2007).

Beer Sales and Potential Complications

For some universities, the potential for increases in revenue and attendance is not enough to permit the sale of beer in their football stadiums. The problem of excessive beer consumption by students during college football games is a concern for many universities. The amount of alcohol consumed by students was found to be related to the ranking of the opposing team (Barry et al., 2014). The breath alcohol content levels of students at bars surrounding a Power Five southeastern university after high profile games were found to be significantly higher than after low profile games. The study used the Massey rating system in order to judge whether a game was noted as having a high or low profile status. These findings could point to student attendance being affected by the status of the opponent, and as such, we have included variables that account for such a factor. Boyes and Faith (1993) however stated the opposite, asserting that the sale of beer in stadiums could actually decrease excessive alcohol consumption. Their study found that intoxication levels increased at Arizona State University after the university prohibited the sale of beer. This was explained by students and other attendees consuming copious amounts of alcohol before the game as well as smuggling alcohol into the stadium. It was stated that there is a possible inverse relationship between in-stadium beer sales and the amount of alcohol smuggled in. It was also explained that the sale of beer would reduce the need for students to consume excessive amounts before the game, while the higher prices of beer at the stadium would reduce the amount consumed during the game.

In addition to excessive alcohol consumption, underage drinking and the associated public image were suggested as having a more profound impact on the decision to sell beer than dram shop laws and NCAA regulations (McGregor, 2012). In relation to the concern of the public image of the institution, some believe that selling alcohol at athletic events would lead to increased criminal activity on campus. In accordance, it was found that college football games are associated with increased levels of criminal activity on and around campus (Rees, & Schnepel, 2009). Examples of such crimes generally include assault, disorderly conduct, vandalism, and alcohol related offenses.

This public image could also have an effect of families attending games. The family systems theory states that family anxiety increases when around people who are drinking, be it family or nonfamily members (Bowen, 1974). Showing that families do not wish to be around those who drink, this could prove to be a reason why the majority of professional sport teams offer a family section, where alcohol is not permitted. With the collegiate football scene being new to serving alcohol and not having these sections firmly in place, this theory provides a hypothesis that attendance would decrease as families would shy away from attending games when alcohol is available.

Methodology

Our study evaluated the five-year period from 2010-2014 to assess whether or not the availability of beer in college football stadiums had an effect on overall attendance figures. Military academies were excluded from the sample due to their mandatory attendance policies, making our sample a total of 125 institutions. The study includes a variety of independent variables that were deemed to have the potential to influence overall attendance in some regard.

Dependent

- Attendance (OA): These figures were obtained from the universities box scores.

Independent

- Nationally Broadcasted (NB): Home games were deemed as nationally broadcast if they were televised on one of the following major networks: ABC, CBS, NBC, FOX, ESPN, and ESPN2. These networks were chosen due to their availability across most television platforms.
- Day of Game (DG): This categorical variable was based on the day of the week that the game was played (Thursday, Friday, Saturday, etc.)
- Night Game (NG): A game was designated with this distinction if the start time was after 5:00PM EST, regardless of what time zone the college/university is located geographically.
- Temperature (TEMP): This figure was obtained from box scores that were found on the respective universities athletic page.
- Precipitation (PREC): A game was deemed to have precipitation if it was snowing or raining in the description on the box score of the university's athletic site.
- Home/Away Win Percentage (HW%/AW%): These figures were calculated based on the win/loss record of each team before the start of the game being measured.
- Home/Away FPI: "The Football Power Index (FPI) is a measure of team strength that is meant to be the best predictor of a team's performance going forward for the rest of the season. FPI represents how many points above or below average a team is. Projected results are based on 10,000 simulations of the rest of the season using FPI, results to date, and the remaining schedule. Ratings and projections update daily" (http://espn.go.com/college-football/statistics/teamratings).
    - FPI Previous Season: Final FPI value for the previous season. For example, the FPI for all home games of a given program for the 2013 season would be the previous FPI value from the 2012 season.
    - FPI Current (At time of game): The FPI value for a given program at the time of the game being measured.
- Conference Game (CONF): A game was designated as a conference game if the opponent was in the same conference as the home team.
- Power Five Opponent (P5): Power Five opponents were classified as those programs that represented one of the following conferences: B10, B12, ACC, SEC, PAC-12 and the Big East (2009-2012). The Big East was included in this category because it was a BCS automatic qualifying conference before it dissolved as a football conference in 2012.
- Historical AP Poll Appearances (AP): This value represents the total number of times a program has appeared in the AP poll since 1936. For

example, the number of AP poll appearances for a given program for the 2013 season is represented by the number of times they appeared in the poll from 1936-2012. These figures were obtained from http://collegepollarchive.com/football.

- Public/Private University (PUB): A university was deemed Public if it is a public institution.
- Home Enrollment (HE): This figure encompasses both the undergraduate and graduate enrollment at the university's main campus only. This figure was obtained from data provided by the Office of Postsecondary Education of the U.S. Department of Education (http://ope.ed.gov/athletics).
- County Population (CPOP): 2013 United States census data was used to obtain the overall population for the county in which the university's football stadium is located. This information was gathered using citydata.com.
- County Income Per Capita (CIPC): 2013 United States census data was used to obtain the overall income per capita for the county in which the university's football stadium is located. This information was gathered using citydata.com.
- Beer availability (BA): Beer was deemed as "available" if it was served in all public locations of the institutions football stadium. Universities that sold beer solely in private suites or special admission areas were not counted for the purposes of this variable.

In addition, we hypothesized that stadium location may have an effect on attendance regardless of whether or not beer was offered. A list of off-campus stadiums can be found in table 2 along with a column to indicate whether or not they offered beer in their stadium at any point during the sample period.

Analysis

Statistical analysis was run using a series of multiple linear regressions to measure the correlation between the dependent and independent variables. The SPSS software was used for all statistical tests with an alpha-level of 0.05 as our measure of significance. Variables were gauged on their level of significance (p-value) and beta coefficient (ß) values. The beta coefficient is a predictor of the impact of change in the dependent variable based on the independent variables, be it either negative or positive.

Results

The first multiple linear regression was run using the entire sample of 125 programs. The test for the effect of beer availability on attendance resulted in a significant negative relationship. In order to reduce the risk of multicollinearity, a series of regressions were run using only the significant and marginally significant independent variables from the original test of 125 programs to find the most accurate model (See Table 3). The final regression model with its variables is shown here:

OA=BA(911.750)+NB(2836.865)+DG(1499.267)+NG(1063.738)+TEMP(58.726)+PREC(2138.983)+HomeFPIPrev(207.893)+AwayFPICur(114.471)+HomeFPICur(354.342)+CONF(3464.430)+P5(3717.471)+AP(70.982)+PUB(3847.068)+HE(0.435)+CPOP(-0.004)+CIPC(-0.079)

This regression model had an R^2 of 0.866. This shows that 86.6% of the variance in overall attendance was explained by our independent variables. The regression also showed a marginally significant negative effect of beer availability on attendance ($p=0.051$, $ß = -911.750$). These findings would suggest that programs offering beer in their stadiums would see a significant decrease in their attendance figures.

In an attempt to examine whether or not a difference in the relative attendance of institutions would influence the effect of beer availability, we elected to eliminate institutions that did not offer beer and had frequent sell out games. This resulted in the elimination of the SEC institutions as the conference does not allow beer sales as well as other various institutions that had similar criteria and had very high average attendance with little variance. In this new sample, a significant negative correlation was still found between beer availability and attendance.

Lastly, we wanted to test for any effect that stadium location might have on attendance (on-campus vs. off-campus) (See Tables 6 & 7). For off-campus stadiums our regressions showed significant correlations with the variables DG, NG, TEMP, HW%, AwayFPIPrev, HomeFPIPrev, CONF, P5, AP, PUB, HE, CPOP, and CIPC, as well as a significant negative relationship between BA and OA ($p=0.003$, $ß=-3312.141$). Regressions for on-campus stadiums showed similar results, with NB, DG, NG, TEMP, PREC, AW%, HomeFPIPrev, AwayFPICur, HomeFPICur, CONF, P5, AP, PUB, HE, CPOP, and CIPC all having significant effects on student attendance while again a significant negative relation was found in regards to beer availability ($p=0.010$, $ß=-1543.67$).

Conclusion

Our findings suggest that there is a negative correlation between offering beer in public areas of college football stadiums and overall attendance figures, which may be explained by the family systems theory. As correlation does not equal causation, we are not necessarily suggesting that offering beer in stadiums will have a drastic negative impact on attendance figures. What we are stating is that we did not find any instances in which beer availability and attendance had a statistically significant positive relationship. Additionally, no significant differences were found in regards to the effect of beer availability on attendance and whether the stadium is located on or off-campus. Our findings do have significant implications for athletic directors and decision makers that are considering offering beer in their stadiums. As many programs continue to ponder the sale of alcohol in their stadiums, the effect it has on attendance is an important factor to consider. The decrease in attendance could spur a litany of other negative effects, such as a multiplier effect on decreasing attendance.

It should also be noted that these changes in allowing beer sales in stadiums might be subject to a “honeymoon effect,” where sales/attendance in the initial years are large and then taper down as the excitement and novelty dwindles (Howard & Crompton, 2003). Howard and Crompton found that attendance saw a large increase for the first year after a new stadium was built for a franchise. This increase dropped significantly after the first year but was still higher than it was prior to the building of the new stadium. This could be transferred to the situation at hand of the novelty of selling beer in a stadium for the first time.

As our findings indicate, offering beer is not a viable way to increase attendance at collegiate football games. Based on this information, we suggest that the legal implications and potential for negative publicity are not worth the time and hassle. Ultimately, colleges and universities need to consider alternative options, other than offering beer, to increase their attendance figures, which has been decreasing in recent years (Solomon, 2015).

Limitations & Direction for Future Research

One limitation of this study is that it did not account for the price of in-stadium beer sales. This data was not able to be collected accurately and mostly was not available to the researchers but may play a role in effecting attendance. A higher price point could potentially dissuade individuals from attending the contest or purchasing beer while in the stadium. Therefore, this would negate the idea that offering beer during the game would increase revenue from beer sales. Lastly, the reliability of our data hinges upon the accuracy of the information reported on the box scores and listed on the institutions athletic website (temperature & precipitation). Future research should aim to incorporate both the price of beer in stadiums as well as the average price of tickets per game which we were unable to find from a reliable source.

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Tables

Table 1

Schools Selling Beer

Program Name	Years Beer Sold During Sample Period
University of Akron	2012-2014
Bowling Green State University	2010-2014
University of Cincinnati	2010-2014
Colorado State University	2010-2014
Georgia State University	2013-2014
Kent State University	2010-2014
Southern Methodist University	2014
Syracuse University	2010-2014
Troy University	2014
Tulane University	2014
University of Hawaii at Manoa	2010-2014
University of Houston	2010-2014
University of Louisiana-Lafayette	2010-2014
University of Louisiana-Monroe	2013-2014
University of Louisville	2010-2014
University of Memphis	2010-2014
University of Minnesota	2012-2014
University of Nevada	2010-2014
University of North Texas	2014
University of Toledo	2013-2014

University of Nevada – Las Vegas	2009-2014
University of South Alabama	2012-2014
University of South Florida	2010-2014
University of Texas – El Paso	2012-2014
University of Texas – San Antonio	2011-2014
Western Kentucky University	2012-2014
West Virginia University	2011-2014

Table 2

Off Campus Stadiums and Beer Availability

School	Beer Available During Sample Period
Baylor University	No
Colorado State University	Yes
University of Connecticut	Yes
Georgia State	Yes
Kent State University	Yes
North Carolina State University	No
Northwestern University	No
San Diego State University	Yes
San Jose State University	No
Tulane University	No
Temple University	Yes
University of Alabama – Birmingham	No
University of California – Los Angeles	No
University of Hawaii – Manoa	Yes
University of Massachusetts - Amherst	Yes
University of Memphis	Yes
University of Miami – Florida	Yes
University of Nevada – Las Vegas	Yes
University of Oregon	No
University of Pittsburgh	No
University of South Alabama	Yes
University of South Carolina	No
University of South Florida	Yes
University of Texas – San Antonio	Yes
University of Washington	No

Table 3

Model Summary - All Schools

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.942[a]	.887	.886	9156.5879

a. Predictors: (Constant), County Income per Capita, Nationally Broadcast, Conf. Game, Precipitation, County Population of Stadium, Night Game, Beer Available, Home Enrollment (Main Campus), Day of Game, Temperature, Home FPI Prev. Year, Away FPI Current, Public, Power 5 Opp., Home Team AP Top 25, Home FPI Current

Coefficients - All Schools[a]

Model		Unstandardized Coefficients		Standard Coeffs.			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	5874.090	2026.278		2.899	.004		
	Beer Available	-911.750	467.670	-.013	-1.950	.051	.838	1.194
	Nationally Broadcast	2836.865	460.170	.048	6.165	.000	.609	1.641
	Day of Game	1499.267	237.378	.042	6.316	.000	.840	1.191
	Night Game	1063.738	360.781	.020	2.948	.003	.855	1.170
	Temperature	58.726	11.828	.034	4.965	.000	.811	1.234
	Precipitation	-2138.983	676.551	-.020	-3.162	.002	.971	1.030
	Home FPI Prev. Year	207.893	25.808	.093	8.055	.000	.283	3.535
	Away FPI Current	114.471	19.025	.051	6.017	.000	.514	1.947
	Home FPI Current	354.342	27.004	.156	13.122	.000	.264	3.788
	Conf. Game	-3464.430	424.111	-.058	-8.169	.000	.751	1.332
	Power 5 Opp.	3717.893	486.309	.069	7.645	.000	.464	2.154
	Home AP Top 25	70.982	1.139	.579	62.334	.000	.434	2.306
	Public	3847.068	677.795	.042	5.676	.000	.683	1.464
	Home Enrollment (Main Campus)	.435	.020	.169	21.929	.000	.631	1.585
	County Population of Stadium	-.004	.000	-.083	-12.719	.000	.872	1.147
	County Income per Capita	-.079	.020	-.027	-4.004	.000	.838	1.194

a. Dependent Variable: Overall Attendance

Table 4

Model Summary - Off Campus

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.864[a]	.746	.740	10062.803

a. Predictors: (Constant), County Income per Capita, Conf. Game, Home FPI Prev. Year, Night Game, County Population of Stadium, Day of Game, Away FPI Prev. Year, Public, Temperature, Home Win %, Beer Available, Power 5 Opp., Home Enrollment (Main Campus), Home Team AP Top 25

Coefficients - Off Campus[a]

Model		Unstandardized Coefficients		Standard Coeffs.	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-9826.727	5277.649		-1.862	.063		
	Beer Available	-3312.141	1119.231	-.084	-2.959	.003	.569	1.757
	Day of Game	1434.042	551.952	.059	2.598	.010	.892	1.122
	Night Game	2870.135	955.911	.073	3.003	.003	.784	1.276
	Temperature	132.906	33.369	.101	3.983	.000	.712	1.404
	Home Win %	5146.335	1602.688	.083	3.211	.001	.680	1.472
	Away FPI Prev. Year	178.100	43.098	.105	4.132	.000	.706	1.417
	Home FPI Prev. Year	470.317	55.079	.291	8.539	.000	.394	2.540
	Conf. Game	-3156.898	1086.015	-.071	-2.907	.004	.771	1.297
	Power 5 Opp.	7084.264	1227.329	.179	5.772	.000	.476	2.103
	Home AP Top 25	34.116	3.963	.274	8.609	.000	.452	2.212
	Public	8477.702	2385.974	.093	3.553	.000	.668	1.497
	Home Enrollment (Main Campus)	.460	.092	.152	4.971	.000	.492	2.033
	County Population of Stadium	-.004	.001	-.081	-3.016	.003	.638	1.569
	County Income per Capita	.187	.077	.076	2.435	.015	.469	2.134

a. Dependent Variable: Overall Attendance

Table 5

Model Summary - On Campus

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.952[a]	.906	.906	8656.4984

a. Predictors: (Constant), County Income per Capita, Home FPI Prev. Year, Precipitation, Night Game, Conf. Game, Beer Available, County Population of Stadium, Day of Game, Away FPI Prev. Year, Home Enrollment (Main Campus), Temperature, Public, Nationally Broadcast, Power 5 Opp., Home Team AP Top 25, Home FPI Current

Coefficients - On Campus[a]

Model		Unstandardized Coefficients		Standard Coeff.	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	8272.867	2163.480		3.824	.000		
	Beer Available	-1548.061	604.060	-.017	-2.563	.010	.893	1.120
	Nationally Broadcast	2753.608	481.209	.046	5.722	.000	.606	1.650
	Day of Game	1284.723	256.885	.034	5.001	.000	.820	1.220
	Night Game	826.086	383.632	.015	2.153	.031	.853	1.172
	Temperature	56.837	12.408	.032	4.581	.000	.811	1.234
	Precipitation	-2098.590	717.320	-.018	-2.926	.003	.974	1.027
	Away FPI Prev. Year	84.912	19.189	.037	4.425	.000	.548	1.826
	Home FPI Prev. Year	228.330	27.129	.097	8.416	.000	.292	3.429
	Home FPI Current	322.022	28.768	.135	11.194	.000	.267	3.740
	Conf. Game	-3196.430	454.442	-.051	-7.034	.000	.729	1.371
	Power 5 Opp.	4373.056	503.032	.078	8.693	.000	.484	2.066
	Home Team AP Top 25	76.045	1.196	.622	63.563	.000	.404	2.477
	Public	4068.424	693.760	.045	5.864	.000	.657	1.522
	Home Enrollment (Main Campus)	.375	.020	.149	18.579	.000	.600	1.667
	County Population of Stadium	-.005	.000	-.100	-14.804	.000	.856	1.168
	County Income per Capita	-.105	.021	-.035	-5.128	.000	.814	1.229

a. Dependent Variable: Overall Attendance

Who Pays for College Athletic Spending? An Examination of the Evidence

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Abstract

College athletics is a major business in the United States. Collegiate sports teams generate billions of dollars in revenues, but they also incur billions of dollars in costs, and for the vast majority of athletic teams, revenues do not cover costs. When athletic programs do not cover their costs, the institutional budget must fund these expenses. In this paper, we demonstrate that an institution's athletic subsidy per student is dependent on the institution's number of students. Further, we find that institutions where the athletic subsidy per student is high enroll a disproportionate share of students who are economically disadvantaged and less qualified academically.

Who Pays for College Athletic Spending? An Examination of the Evidence

College sports in the United States are a big business. With billions in revenues and millions of ardent fans, collegiate athletics is a major player in the entertainment industry. Nonetheless, like their host educational institutions, college athletic programs are not-for-profit. Although some programs generate revenues in excess of costs, most do not. Using 2014-15 data from the *USA Today*, Alsher (2016) reports that 219 of 231 public, National Collegiate Athletic Association (NCAA) Division I athletic programs operated at a loss.

When college athletic programs operate at a loss, the institutional budget must fund the deficit (Center for College Affordability and Productivity, 2010). For athletic programs in the *USA Today* data set, subsidies from the institutional budget vary widely, but can reach into the tens of millions of dollars, with an average of almost 54 percent of athletic revenues and a still higher median of nearly 66 percent of athletic revenues.

Many researchers argue and present evidence that even if a college athletic program operates at an accounting loss, the funds transferred from the institutional budget are an investment with a high rate of return (Fort & Winfree, 2013). On the other hand, other researchers present evidence that the rate of return on institutional investment in athletics is negligible--perhaps zero or negative--or highly variable, depending on athletic success (Frank, 2004 and Zimbalist, 2010).

Our purpose in this paper is not to engage this debate. Rather, our purpose is first to look closely across the landscape of collegiate athletic programs to uncover the determinants of the institutional subsidy to fund athletics on a per-student basis. We find that institution size, as measured by the number of undergraduates, is a critical factor. From here, we move to our second purpose, which is to identify how student characteristics vary across institutions that heavily or lightly subsidize their athletic programs. We find that students who face financial and academic challenges are more likely to attend institutions that provide relatively high subsidies to their athletic programs.

Our paper is organized as follows. In the following section, we provide a brief review of the literature on the benefits and costs of college athletics. Next, we present the empirical model we used to estimate per-student subsidies across a sample of institutions. We then turn to the empirical estimates in which we present evidence of three key findings: (1) that athletic subsidies on a per-student basis fall with the number of undergraduates enrolled at an institution, (2) that students with financial and academic difficulties are more likely to attend small institutions where the per-student subsidy is higher, so that (3) students with financial and academic difficulties pay differentially more to fund collegiate athletics than their more affluent and academically-qualified peers, who attend larger institutions. We review the key implications of our findings and offer concluding thoughts in a final section.

College Athletic Spending: A Review of the Literature

The literature on the benefits of athletic expenditures by institutions of higher education is rich and extensive, and the results are diverse. Much of the diversity can be attributed to variations in the institutions examined. For instance, are institutions in the study large, flagship institutions in prestigious conferences with a rich athletic heritage, or are they small schools playing at the mid-major level in second-tier conferences composed of members with limited resources and little potential for athletic success? Methodologies also range widely, from case studies of individual schools to in-depth statistical analyses of large databases.

There is substantial scholarly literature which suggests that athletic expenditures are beneficial to colleges and universities. Fort and Winfree (2013) argue forcefully that expenditures on college athletics are an investment that yields a high return to the institution, and numerous studies support this claim. McCormick and Tinsley (1987), for example, found a positive relationship between athletic expenditures, SAT scores, and academic success, especially for schools that play in major conferences. Similarly, Mixon (1995), Mixon, Trevino, and Minto (2004), and Mixon and Trevino (2005) concluded that athletic success in football results in improved academic success and freshman retention. These results were reinforced by Pope and Pope (2009), who found that athletic success by the top football and basketball teams increases applications and SAT scores. Tucker and Amato (1993) corroborate this result for football though not for basketball, and Toma and Cross (1996) found increases in applications following championship seasons, but few measurable impacts on SAT scores or other measures of student quality. Other researchers conclude that athletics brings higher graduation rates and donations (Stinson, Marquardt, & Chandly, 2012), a stronger sense of community (Kelly & Dixon 2011), and the development of leadership and time-management skills, teamwork, and character for participants (Denhart, Villwock, & Vedder, 2009).

On the other hand, numerous researchers question these benefits or their magnitude. Frank (2004) summarizes the findings of many empirical studies in a paper prepared for the Knight Commission on Intercollegiate Athletics with the statement, "The findings reported in these studies are mixed, but the overall message is easily summarized: It is that if success in athletics does generate the indirect benefits in question, the effects are almost surely small" (p. 1). In a study commissioned by the National Collegiate Athletic Association (NCAA) in 2003, Litan, Orszag, and Orszag found positive effects in SAT scores from athletic success, but the effects were small and statistically insignificant, a finding similar to those of Smith (2009) and Zoda (2012). In another NCAA-commissioned study, Orszag and Orszag (2005) found that schools moving from NCAA Division II to Division I increase debt, but do not observe significant increases in enrollment.

Other studies focus on the magnitude of athletic expenditures and students' misperceptions of institutional support for this spending. Zimbalist (2010) considers athletic expenditures excessive, and Denhart, Ridpath, and Vedder (2011) charge that they lack transparency as well. In a case study of Ohio University, these researchers determined that most students are aware of university fees, but underestimate their size and are largely unaware that these revenues subsidize intercollegiate athletics. Further, their surveys indicate that intercollegiate athletics are unimportant to the majority of students. Ridpath, Smith, Garrett, and Robe (2015) expanded the survey beyond Ohio University to students of all schools in the Mid-American Conference. The results are similar: students desire a reduction in fees for intercollegiate athletics and consider athletics unimportant. Ridpath, Fattlar, and Yiamouyiannis (2012) report similar findings in another study of the Mid-American Conference. Denhart and Vedder (2010) and Hartsell (2015) describe athletic fees and subsidies as a "regressive tax" that is higher at mid-major schools competing in less prestigious conferences. Further, they found that fees are disproportionately higher at schools where the percentage of students receiving Pell grants is higher. These findings are consistent with Lipford and Slice's (2017) research that shows athletic expenditures are largely fixed by NCAA division, so that schools with small enrollments playing in the upper divisions face high costs per undergraduate.

Our work builds on this analysis of athletic fees and subsidies in an effort to explain their size and determine which students pay the most to fund their schools' athletic programs.

Method

The amount of subsidy per student that goes to college athletics varies significantly across institutions of higher education. To analyze and identify key factors that explain this difference, we use regression analysis that, in turn, sheds important light on the question of who pays. Before presenting these results, we describe the data we used to estimate them.

The Data

In a 2015 article, *The Chronicle of Higher Education* provides detailed data on the revenues and costs of collegiate athletic programs for a sample of 205 NCAA Division I state schools for the years 2010 to 2014 (Wolverton, Hallman, Shifflett,

& Kambhampati, 2015). We use data from this article to obtain values of the institutional subsidy to college athletics. The authors of the report calculate the institutional subsidy to athletics as the sum of four components: (1) student fees for athletics, (2) state, municipal, federal and other government appropriations made in support of the operations of college athletics, (3) institutional resources for the current operations of intercollegiate athletics, as well as all unrestricted funds allocated to the athletics department by the university (e.g., state funds, tuition, tuition waivers and transfers), including federal work study support for student workers employed by athletics, and (4) facilities and services provided by the institution not charged to athletics. All values are adjusted for inflation.

For additional data, we use U.S. Department of Education data collected under the Equity in Athletics Disclosure Act (EADA) of 1994 to obtain values of undergraduate enrollment and total athletes by institution. The National Center for Education Statistics, also under the U.S. Department of Education, provides the Integrated Postsecondary Education Data System (IPEDS) that includes the characteristics that we use to measure the financial capability and academic readiness of college students.

Data Analysis

The equation we estimated to determine per-student subsidies to athletics is given below:

$$\text{Subsidy Per Undergraduate}_{i,t} = \alpha_0 + \alpha_1\text{Undergraduates}_{i,t} + \alpha_2\text{Undergraduates Squared}_{i,t} + \alpha_3\text{Athletes}_{i,t} + \alpha_4\text{Athletes Squared}_{i,t} + \alpha_5\text{DIAA}_{i,t} + \alpha_6\text{DIAAA}_{i,t} + \Sigma_j\alpha_j\text{Conference}_{i,t} + \Sigma_k\alpha_k\text{Year}_{i,t} + \varepsilon_{i,t}.$$

We model the subsidy per undergraduate as a function of the number of undergraduates, because large schools often have athletic programs that generate significant revenues, whereas small schools usually do not. Further, athletic costs at large schools are spread over many students, unlike the case for small schools. Both factors lead us to expect that subsidies per undergraduate decrease with the number of students. We include the square of undergraduates to test for the rate of decline, and we expect its value to be positive. We use an institution's total number of athletes as a proxy for the size of its athletic program and hypothesize that per-student subsidies increase with larger athletic programs. Again, we include a squared term to measure the rate of change.

Each NCAA division represents a different level of financial commitment to college athletics, including obligations to comply with different NCAA mandates on the number of sports, scholarships, and coaches, among other variables. To account for these differences, we include dummy variables for divisions DIAA and DIAAA. DIAA mandates are less costly than DIA mandates, and DIAAA mandates are less costly still because schools in this division do not field football teams. Based upon costs alone, we hypothesize that subsidies per student will be lower for DIAA and DIAAA schools. On the other hand, these schools typically generate less revenue from athletics, so the effect of NCAA division is ambiguous.

Within NCAA divisions, athletic conferences vary dramatically in their financial commitment to athletics and their ability to generate revenues. The Power Five conferences (the Atlantic Coast Conference, the Big Ten, the Big Twelve, the Pacific Twelve, and the Southeastern Conference) generate enormous revenues through post-season football bowl appearances, the NCAA basketball tournament, gate receipts, and lucrative television contracts. Teams in these conferences also split revenues through conference revenue-sharing agreements. On the other hand, teams in other conferences generate significantly less revenue to offset athletic costs. To account for conference differences, we include dummy variables for all Division I conferences represented by the teams included in the sample, except for the Big Ten conference, which has its subsidy valued imbedded in the intercept.

To account for secular trends across time, we also include dummy variables for the years 2011 to 2014. The value for 2010 is also imbedded in the intercept.

Because the time invariant effects of NCAA division and conference are central to our analysis, we employ a random effects regression model. A Breusch and Pagan Lagrangian multiplier test reveals the random effects model is superior to OLS (χ^2 = 1381.89). The sample contains data on 203 institutions and a total of 1002 observations. (We omitted observations from schools without at least three consecutive years of data at the same NCAA classification.)

Results

The Estimates of Subsidy per Student

The results of our estimate of the above equation are reported in Table. 1. The estimated equation is highly statistically significant, and the overall fit is high.

Turning to the variables of key interest, the number of undergraduates and the square of this value, we found that in accordance with our expectations, the per-student subsidy falls as the number of students rises with a rate of decline that decreases. This result is a highlight of our findings: the amount of subsidy per student depends critically upon the size of the school a student attends, with small schools allocating significantly more resources to athletics on a per-student basis than medium and large schools.

Other findings are also consistent with our expectations. Large athletic programs, as measured by total athletes and the square of this value, require greater subsidies. The coefficients on NCAA division indicate that in spite of significant revenues, Division IA schools require the heaviest per-student subsidies. DIAA schools subsidize athletics almost $82 less per student, and DIAAA schools subsidize athletics almost $300 less per student.

The conference dummy variables show significant variance. Of interest, there is no statistically significant difference in the subsidy per student among the Power Five conferences. Of the remaining conferences, the coefficients are positive, indicating subsidies per student at least equal to those of the Power Five conferences. Twenty conferences – those with statistically significant coefficients -- provide subsidies hundreds of dollars more per student.

Last, the year dummy variables indicate a trend in favor of greater subsidies, with the 2014 subsidy almost $120 more per student than in 2010.

Figure 1 provides a graph of the relation between per-student subsidies and the number of undergraduates for three conferences. The top curve represents the Mid-American Conference, where per-student athletic subsidies are highest. (The Big South Conference subsidy is higher, but when this value is adjusted for NCAA division and number of athletes, the per-student subsidy is higher for the MidAmerican Conference.) The bottom curve is for the low-subsidy Southeastern Conference. As shown in the figure, the SEC subsidy is negative – revenues exceed costs – at around 30,000 students. The Southwestern Athletic Conference represents a medium-subsidy conference, as measured by the conference coefficients. However, this conference illustrates the importance of NCAA division. It lowers per-student subsidies by playing at the DIAA division instead of the DIA division, so that its curve lies less than half-way between the Mid-American and Southeastern Conferences.

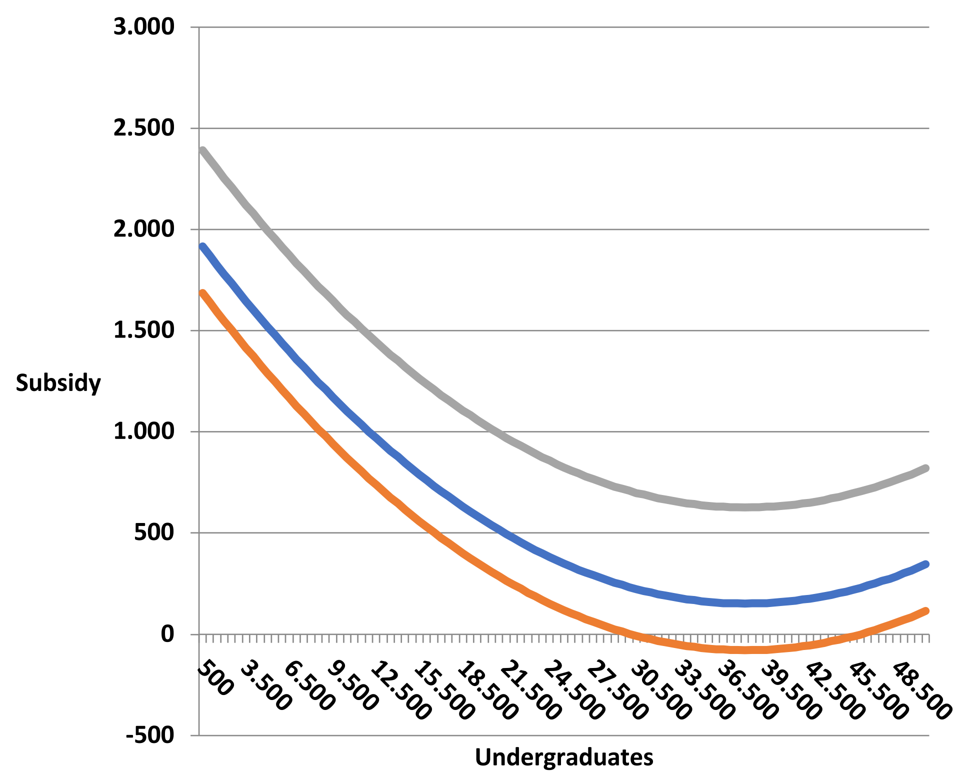
Table 1.

Estimates of subsidy per student: random effects model

Variable	Coefficient	*Z*-score
Undergraduates	-0.095	-12.03***
Undergraduates Squared	$1.25e^{-06}$	8.47***
Athletes	1.181	3.74***
Athletes Squared	-0.001	-3.25***
D1AA	-81.77	-1.66*
D1AAA	-298.72	-4.24***
American Athletic Conference	512.72	5.60***
American East Conference	566.86	3.51***
Atlantic 10 Conference	570.76	5.16***
Atlantic Coast Conference	-28.76	-0.33
Atlantic Sun Conference	223.64	1.60
Big 12 Conference	-48.96	-0.61
Big East Conference	187.52	2.30**
Big Sky Conference	232.10	2.06**
Big South Conference	661.08	4.24***
Big West Conference	561.72	4.60***
Colonial Athletic Association	527.09	5.06***
Conference USA	454.97	5.07***
Horizon League	256.17	1.87*
Great West Conference	159.70	1.36
Independent	500.74	3.56***
Mid-American Conference	573.50	4.74***
Mid-Eastern Athletic Conference	342.31	2.11**
Missouri Valley Conference	109.10	0.67
Mountain West Conference	349.57	3.55***
Northeast Conference	560.81	1.65*
Ohio Valley Conference	172.85	1.16
Pacific 12 Conference	155.04	1.57
Southeastern Conference	-147.15	-1.61
Southern Conference	449.59	3.97***
Southland Conference	289.94	2.56***
Southwestern Athletic Conference	267.59	1.63
Sun Belt Conference	367.18	3.93***
The Summit League	222.61	1.86*
Western Athletic Association	322.75	3.31***
Year 2011	34.20	2.84***
Year 2012	59.40	4.79***
Year 2013	92.18	7.21***
Year 2014	119.62	9.16***
Constant	1370.78	8.59***

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, R^2 within=0.25, R^2 between=0.70, R^2 overall=0.68, Wald χ^2=703.09***, N=1002, number of groups = 203

Figure 1. Subsidy Per Student for Sample Athletic Conferences



Correlations between Student Characteristics and the Number of Undergraduates

The regression results show clearly the important link between athletic subsidies per student and the number of undergraduates at the institution in which a student is enrolled. We extend this analysis by asking if there are differences in the financial and academic capabilities of students across institution size. Our hypothesis is that students with the most financial and academic capability are more likely to attend large, prestigious, flagship universities and colleges, and that students who face greater financial and academic challenges are more likely to attend small, less prestigious, "second-tier" universities and colleges.

To test this hypothesis, we use IPEDS data on the share of first-time undergraduates receiving Pell grants, the share of first-time undergraduates receiving student loans, the graduation rate, and the composite ACT score, for each institution and year in the sample. Our interest in this analysis is in simple correlation and association and not causation. School size does not "cause" student financial or academic capability. As a result, we emphasize simple scatterplots, but then present elementary regression results to further test our findings. Support for our hypothesis is strong.

Figures 2 – 5 provide scatterplots of the student characteristics against the number of undergraduates. Looking first at financial capability, Figure 2 shows that as the number of undergraduates increases, the share of first-time undergraduates receiving Pell grants declines.

Figure 2. Percent of First-Year Undergraduates Receiving Pell Grants

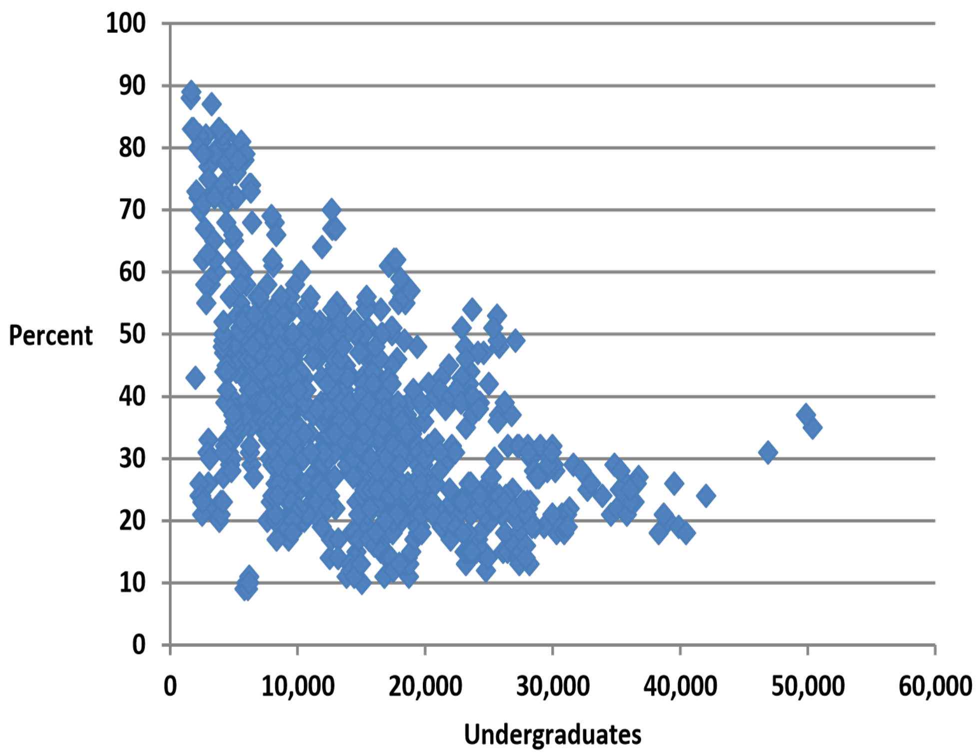
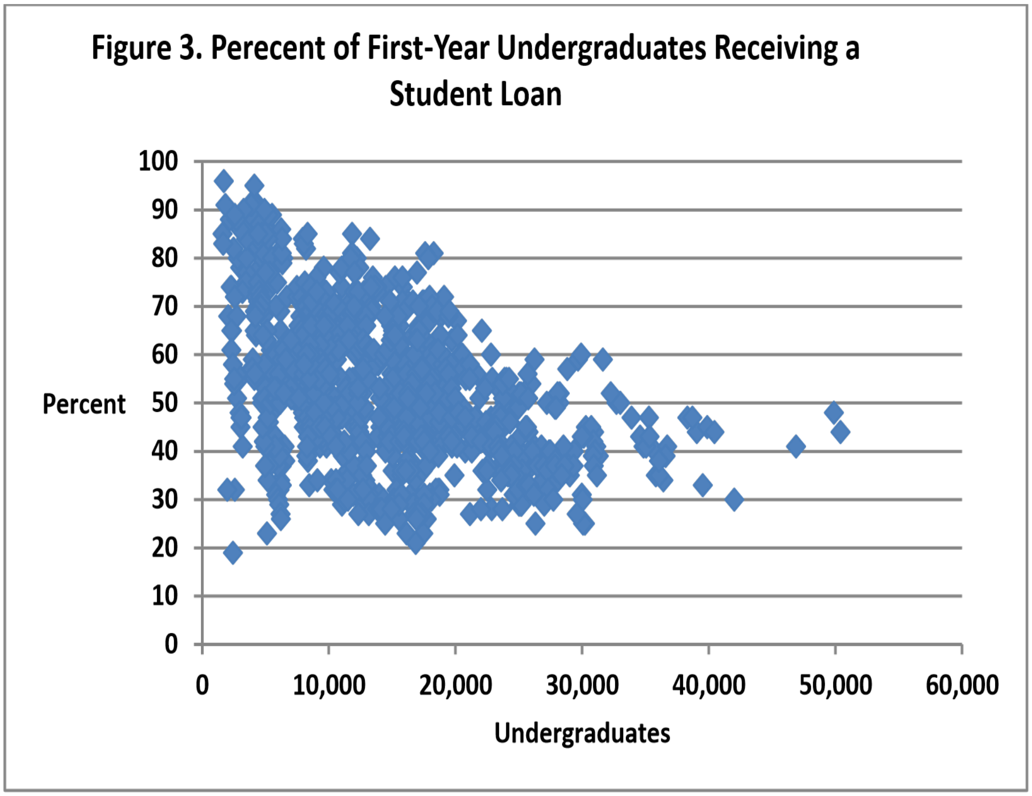


Figure 3 provides a similar scatterplot for the share of first-time undergraduates receiving student loans: the share of students with loans is inversely correlated with the number of undergraduates. These scatterplots indicate that students with the greatest ability to pay are more likely to attend large schools, where athletic subsidies per student are lower. Students with the least ability to pay are more likely to attend small schools, where per-student athletic subsidies are higher.



Turning to academic potential, we find that less-gifted students are more likely to attend small schools. The graduation rate is lowest at small schools and rises markedly with the number of undergraduates, as shown in Figure 4. The composite ACT score of the bottom 25th percentile of students is also lowest for small schools, as shown in Figure 5. (Similar unreported results hold for the top 75th percentile of composite ACT scores.)

In Table 2, we present regression results for each student characteristic against the number of undergraduates with year dummy variables to capture any secular trends. We present OLS and GLS/Random Effects estimates in each case. Regardless of specification, the number of undergraduates is correlated with the student characteristic in the expected direction and at a statistically significant level. Students facing financial and academic challenges are differentially more likely to attend small schools, where athletic subsidies are greater on a per-student basis.

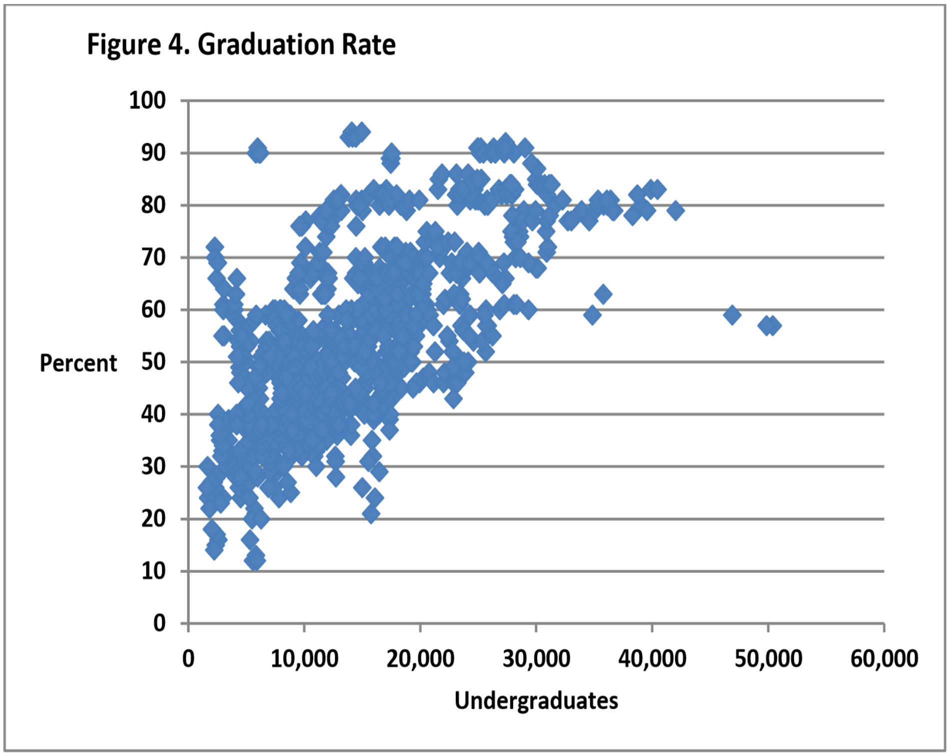


Figure 4. Graduation Rate
100
90
80
70
60
Percent
50
40
30
20
10
0
0
10,000
20,000
30,000
40,000
50,000
60,000
Undergraduates

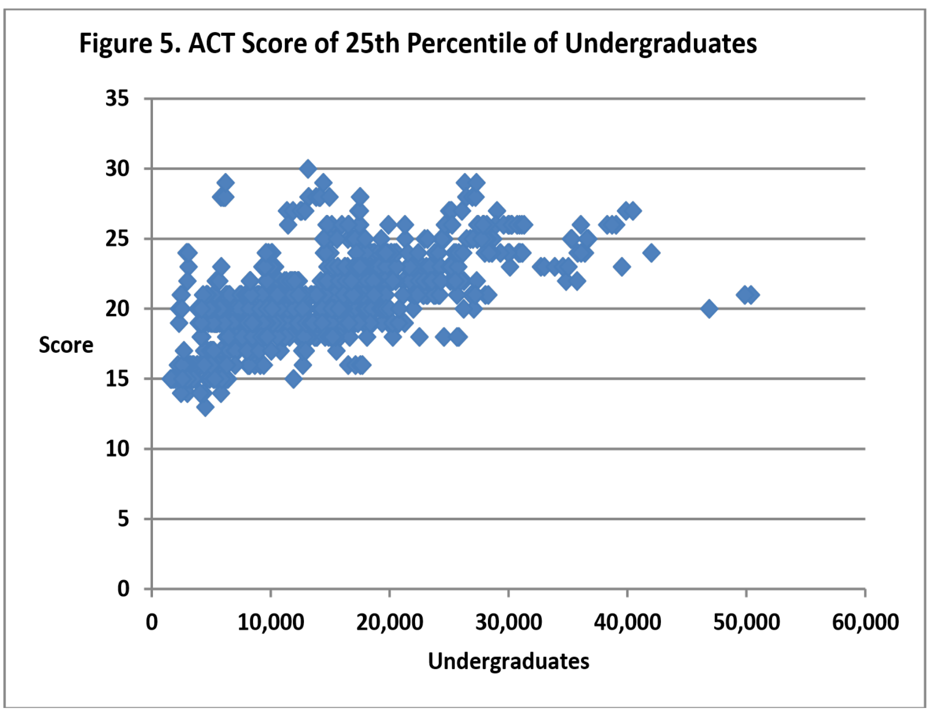


Figure 5. ACT Score of 25th Percentile of Undergraduates
35
30
25
20
Score
15
10
5
0
0
10,000
20,000
30,000
40,000
50,000
60,000
Undergraduates

Table 2.

Estimates of Correlations between Student Characteristics and Number of Undergraduates

Dependent Variable	**Percent of Students Receiving Pell Grants**			**Percent of Students Receiving Student Loans**		
	OLS	**OLS**	**GLS/RE**	**OLS**	**OLS**	**GLS/RE**
Variable	**Coefficient/(*t*- or *Z*-Score)**			**Coefficient/(*t*- or *Z*-Score)**		
Under-graduates	-0.001/ (-18.71)***	-0.001/ (-18.35)***	-0.0003/ (-3.83)***	-0.0009/ 16.49)***	-0.0009/ (- (-16.54)***	-0.0007/ (-6.97)***
Year 2011		4.81/ (3.58)***	4.74/ (17.01)***		1.55/ (1.18)	1.49/ (2.83)***
Year 2012		5.19/ (3.88)***	5.13/ (18.43)***		3.62/ (2.77)***	3.53/ (6.73)***
Year 2013		4.36/ (3.26)***	4.29/ (15.39)***		2.10/ (1.61)	2.06/ (3.91)***
Year 2014		4.24/ (3.15)***	4.19/ (14.86)***		0.96/ (0.73)	0.93/ (1.76)*
Constant	50.40/ (57.06)***	46.70/ (38.34)***	37.33/ (24.25)***	65.50/ (76.27)***	63.85/ (53.62)***	61.44/ (36.62)***
Adj. R^2	0.25	0.26		0.21	0.22	
F-stat	330.13***	71.03***		271.96***	56.35***	
R^2 overall			0.22			0.22
Wald χ^2			445.89***			96.12***
N	1002	1002	1002	1002	1002	1002

Dependent Variable	**Graduation Rate**			**ACT Composite, 25th Percentile**		
	OLS	**OLS**	**GLS/RE**	**OLS**	**OLS**	**GLS/RE**
Variable	**Coefficient/(*t*- or *Z*-Score)**			**Coefficient/(*t*- or *Z*-Score)**		
Under-graduates	0.0013/ (26.20)***	0.0 013/ (26.18)***	0.0004/ (6.30)***	0.0002/ (21.94)***	0.0002/ (21.95)***	0.0001/ (6.35)***
Year 2011		0.28/ (0.22)	0.44/ (2.05)**		0.05/ (0.22)	0.08/ (1.46)
Year 2012		0.77/ (0.60)	1.02/ (4.75)***		0.12/ (0.48)	0.18/ (3.13)***
Year 2013		1.46/ (1.13)	1.68/ (7.85)***		0.31/ (1.28)	0.38/ (6.62)***
Year 2014		2.37/ (1.82)*	2.58/ (11.93)***		0.45/ (1.83)*	0.49/ (8.57)***
Constant	35.40/ (41.67)***	34.43/ (29.17)***	47.11/ (33.65)***	17.77/ (111.89)***	17.58/ (79.05)***	19.10/ (67.14)***
Adj. R^2	0.41	0.41		0.34	0.34	
F-stat	686.33***	138.17***		481.34***	97.30***	
R^2 overall			0.40			0.34
Wald χ^2			247.83***			161.31***
N	1002	1002	1002	933	933	933

Note: p***< 0.01, ** $p < 0.05$, * $p < 0.1$

Correlations between Student Characteristics and the Athletic Subsidy per Student

The correlations between student characteristics and the number of undergraduates provide indirect evidence that poorer, less academically-qualified students pay larger subsidies to athletics than their more affluent, academically-gifted counterparts, because they attend smaller schools that generate less athletic revenue and that have fewer students over whom to spread athletic costs.

To examine the relation between student characteristics and athletic subsidies directly, we again present simple scatterplots and regressions, with an emphasis on correlation and association in lieu of causation. In no way do students' financial or academic characteristics "cause" athletic subsidies.

Figures 6 and 7 show that as the shares of first-time undergraduates receiving Pell grants and student loans increase, so do athletic subsidies per student. Students with the greatest financial need attend institutions that spend a larger share of their resources on athletics.

When we consider academic ability, we find that athletic subsidies per student decline with the graduation rate and the composite ACT score of the lowest 25th percentile of students, as shown in Figures 8 and 9. (Similar results hold for the top 75th percentile of composite ACT scores.) Institutions that require few resources to subsidize athletics on a per-student basis attract and enroll students who are more likely to graduate and have higher ACT scores, while students with financial and academic weakness are more likely to attend institutions that allocate more resources to athletics on a per-student basis.

Figure 6. Subsidy Per Undergraduate Correlated with Percent of First-Year Undergraduates Receiving a Pell Grant

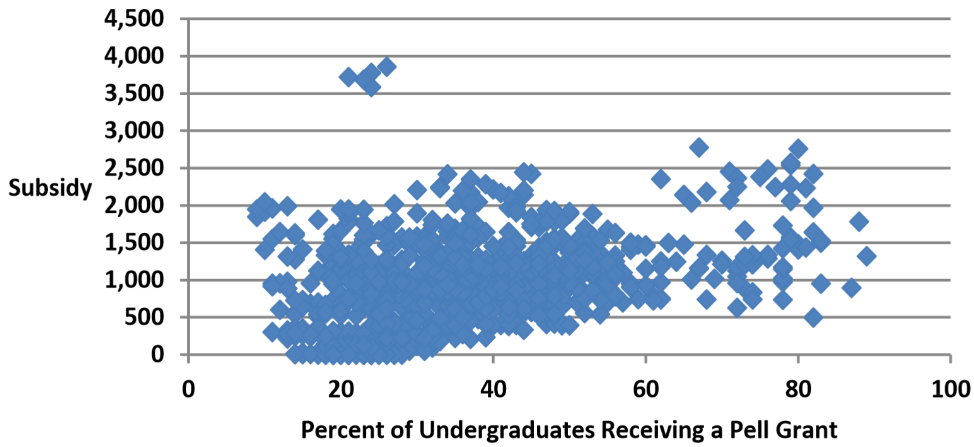
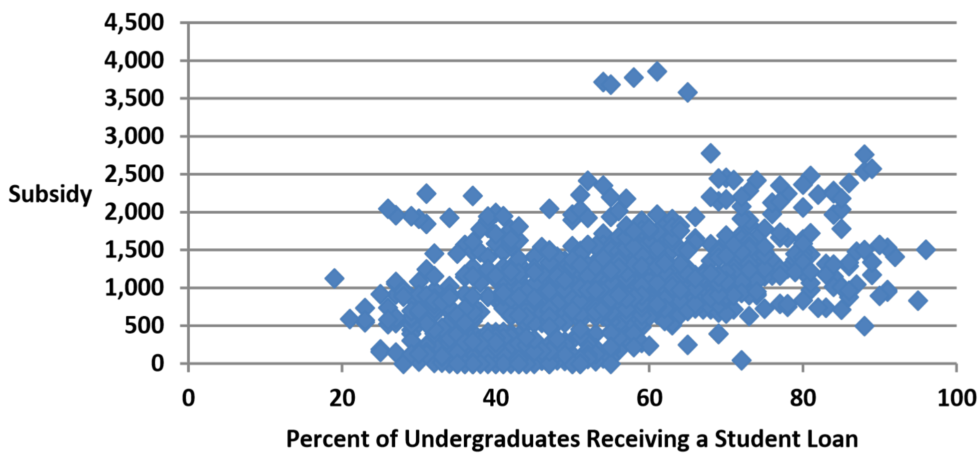


Figure 7. Subsidy Per Undergraduate Correlated with Percent of First-Year Undergraduates Receiving a Student Loan



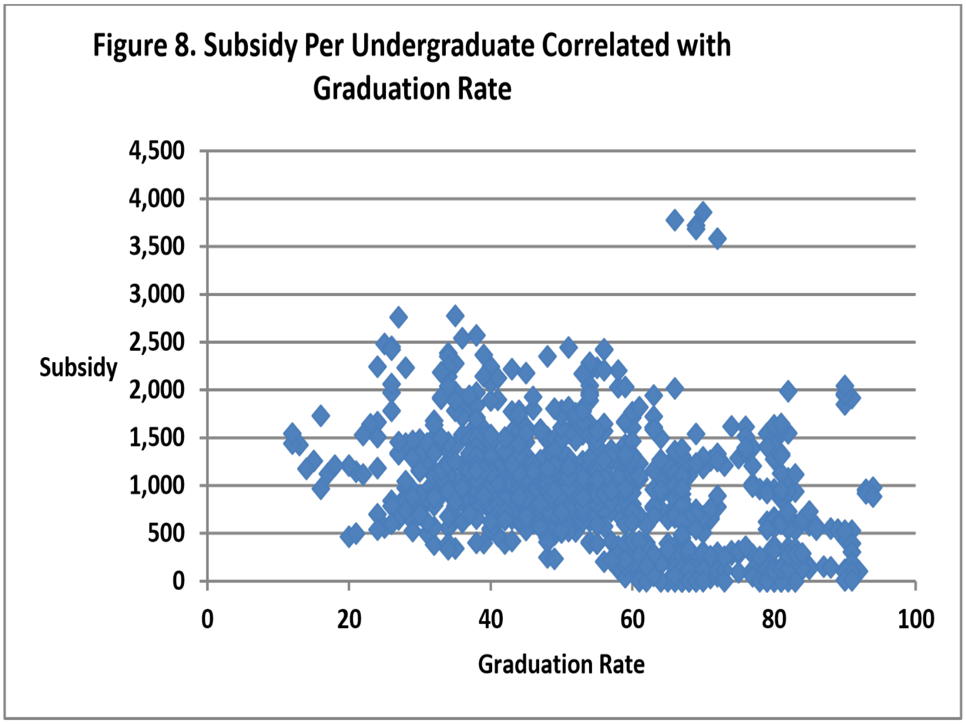


Figure 8. Subsidy Per Undergraduate Correlated with Graduation Rate
Subsidy
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
20
40
60
80
100
Graduation Rate

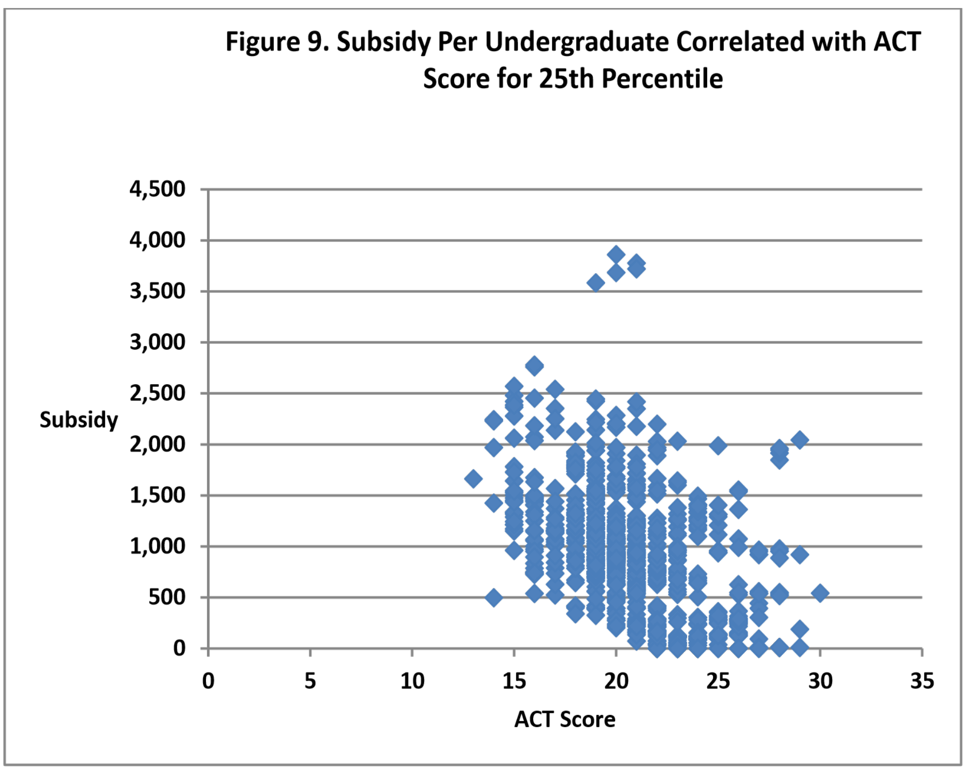


Figure 9. Subsidy Per Undergraduate Correlated with ACT Score for 25th Percentile
Subsidy
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
5
10
15
20
25
30
35
ACT Score

Regression estimates of correlation and association are shown in Table 3. All signs and significance levels accord with our expectations. The percentages of first-time students receiving Pell grants and student loans are positively and significantly correlated with athletic subsidies per undergraduate, and the graduation rate and ACT composite score of the 25^{th} percentile of students are negatively and significantly correlated with athletic subsidies per student.

Discussion

College athletics is big business in the United States. Revenues exceed costs for some institutions, but the majority of athletic programs require significant funding from the institutional budget. The main purposes of this study are to identify and measure the significant factors that determine institutional transfers to the athletic budget on a per-student basis and to identify the financial and academic characteristics of the students who provide this funding, whether directly or indirectly.

Our analysis yields two main findings.

1. With few exceptions, institutions of higher education subsidize their athletic programs from their wider institutional budgets. This subsidy varies significantly across institutions for numerous reasons, and institution size, as measured by the number of undergraduates, is a critical factor. Large schools are more likely to have athletic programs that generate significant revenues that reduce the subsidy. In addition, on a per-student basis, costs that must be funded from the institutional budget are spread over a large number of students. For small schools, the situation is reversed. Their athletic programs typically generate little revenue, and the costs that the institution must fund are spread over relatively few students, so that the subsidy per student is high.
2. Students who are financially and academically capable are more likely to attend large institutions, typically prestigious, flagship schools that spend relatively few institutional resources on athletics on a per-student basis. On the other hand, students with less financial means and academic potential are more likely to attend small, less prestigious institutions that spend relatively more institutional resources on athletics on a per-student basis. These resources have alternative uses. They could be used to reduce tuition and fees, so that fewer students would require Pell grants or incur debt. Or, these resources could be used to provide additional educational support to help these students succeed.

Table 3.
Estimates of Correlations between Subsidy Per Undergraduate and Student Characteristics

Dependent Variable	**Subsidy Per Undergraduate**			**Dependent Variable**	**Subsidy Per Undergraduate**		
	OLS	**OLS**	**GLS/RE**		**OLS**	**OLS**	**GLS/RE**
Variable	**Coefficient/(*t*- or *Z*-Score)**			**Variable**	**Coefficient/(*t*- or *Z*-Score)**		
Percent of Students Receiving Pell Grants	15.02/ (13.74)***	15.02/ (13.66)***	3.91/ (2.85)***	Percent of Students Receiving Student Loans	17.79/ (15.87)***	17.84/ (15.91)***	3.49/ (4.26)***
Year 2011		-35.66/ (-0.66)	15.01/ (1.06)	Year 2011		9.04/ (0.17)	28.60/ (2.24)**
Year 2012		-10.09/ (-0.19)	43.52/ (3.02)***	Year 2012		3.38/ (0.06)	51.59/ (3.97)***
Year 2013		44.62/ (0.83)	86.16/ (6.19)	Year 2013		72.70/ (1.39)	96.12/ (7.51)***
Year 2014		77.44/ (1.43)	112.15/ (8.07)***	Year 2014		124.15/ (2.36)**	125.79/ (9.84)***
Constant	386.99/ (8.95)***	371.92/ (7.08)***	738.11/ (12.48)***	Constant	-11.38/ (-0.18)	-56.15/ (-0.82)	685.59/ (12.16)***
Adj. R^2	0.16	0.16		Adj. R^2	0.20	0.20	
F-stat	188.88***	38.97***		F-stat	251.92***	52.38***	
R^2 overall			0.13	R^2 overall			0.15
Wald χ^2			139.16***	Wald χ^2			148.37***
N	1002	1002	1002	N	1002	1002	1002

Dependent Variable	**Subsidy Per Undergraduate**			**Dependent Variable**	**Subsidy Per Undergraduate**		
	OLS	**OLS**	**GLS/RE**		**OLS**	**OLS**	**GLS/RE**
Variable	**Coefficient/(*t*- or *Z*-Score)**			**Variable**	**Coefficient/(*t*- or *Z*-Score)**		
Graduation Rate	-13.59/ (-13.41)***	-13.80/ (-13.66)***	-4.69/ (-2.98)***	ACT Composite, 25th Percentile	-95.74/ (-15.93)***	-97.13/ (-16.25)***	-20.49/ (-2.73)***
Year 2011		41.10/ (0.76)	35.80/ (2.82)***	Year 2011		44.82/ (0.81)	32.58/ (2.40)**
Year 2012		79.18/ (1.47)	68.63/ (5.38)***	Year 2012		93.59/ (1.72)*	68.46/ (5.04)***
Year 2013		130.82/ (2.43)**	111.12/ (8.56)***	Year 2013		151.69/ (2.78)***	108.94/ (7.87)***
Year 2014		174.82/ (3.23)***	141.05/ (10.49)***	Year 2014		200.64/ (3.66)***	139.70/ (9.82)***
Constant	1679.16/ (28.86)***	1605.08/ (24.18)***	1117.76/ (12.06)***	Constant	2930.83/ (23.20)***	2860.96/ (22.12)***	1294.69/ (8.14)***
Adj. R^2	0.15	0.16		Adj. R^2	0.21	0.22	
F-stat	179.88***	38.97***		F-stat	253.72***	54.92***	
R^2 overall			0.15	R^2 overall			0.18
Wald χ^2			140.28***	Wald χ^2			123.03***
N	1002	1002	1002	N	933	933	933

Note: p***< 0.01, ** $p < 0.05$, * $p < 0.1$

Our research is consistent with that of Denhart and Vedder (2010) who also examine athletic subsidies on a per-student basis by conference and students' financial and academic capabilities. However, our research has limitations. In particular, the sample is limited to state schools playing at the Division I level. Further research that included private schools and schools playing at the Division II and Division III levels would yield more insight into the size of institutional subsidies going to athletics and to the financial and academic characteristics of the students who pay the bills. Different metrics of students' academic readiness and financial position would also shed additional insight into the questions this study has sought to explore.

In an economic, social, and political climate where the rising cost of higher education, student debt, and student success are of widespread public concern, our findings should be of interest to all who fund higher education, including taxpayers, legislators, students, and their parents.

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Salary Disparities Between Male and Female Head Coaches: An Investigation of the NCAA Power Five Conferences

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Abstract

Coaching salaries within intercollegiate athletics have increased tremendously over the past decade. This has led to continued and increased criticisms of current gender constructs within the NCAA and specifically the way in which coaches are compensated. The primary purpose of this study was to determine whether gender was a significant predictor of compensation for basketball coaches of men's and women's programs at the Division I level, while also assessing a variety of revenue and productivity variables. Results indicated that gender was not a statistically significant predictor of compensation. Rather, a host of revenue-specific variables were found to be the primary drivers of compensation for both male and female coaches.

Salary Disparities Between Male and Female Head Coaches: An Investigation of the NCAA Power Five Conferences

Disparities in the wages paid to males and females have been well documented and publicized throughout history. These differentials have resulted in continued and increased criticisms of gender-based societal constructs. In the sport setting, while the earnings gap between men's and women's head coaches at the collegiate level is far from unique, little research focused on college basketball has been done to determine what influences these disparities. Consider the salaries paid to the University of Florida head basketball coaches Amanda Butler and Mike White. Despite similar win percentages (.603 for Butler and .696 for White) which are commonly used as a barometer for compensation (Grant, Leadley, & Zygmont, 2013), White's base salary of $3,967,385 is roughly nine times that of Butler ($429,006) (University of Florida, 2016). Some suggest that the differences can be attributed to the masculine culture of sport organizations, where women receive less compensation for their work, and are not provided equal returns for human capital investments (Cunningham & Sagas, 2008; Judge & Livingston, 1994; Tam, 1997). Thus, women become marginalized in the work place and are paid lower wagers (Acosta & Carpenter, 2006). Others rationalize that women are underrepresented in leadership and coaching roles, and underpaid in intercollegiate athletics specifically, because of overt institutional discrimination associated with access and treatment (Cunningham & Sagas, 2008).

The purpose of this study was to examine how a variety of economic and coach-specific productivity variables impacted the salaries paid to both male and female coaches of Division I collegiate basketball programs. Since the National Collegiate Athletic Association (NCAA) head coaching labor market is homogeneous, meaning that men and women are hired to perform comparable work, gender discrimination will be discernable when revenue and productivity are addressed (Brook & Foster, 2010). It is imperative to note however, that while this study assumed that coaches were hired to preform similar duties, the contexts in which women's and men's college basketball programs operate are different. From financial resources to administrative support, men's programs and their coaches receive a greater amount of assistance and attention than their female counterparts. Nevertheless, by investigating financial, program, and coach specific variables, this research sought to determine the primary influencers of coaches' salaries to provide a framework for understanding current pay disparities.

Literature Review

Previous research has generally concluded that females earn lower wages than males despite performing comparable work. More specifically, in 2016, women who worked full-time jobs in the United States were paid just 80 percent of what their male counterparts were paid (Semega, Fontenote, & Kollar, 2017). While the pay gap has certainly narrowed, at the current rate women will not reach wage quality with males until 2059 (American Association of University Women, 2017). Studies have sought to determine the reasons for this discrepancy, often centered, whether directly or indirectly, around three prevalent theories; human capital (Becker; 1975; Schultz, 1960), gender role (Bem, 1981), and devaluation (England, 1992; Kilbourne, England, Farkas, Beron, & Weir, 1994). These theories, in conjunction with previous literature focused on the collegiate basketball setting, formed the foundation of this research.

Theoretical Framework

Human capital theory postulates that personal incomes will vary based on the amount of investment in human capital, which should be understood to be the education and training that is undertaken by an individual or group of individuals (Becker, 1975). Therefore, gender should have no direct effect on wages. However, research has found that penalties against females in the workplace have proven to be a product of occupational differences in specialized training, that is, a lack of skill specialization (Tam, 1997). If we apply this theory to the collegiate basketball setting, one could consider the current tenure and career winning percentage of a coach to be the equivalent of education and specialized training measures used as benchmarks in the corporate setting (Cunningham & Sagas, 2000; Wicker, Orlowski, & Breuer, 2016). Moreover, many would agree that it takes a unique skill set to be a Division I head basketball coach, regardless of program. The question therefore becomes whether similar metrics in training, education, and specialized human capital result in comparable wages for both males and females.

Gender role theory is “grounded in the supposition that individuals socially identified as males and females tend to occupy different ascribed roles within social structures and tend to be judged against divergent expectations for how they ought to behave” (Littlejohn & Foss, 2009, p. 433). Traditional gender roles have created predetermined earnings structures that oftentimes feature higher earnings for men and lower earnings for women (Judge & Livingston, 1994). For example, women still account for large majority of the workforce in waitress, retail, administrative assistant and nursing positions (Carnevale & Smith, 2014). These occupations are culturally thought to be female-oriented and thus are ascribed with certain gender stereotypes. Collegiate sports are no different. The coaching landscape at the Division I level is riddled with preconceived notions of earning structures, which generally favor male coaches, regardless of program. Based on this theory, male coaches, simply due to their social identification, will garner a greater wage even when relevant control variables are accounted for (Judge & Livingston, 1994). Simply stated, when men attempt to preserve the traditional social order in the workplace, they are rewarded financially, while women are largely trivialized for acting in a similar manner (Judge & Livingston, 1994).

Lastly, the devaluation theory or hypothesis, with roots in sociology, argues that male-dominated occupations are more highly compensated and rewarded than female-dominated occupations due to societal structures that devalue "women's work" (Perales, 2013). This construct suggests that if a specific occupational position, such as women's basketball coach, is predominately held by women, then all the workers in that occupation will be subject to the devaluation effect (Tam, 1997). Under the principal of this hypothesis, no economic factors can completely explain the effects of gender composition on compensation packages because "women's labor, to a substantial extent, modifies or overrides market considerations" (Tam, 1997, p. 1654).

Empirical Framework

Coaching salaries and athletic department revenues across Division I college athletics have increased tremendously over the past decade (Hobson, 2017; McKenna, 2016). The beneficiaries of these significant growth patterns have historically been male head coaches of men's sport programs (Brook & Foster, 2010; Hoffer & Pincin, 2016; Terry, Pjensky & Patterson, 2011). While a variety of explanations can be given for the evolving earnings gap, Carroll and Humphreys (1999) concluded that the prestige associated with men's sports persuades athletic directors to overinvest in the men's salaries and programs in relation to women's salaries and programs. However, the possibility of overt gender discrimination should not be dismissed.

When analyzing NCAA Division I athletic department revenue, Hoffer and Pincin (2016) found that although strict compensation regulations exist for student-athletes, coaching salaries are virtually unregulated. Between 2004 and 2015, inflation-adjusted revenue grew by roughly $35 million for the median NCAA Division I athletic department (Fulks, 2016). Due in large part to the general financial growth of NCAA Division I athletics, an increasing number of educational institutions have and continue to offer larger contracts and benefit packages to their various coaches. Moreover, to compete on a national level, colleges and universities are forced to pay millions of dollars in an effort to secure top-level staff members, which further inflates coaches' salaries.

In 2016, 39 male basketball or football coaches were the highest paid employees in their respective states (Gibson, Keller, & Chandan, 2017). At the University of North Carolina, Roy William's 2016 contract earned him a base salary of just over $2 million dollars. At the same university, women's head basketball coach Sylvia Hatchell earned a base salary of roughly $650,000 dollars (University of North Carolina, 2016). While both coaches have comparable career win percentages and NCAA tournament appearances (.732 and 22 for Hatchell and .790 and 26 for Williams), Hatchell has been a head coach at North Carolina for nearly twice as long as Williams. It might be argued that conventional wisdom would suggest that Hatchell should be earning more, or at least a comparable wage, to her male counterpart. While this is not to suggest that coaches of women's programs have not earned increases in pay, these increases have clearly occurred to a much lesser degree than the coaches of men's programs. This example illuminates the point that while head coaches' salaries continue to increase, both genders are not benefiting equally from the influx of dollars pouring into these athletic departments.

Humphreys (2000) was one of the first to explore the salary differences between men's and women's head basketball coaches. In his study of 238 Division I NCAA institutions in 1990-91, he found that regardless of gender, head coaches of women's programs earned a significantly lower salary than coaches of men's programs. He concluded that the large gap between the salaries of men's and women's basketball coaches may be attributed to a variety of factors that included the prestige of men's sports and the impact that such prestige had on an athletic director's funding decisions. Brook and Foster (2010) paralleled the findings of Humphreys (2000), concluding that although men's basketball programs pay their coaches more, the variations in salary were not indicative of employer discrimination. Further, Brooks and Foster (2010) suggest that revenue and labor variables are better indicators of salary than gender and employer discrimination.

This study built on the previous research in two primary areas. First, it analyzed more recent publicly available information from the fiscal year 2015 (FY15) as reported by the individual institutions. Given the drastic rise in salary figures since previous publications, especially within men's programs, this topic warranted further exploration and analysis. Second, the study included a more comprehensive set of revenue-specific variables that could influence compensation. This permitted a more thorough analysis of factors that drive compensation and created a robust model for determining whether gender of the coach had a significant influence on compensation.

Methods

Variables

To determine the primary drivers of compensation of both men's and women's basketball programs, a host of variables that relate to compensation were analyzed. The measured variables took two different forms: those that pertained to athletic department revenues and those that measured a head coach's performance and productivity. Athletic department revenues were obtained through written requests by the researchers to each public university in the Power Five conferences (Big Ten, Big 12, Atlantic Coast Conference [ACC], Southeastern Conference [SEC], Pacific-12 [Pac-12]) in accordance with the Freedom of Information Act (FOIA). Correspondence through written mail, email, and phone conversations occurred to varying frequencies by the researchers in an attempt to acquire reports from each institution. On average, institutions that provided their financial reports only required one exchange, generally via written mail. Those institutions who did not respond immediately, were then contacted via email and then by phone. Any institution that did not respond after the third attempt was not contacted again. Private schools are not required to disclose revenue and expense information and thus were not contacted. Their omission is important to note in the greater context, however, since their designation does not permit them to lobby for additional funding in the same manner as public institutions. Thus, these schools are generally more reliant on revenues from, for example, ticket sales and student fees which could limit the salaries afforded to their coaches.

In total, 36 out of a possible 53 reports were obtained for the FY2015. The revenue variables utilized in this analysis were: ticket sales, institutional support, guarantees (input revenue received from participation in away games), contributions, in-kind contributions, media rights, NCAA distributions, conference distributions (non-media), program/novelty/parking/concession sales, royalties/licensing/advertising/sponsorships, sports camp revenues, athletic restricted endowment and investments income, and other operating revenue (any operating revenues received by athletics in the report year which cannot be classified into one of the stated categories). In addition, variables which included tenure at current institution, career win percentage, and career NCAA tournament appearances were also utilized to control for each coach's on-court prestige and productivity. The latter variables were obtained directly from the NCAA's website to maintain accuracy and consistency. Lastly, gender was coded both for the coach and the program and took a binary form of one for male and zero for female in both instances. In total, eighteen variables were included in the analysis.

Methodology

This study employed a standard multiple linear regression model to identify those variables, which significantly impacted compensation.

$$Salary_{ij} = \beta_o + \beta_1 x_1 + \beta_2 x_2 \ldots \varepsilon_i$$

Where the salary of head coach i at institution j is determined by the values of the various parameters, x, of the variables β, with a standard error term, ε. This analysis is a commonly accepted methodology for studying wage disparities (Chalikia & Hinsz, 2013; Conway & Roberts, 1986), and permitted the examination of variance in salaries among males and females in the context of predictor variables that have been determined to affect coaches' compensation.

Empirical Results

All Coaches/Programs

First, the primary influencers of compensation for all head coaches in the sample were examined by regressing all variables against their FY15 salaries. With gender as an indicator variable, it was of primary interest to determine if compensation, regardless of program, was influenced by the gender of the head coach. Of the 72 coaches in the sample, 47 were male and 25 were female. Descriptive statistics for each program can be found in Table 1. Of interest is the average tenure of coaches of women's programs compared to the average salaries. As is the case in most occupations, the longer an individual is employed by a certain company or program the higher their salary should theoretically be. Despite this notion, it appears that the opposite is true in Division I college basketball, especially for the women's programs. For example, Charli Turner Thorne, the head coach of the women's program at Arizona State University earned a base salary of $590,770 for the 2015-16 season in her twentieth year of coaching at the institution (Arizona State University, 2016). Compare Thorne's salary to that of Joni Taylor, the women's coach at the University of Georgia, who entering her first season at the school in 2015-16 earned a base salary of $857,130 (University of Georgia, 2016). It is with this understanding that we sought to deduce which variables significantly influenced compensation, as it appeared that conventional norms surrounding compensation were not applicable in this setting.

Table 1

Descriptive Statistics – Men's/Women's Programs

	Women's Programs		Men's Programs	
Variable	Mean	SD	Mean	SD
Tenure (Years)	8.0	6.3	6.25	4.5
Career Win %	.618	.106	.664	.077
Tournament Appearances	6.3	6.1	8	6.8
Ticket Sales	229315	226970	4813325	4239316
Institutional Support	52242	109219	96747	338246
Guaranteed Revenue	1931	8123	153489	239074
Contributions	317910	393448	1840160	3680323
In-Kind Contributions	14501	28372	46356	77547
Media Rights	32461	147016	3144917	2016942
NCAA Distributions	30064	55747	1473338	1494852
Conference Distributions	30116	76909	955387	1637886
Program/Novelty/ Parking/Concession	33640	37055	286371	313044
Royalties/Licensing/ Advertising/Sponsorships	100138	162916	446301	888035
Camp Revenue	39859	61409	1112184	170471
Restricted Endowments	17924	29391	49636	92188
Other	22586	61112	87513	395886
Head Coach Salary	689879	287091	2716191	1460545
	n = 25		*n* = 47	

Table 2 reports the results of the regression model, which featured a robust R^2 value of .940. Based on the results, head coach's gender was not found to be a significant predictor of compensation. Rather, revenue producing potential, including ticket sales, contributions, media rights, and camp revenue, were found to be the primary drivers of compensation. It should be noted that the negative beta coefficient associated with Program/Novelty/Parking/Concession may be attributable to extraneous variables not contained within the model.

Table 2

Regression Results for All Coaches & Programs

Variable	β Coefficient	p-value
Constant	-440107.2	.465
Tenure	-6790.2	.746
Career Win %	1527354.7	.141
Tournament Appearances	10185.8	.642
Program	136331.9	.703
Gender	54412.1	.807
Ticket Sales	.279	.000***
Institutional Support	.119	.688
Guaranteed Revenue	-.540	.490
Contributions	.118	.082*
In-Kind Contributions	.687	.623
Media Rights	.125	.089*
NCAA Distributions	.128	.162
Conference Distributions	.105	.166
Program/Novelty/Parking/Concession	-2.027	.001***
Royalties/Licensing/Advertising/Sponsorships	.196	.153
Camp Revenue	2.8	.000***
Restricted Endowments	-.976	.427
Other	-.637	.287
R Squared	.940	
Adjusted R Squared	.884	
n = 72		

* statistically significant at the .10 level; ** at the .05 level; *** at the .01 level

Women's Programs

The second analysis examined whether compensation within the same program is influenced by gender. Given there are no female coaches of men's programs, the analysis was limited to the women's programs. In a sample of 36 women's basketball programs, 25 employed a female head coach and 11 employed a male head coach, which permitted a test for employer gender discrimination within the same program. Descriptive statistics of women's basketball programs can be found in Table 3, segmented by the gender of the coach.

Table 3

Descriptive Statistics – Women's Basketball Programs by Gender

	Female Head Coach		Male Head Coach	
Variable	Mean	SD	Mean	SD
Tenure (Years)	8.0	6.5	7.9	6.2
Career Win %	.597	.106	.668	.090
Tournament Appearances	6	5.5	7.9	7.3
Ticket Sales	178921	155488	343847	318593
Institutional Support	75177	124911	118	393
Guaranteed Revenue	1540	7702	2817	9343
Contributions	374996	447492	188170	185860
In-Kind Contributions	19015	32676	4243	9396
Media Rights	36429	170139	23443	77752
NCAA Distributions	34994	65320	18858	20932
Conf. Distributions	34057	91742	21160	19386
Program/Novelty/ Parking/Concession	31388	33082	38758	46234
Royalties/Licensing/ Advertising/Sponsorships	122996	190499	48190	39060
Camp Revenue	36623	52523	47213	80573
Endowments	19385	27942	14606	33647
Other	22262	60169	23323	66195
Head Coach Salary	631763	2339689	821959	359807
	n = 25		*n* = 11	

The regression results concerned with coaches of women's programs presented in Table 4 indicated that while coach's gender was not a significant predictor, ticket sales, NCAA distributions, and other revenue were found to significantly influence compensation. These results, like those in Table 3, would indicate that athletic departments are more concerned with the coach's ability to generate revenue, and specifically ticket revenue, than the coach's gender.

Table 4

Regression Results for All Coaches of Women's Programs

Variable	β Coefficient	p-value
Constant	475375.0	.301
Tenure	214.6	.985
Career Win %	48737.3	.943
Tournament Appearances	8333.3	.589
Gender	-17298.5	.848
Ticket Sales	.816	.001***
Institutional Support	-.624	.320
Guaranteed Revenue	-1.1	.817
Contributions	-.113	.240
In-Kind Contributions	-2.1	.211
Media Rights	-.253	.578
NCAA Distributions	2.1	.028**
Conference Distributions	.469	.548
Program/Novelty/Parking/Concession	1.2	.207
Royalties/Licensing/Advertising/Sponsorships	.187	.401
Camp Revenue	-.432	.475
Restricted Endowments	-.531	.695
Other	-2.3	.006**
R Squared	.902	
Adjusted R Squared	.813	
n = 36		

* statistically significant at the .10 level; ** at the .05 level; *** at the .01 level

Men's Programs

Lastly, a regression model that included all coaches of men's programs was run to determine the significant predictors of compensation within this structure. Since there are no female coaches of men's programs, the gender variable was not included. Table 5 displays the results of the model, which lends support to the notion that coaches of men's programs are compensated based on their revenue producing potential, which mirrors previous results in this research. Once again, ticket sales were found to be a primary driver of compensation. In this case, however, the number of tournament appearances also impacted the pay of the head coach. This variable has a dual application as it highlights the importance of tournament appearances from both a productivity and revenue-producing standpoint. NCAA tournament appearances not only highlight the coach's ability to win games but also provide increased revenue to the conferences and schools since they receive monetary returns for making and advancing in the NCAA tournament.

Table 5

Regression Results for Men's Programs

Variable		β Coefficient	p-value
Constant		-1138240.3	641
Tenure		-8153.1	.884
Career Win %		2805207.5	.485
Tournament Appearances		128873.4	.030**
Conference		16258.5	712
Ticket Sales		.275	.002**
Institutional Support		.124	.800
Guaranteed Revenue		-.872	.517
Contributions		.116	.409
In-Kind Contributions		.658	.785
Media Rights		.156	.211
NCAA Distributions		.112	.497
Conference Distributions		.133	.286
Program/Novelty/Parking/Concession		-2.2	026**
Royalties/Licensing/Advertising/Sponsorships		.217	.350
Camp Revenue		3.2	.007**
Restricted Endowments		-1.7	.486
Other		-.581	.630
R Squared	.797		
Adjusted R Squared	.627		
n = 36			

* statistically significant at the .10 level; ** at the .05 level; *** at the .01 level

Discussion

Coaches' salaries in Division I college basketball have risen tremendously in recent years. Nevertheless, coaches of women's programs continue to garner significantly less pay than coaches of men's programs. To illustrate this point, consider that in 2010, the median salary for coaches of men's programs was $329,000 compared to $171,600 for women's programs (Gentry & Alexander, 2012). When comparing these figures to the data utilized for this study, the increases for both programs are substantial despite the earning gap increasing significantly. Based on the data compiled for this analysis, men's programs had a median salary of roughly $2.7 million compared to women's programs at $690,000. Given the unequal rise in salaries between head coaches of men's and women's programs, it was of primary interest to conclude whether universities, as employers, engage in compensation discrimination based on gender. This research was conducted under the assumption that the men's and women's basketball labor markets are homogenous, meaning that coaches of both programs, regardless of gender, are hired to do similar work and perform similar tasks. Results from the various multiple linear regression analyses indicated that in no scenario was coach's gender found to be a statistically significant influencer of compensation. These results align with those of previous studies that examined the same market (Brook & Foster, 2010; Humphreys, 2000). Therefore, though compensation amounts for head coaches of men's and women's programs are dissimilar, our results indicated that they are not indicative of direct and overt gender discrimination but rather may be a byproduct of market factors and societal predispositions.

The secondary purpose of this study was to determine which variables significantly impacted and influenced compensation. If regression results for both men's and women's programs yielded significant variables that were similar in nature, then we could make a case that there may be some form of veiled gender compensation discrimination in the homogenous market. Indeed, when comparing the results of men's and women's programs independently, the outcomes suggest that the salary of head coaches of men's and women's programs are influenced by similar variables. Revenue producing potential, and specifically ticket sales, were found to be the primary reoccurring drivers of compensation. While this is not to suggest that coaches are solely responsible for revenue generation, they do have an influence on the product and the winning potential of their program which subsequently impacts attendance (Branvold, Pan, & Gabert, 1997; Scibetti, 2011). However, given the stark disparities between ticket sales of men's and women's programs, current compensation structures appear to align with the results. To illustrate this point, consider that during the FY15 women's programs averaged ticket sales revenue of $233,146, compared to the $4,812,325 average for men's programs. While we are not dismissing the fact that men's basketball games are more highly attended than women's games, this large disparity in revenue is likely being considered, at least in part, by administrators as a validator for current compensation packages.

While the data and results did not support the notion that gender was a significant influencer of compensation, we believe that there may be a degree of veiled bias among those in charge of determining compensation packages. As previously mentioned, societal predispositions may be at work in this market which could explain the disparities in compensation. From a theoretical standpoint, gender role theory has a clear application given the results as it proposes that individuals make assumptions about gender roles based on their observations of the "sexual division of labor and gender hierarchy of the society" (Eagly et al., 2000, p. 124). As such, certain behaviors and characteristics are ascribed to specific jobs. Based on this theory, female coaches are at a general disadvantage when placed in positions that have traditionally been reserved for men (Rosenthal, 2008). Unfortunately for female head coaches, this means that women's programs have had a difficult time garnering the same support and compensation packages as their male counterparts. Consequently, program prestige, ticket sales, and revenue producing potential for women's programs, which were found to significantly influence compensation, have suffered at the hands of deeply rooted societal constructs regarding gender and work placement.

In the same context, we might suggest that devaluation theory also has an effect on the compensation of female head coaches. Devaluation theory states that occupations dominated by women are thought to be less valuable than occupations dominated by men (Perales, 2013). At the NCAA Division I level, two-thirds of all women's programs are coached by females. Such a high concentration of women in head coaching positions would imply that the occupation is largely considered to be "women's work." Thus, based on the devaluation theory, the domination of female head coaches within women's basketball programs means that both male and female head coaches will earn less. This is not to suggest that coaches of both programs are hired to perform different tasks, but rather that the valuations of such tasks appear to vary based on the program. Based on the results of this study, devaluation theory seems to be the most viable explanation for current salary disparities since both male and female coaches of women's programs earn substantially less than coaches of men's teams, a potential product of society's devaluation of "women's work".

Conclusion

Based on the results of this study, coach's gender alone should not be considered a viable influencer of compensation within the realm of NCAA Division I basketball. Rather the program designation (men's or women's) and the ability for the coach to produce revenue, and specifically ticket revenue, should be considered as the primary drivers of compensation. Again, this is not to suggest that coaches are solely responsible for revenue generation, yet they are accountable for the talent level of their players and the subsequent product that is produced and consumed. These findings further support those of previous studies concerned with the same construct and provide a more current understanding of the salary disparities among and within basketball programs (Brook & Foster, 2010; Humphreys, 2000).

Unfortunately, the compensation gap among coaches of male and female programs has not narrowed from previous studies. In fact, the earnings gap has increased with no signs indicating that such a trend will cease. The large gap between salaries is likely attributable to additional factors not accounted for in this analysis. A better understanding of how individuals view the prestige of men's sports and the biases of athletic administrators and consumers could provide more clarity to the current wage gap. Future analysis concerned with such factors would provide added insight into the influencers of compensation in this market creating a possibility for critical discussion, accountability and a future reduction in the earnings gap.

While this study was effective in determining the influence of coach's gender and other variables on compensation, there are inherent limitations that should be addressed. First, the lack of data that was reported limited the degree and scope of statistical analyses. It would have been beneficial to further segment coaches of women's programs by gender to compare results, however the small sample of male coaches of women's programs prohibited this analysis. Future studies should seek to obtain additional financial reports to provide more comprehensive results. Furthermore, there is a clear opportunity to craft a continuous longitudinal study using this type of data to identify compensation trends over time. The addition of variables may also be beneficial to account for an increased degree of variation in compensation. We surmise that the negative beta coefficients associated with some of the variables may be due, in part, to the lack of covariates included in the sample. Future studies may seek to add additional variables that could account for differences in compensation among and within programs. Lastly, the fact that no females are coaching men's basketball programs at the Division I level makes comparisons impossible. While there is no manner in which to address this limitation, it should be noted that a more thorough analysis could be completed if there were both male and female coaches present in both programs.

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The Big East Breakup: Effects on Competitive Balance

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Abstract

Whereas much of the research on competitive balance deals with the addition of one or more members to a conference and compares the competitive balance before and after the addition(s), the authors of this study investigated competitive balance in men's basketball, using the extreme case of the breakup of the Big East Conference, which led to a reconstituted Big East Conference and the formation of the American Athletic Conference (AAC). Given that the reconstituted Big East Conference had basically chosen its members, whereas the AAC need to scramble around to replace its departing members, it was hypothesized that the reconstituted Big East Conference would have a more competitively balance conference than the newly formed AAC. Using the standard deviation, it was discovered that competition among men's basketball teams displayed more competitive balance in the reconstituted Big East conference than in the AAC.

The Big East Breakup: Effects on Competitive Balance

Fan interest in competitive sports is linked, at least in part, to competitive balance (Depken & Wilson, 2006; El Hodiri & Quick, 1971; Jane 2016; Kesenne, 2006; Knowles, Sherony & Haupert, 1992; Paul &Wilson, 2015; Quick & Fort, 1992; Sanderson & Siegfried, 2003). Whether the games are professional or amateur, some degree of uncertainty regarding the outcome is necessary to sustain fan interest. Otherwise, fan attrition is likely, and thus a decrease in revenues from both attendance and media to the organizations (Ahn & Lee, 2014). Stated somewhat differently, it is of vital importance that for any sports league or conference, there is the necessity that there be some degree of competitive balance among the various teams. The importance of competitive balance was discussed as early as 1956 when Simon Rottenberg pointed out with the "uncertainty of outcome hypothesis" that successful leagues required some degree of parity. (Rottenberg, 1956).

At the professional level, measures such as revenue sharing, salary caps, and reverse order finish for draft choice attempt to bring about more competitive balance. At the college level, regulations imposed by the national governing organization, i.e., NCAA, NAIA, have attempted to promote competitive balance with rules and regulations such as scholarship limits, prohibitions against extra benefits offered to student athletes, etc. (Rhoads, 2004). Conferences also play a role in promoting competitive balance. And as conferences seek to maximize their revenue potential via changes in membership, changes in competitive balance may be expected (Rhoads, 2004). Most commonly in college sports, football and men's basketball are primary drivers of conference and member revenue (e.g., ticket sales, television rights fees). Therefore, the need for competitive balance, particularly in those two sports, is an important consideration whenever changes in conference membership are considered. Arguably, much of the conference realignment over the past few years can be linked to competitive balance.

In order to shed light on this issue we investigated the extreme case of the breakup of the Big East Conference which led to a reconstituted Big East Conference, and the formation of the American Athletic Conference. In this case seven schools which were members of the original Big East Conference broke off (Georgetown, Marquette, Villanova, Providence, St. John's, Seton Hall and De Paul), added three additional schools (Creighton, Xavier, and Butler), and started their own conference. Ironically, the name—the Big East Conference, remained with these schools, while the remaining schools became the American Athletic Conference. Meanwhile before the start of the 2013-14 season three schools left the new AAC (Pittsburgh, Syracuse, and Notre Dame), and five were added (Memphis, Southern Methodist, Houston, Central Florida, and Temple). Then before the start of the 2014-15 season Louisville and Rutgers also departed the conference.

To the extent that conference realignments are at least partially driven to achieve greater competitive balance, it could be suggested that the breakaway institutions, i.e., reconstituted Big East, (hereafter referred to merely as the Big East) could "cherry pick" those institutions which would permit them to achieve this goal. On the other hand, the AAC, those institutions remaining in the original Big East, needed to scramble to find replacements for the departing schools in order to maintain a viable conference, and consequently, would have a more difficult time achieving competitive balance. Thus, one could hypothesize that the Big East should have a more competitively balanced conference than the AAC.

Literature Review

The Big East and American Athletic Conferences

The original Big East Conference was formed in 1979, initiated by the NCAA's newly imposed in-season scheduling requirements for men's basketball. The athletic directors of Syracuse, Providence, Georgetown, and St. John's met with the intention to establish a conference of schools situated in northeastern United States. They invited Boston College, Connecticut, Holy Cross, Rutgers, and Seton Hall to join in the formation of the new conference, but Rutgers and Holy Cross declined (Crouthamel, 2000). By 1982, Villanova and Pittsburgh had joined, and the conference maintained those nine members for roughly the next decade (Gall, 2013).

Primarily a basketball conference, the Big East began to sponsor football in 1991 with the addition of Miami, Rutgers, Temple, Virginia Tech, and West Virginia. This essentially divided the conference into "football" and "non-football" schools, which over time created instability amongst the institutions. In 2003, three of the "football" schools – Boston College, Miami, and Virginia Tech – left the Big East to join the Atlantic Coast Conference (ACC), while five schools left Conference USA (Louisville, Cincinnati, DePaul, Marquette, South Florida) to join the Big East (Gall, 2013).

Beginning in 2010 and continuing through 2013, the Big East, like many conferences during that period, experienced numerous changes. Overall, 13 schools – mostly programs with Football Bowl Subdivision (FBS) teams, including West Virginia, Syracuse, and Pittsburgh – left to join other conferences (Gall, 2013). In 2013 the remaining non-FBS schools (DePaul, Georgetown, Marquette, Providence, Seton Hall, St. Johns, Villanova) broke away from the conference as a group. Initially labeled the Catholic 7, they later negotiated for the rights of the Big East name, along with the rights to hold their basketball tournament at Madison Square Garden (Harten, 2013). Joining them in the new Big East Conference were Creighton, Butler, and Xavier.

The remaining FBS schools (Cincinnati, Connecticut, and South Florida) joined up as the newly formed American Athletic Conference (AAC), which eventually included Central Florida, East Carolina, Houston, Memphis, Navy, Southern Methodist, Temple, Tulsa, and Tulane (McMurphy, Katz & O'Neal 2012). The AAC underwent another change in membership in 2014-15. Louisville left to join the Atlantic Coast Conference, and Rutgers departed for the Big 10. Meanwhile Tulsa, Tulane, and East Carolina left Conference USA to join the AAC.

Competitive Balance in College Basketball

The majority of competitive balance-related studies in college athletics have focused on football. However, a number of researchers have examined various dimensions of competitive balance in men's basketball. In an analysis of membership changes in the Western Athletic and Mountain West conferences over a 40-year period, Rhoads (2004) considered the influence of men's basketball in driving conference realignment. The rationale for this study was that previous researchers such as Fort and Quick (1999) had focused on football as a driver of churning among college conferences. Rhoads accounted for the impact of football in the analysis. The resultant conclusion was that while changes in conference membership led to enhanced competitive balance in football, the same was not true of men's basketball.

Perline and Stoldt (2007) compared levels of competitive balance between men's basketball and women's basketball in the Missouri Valley Conference (MVC). Noting that men's basketball tends to generate more revenue than women's basketball, they hypothesized that higher levels of competitive balance would be found in the men's game. Analysis of data from a 10-year period supported this hypothesis with three different measures, including the standard deviation of winning percentages, indicating more competitive balance in MVC men's basketball than women's. The MVC was also the focus of a study by Perline and Stoldt (2008), which examined changes in competitive balance before and after the 1992 merger of the Gateway Collegiate Athletic Conference with the MVC. Using the same set of measures as in their previous study of the MVC, the authors found mixed results with arguably a slight gain in competitive balance after the merger.

Treber, Levy and Matheson (2013) compared competitive balance between men's and women's basketball in national championship tournaments. Using measures from NCAA tournaments such as margin of victory and winning percentage by seed levels, they too found greater competitive balance in men's basketball than women's at the Division I level. In a related finding, Treber et al reported that competitive balance in the men's tournament had improved when comparing the 1952-1981 and 1982-2011 time periods.

Perline, Noble and Stoldt (2017) conducted an additional study comparing competitive balance in men's and women's basketball programs, this time focusing on the Power 5 conferences, as commonly referenced. In their analysis of data from five years of competition, the authors employed multiple measures of competitive balance, including the standard deviation of winning percentages and actual standard deviation/ideal standard deviation ratio. Their findings again indicated higher levels of competitive balance in men's basketball, an expected result, the authors argued, given typically higher levels of revenue associated with the men's sport.

Methods

Measuring Competitive Balance

In order to measure competitive balance researchers have relied on several statistical approaches, depending on whether the analysis was measuring "within season", or "between season" variation. Possibly the method most often used to measure competitive balance in a conference within a given season, which is what is attempted in this analysis, is the standard deviation (Leeds & Von Allmen, 2014). This statistic measures the average distance that observations lie from the mean of the observations in the data set.

In any conference game absent a tie, there will be one winner and one loser. Therefore, within conference competition, the mean winning percentage will always be .500. Analysis of the dispersion of team standard deviations around the conference mean provides perspective regarding competitive balance. If every team had a winning percentage of .500, the standard deviation would be zero and the highest possible level of competitive balance would exist.

The less dispersion of winning percentages around the mean, the lower the standard deviation and the higher the competitive balance While there are other methods used to measure competitive balance, (e.g., Barra, 2002), the standard deviation appears to be the one most often chosen.

Standard Deviation Formula

The formula for the standard deviation of winning percentages is as follows:

$$\sigma = \sqrt{\frac{\Sigma\,(WPCT - .500)^2}{N}}$$

where the WPCT is the winning percentage of each team in the conference for a given year, .500 is the average winning percentage for all teams for that year, and N is the number of teams in the league.

For comparative purposes one could calculate an ideal standard deviation which would be a situation where each team had a 0.5 chance of winning each game. In our case one could see how far from the ideal, the actual standard deviation varied. The equation is

$$\sigma = 0.5 / \sqrt{N}$$

where .5 indicates that each team has a 0.5 probability of winning, and G is the number of games each team plays.

Results and Discussion

Tables 1-2 display the winning percentages for the conferences under consideration. Table 3 displays the standard deviations for the respective conferences.

Table 1

Big East Conference Standings

	2013-14			2014-15			2015-16			2016-17		
Teams	W	L	PCT	W	L	PCT	W	L	PCT	W	L	PCT
Villanova	16	2	.889	16	2	.889	16	2	.889	15	3	.833
Creighton	14	4	.777	4	14	.222	9	9	.500	10	8	.556
Providence	10	8	.556	11	7	.611	10	8	.556	10	8	.556
Xavier	10	8	.556	9	9	.500	14	4	.778	9	9	.500
St. John’s	10	8	.556	10	8	.556	1	17	.056	7	11	.389
Marquette	9	9	.500	4	14	.222	8	10	.444	10	8	.556
Georgetown	8	10	.444	12	6	.667	7	11	.389	5	13	.278
Seton Hall	6	12	.333	6	12	.333	12	6	.667	10	8	.556
Butler	4	14	.222	12	6	.667	10	8	.556			

De Paul	3	15	.166	6	12	.333	3	15	.166

Table 2

American Athletic Conference Standings

	2013-14			2014-15			2015-16			2016-17		
Teams	W	L	PCT	W	L	PCT	W	L	PCT	W	L	PCT
Louisville	15	3	.833									
Cincinnati	15	3	.833	13	5	.722	12	6	.667	16	2	.889
Connecticut	12	6	.667	10	8	.556	11	7	.611	9	9	.500
Memphis	12	6	.667	10	8	.556	8	10	.444	9	9	.500
S. Methodist	12	6	.667	15	3	.833	13	5	.722	17	1	.944
Houston	8	10	.444	4	14	.222	12	6	.667	12	6	.667
Rutgers	5	13	.278									
C. Florida	4	14	.222	5	13	.278	6	12	.333	11	7	.611
Temple	4	14	.222	13	5	.722	14	4	.778	7	11	.389
S. Florida	3	15	.167	3	15	.167	4	14	.222	1	17	.056
Tulsa				14	4	.778	12	6	.667	8	10	.444
Tulane				6	12	.333	3	15	.167	3	15	.167
E. Carolina				6	12	.333	4	14	.222	6	12	.333

Table 3

Standard Deviations for Conferences

	Standard Deviation				
	2013-14	2014-15	2015-16	2016-17	Average
Big East	.213825	208063	.242126	.190853	.213717
AAC	.249664	230858	.217106	.259377	.239251

As indicated in table 3 for the 2013-14 season, the lowest standard deviation, and thus the most competitively balanced was the Big East with a standard deviation of .214. For the AAC the standard deviation was .250. When comparing the standard deviation for the Big East and the AAC, our expectations were realized. Indeed, the difference in the standard deviation was approximately fifteen percent lower for the Big East. As indicated above this result was not surprising given the fact that the Big East was able to basically pick the teams they wanted in the conference, whereas the AAC was left somewhat scrambling to put together a viable conference after losing seven member of the original Big East conference, and an additional five members before the start of the 2014-15 season. When compiling data for the 2014-15, we found our results were similar to the 2013-14 season with the Big East again having a considerably lower standard deviation than the AAC. In the case of the Big East the standard deviation was .208, and for the AAC it was .231, an approximate 10% differential. Interestingly enough, the change in membership had minimal effect on the conference competitive balance since Louisville was on the high end and Rutgers on the low end of the 2013-14 standings, whereas the replacements found Tulsa on the high end of the 2014-15 standings with both Tulane and East Carolina on the low end.

When comparing the standard deviation of the two conferences for the 2015-16 season the results were somewhat surprising, given our original hypothesis. In this case the AAC had a lower standard deviation, i.e., more competitive balance than the Big East. The standard deviation for the former was.217, whereas the standard deviation for the Big East had risen to .242. Since there were no changes in membership in either conference during this season, there was no explanation that immediately stood out to explain this conclusion. While there were differences in the actual standings, there were relatively few teams that significantly changed their position in the standings. While the deviation in 2015-16 was somewhat surprising, data for the 2016-17 season tended to once again re-enforce the original hypothesis. In that season the Big East had its lowest standard deviation over the four-year period, .191, whereas the AAC had a standard deviation of .259 its highest over the period studied.

In order to avoid the peculiarities which can create deviations for a particular year, we also calculated a mean standard deviation over the four-year period since the breakup of the original Big East. Over the period 2013-14 to 2016-17 the average standard deviation of the Big East Conference was .214 compared to a standard deviation of .240 for the AAC. This was slightly more than a 12% differential for the four-year period, and supported the original hypothesis.

Conclusions

In general, using the standard deviation as our measure of competitive balance, our hypothesis that the Big East Conference would be more competitively balanced than the AAC was suggested by the data, as the Big East Conference was more competitively balance in three of the four years under consideration. The only instance in which the AAC had a more competitively balanced conference than the Big East was in 2015-16. The mean standard deviation over the four-year period studied was .214 for the Big East Conference, and .240 for the AAC.

Limitations

Given the recent reconfiguration of the conferences under investigation, we could only test our hypothesis for four years. Assuming stable membership (a big assumption in the current climate) more robust analysis will be possible as seasons accrue.

In addition, variation in the conference schedules may be a limiting factor. Given the conference's size, not all AAC teams play the same within conference schedule each year or even year-to-year. It is not a true round-robin, as is sometimes the case with other conferences. Other factors such as injuries, etc. could influence our results. Unfortunately, it is almost impossible to account for all such possibilities.

Further and pertaining to realignment, it is important to recognize that competitive balance, or even related revenue potential, is not the only factor impacting membership decisions. Variables such as geography, academic classifications, and other factors may also be factors. However, given the links among competitive balance, fan interest and revenue, particularly for the sports of football and men's basketball, balance is an important issue. Since the Big East does not play football, it was impossible to test our hypothesis for that sport.

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