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Exploring the Relationship Between Intercollegiate Athletic Expenditures and Team On-Field Success Among NCAA Division I Institutions

Willis A. Jones¹

Abstract

In recent years, there has been increased research exploring the relationship between college/university intercollegiate athletic expenditures and team on-field success. Scope and methodological limitations of this previous research, however, suggest the need for further empirical research in this area. This study uses regression analyses with time and institutional fixed effects and several control variables to investigate the relationship between college/university athletic department expenditures and overall athletic department on-field success. The findings indicate that institutional athletic expenditures are strongly correlated with team on-field performance among Football Bowl Subdivision (FBS) institutions but not among non-FBS institutions.

Keywords

intercollegiate athletic expenditures, team on-field success

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In 2009, University of Texas at Austin head coach Mack Brown became the first college football coach to be paid over five million dollars per year (Berkowitz, 2009). Brown is not the only college football coach to see his salary increase substantially in recent years. A report by *USA Today* reveals that college football coaches salaries are up over 46% since 2006 (Wieberg, Upton, Perez, & Berkowitz, 2009). In 2006, only nine Football Bowl Subdivision (FBS)¹ head football coaches earned a salary of at least two million dollars. By 2009, that number had increased to 25 coaches (Wieberg et al., 2009).

Escalating coaches' salaries is one reason for what has been a precipitous increase in operating expenditures among college and university athletic departments. Several reports have chronicled this rise. Litan, Orszag, and Orszag (2003) found that from 1985-2001 mean athletic spending among FBS institutions increased by an average of about 4.5% per year. Cheslock (2008) found that, among a sample of 625 National Collegiate Athletic Association (NCAA) institutions from Divisions I, II, and III, aggregate athletic expenditures increased 7% annually from 1995-2005. Most recently, Orszag and Israel (2009) found that major college athletic programs increased their expenditures by nearly 11% per year from 2004-2007. This 11% increase is double the average annual increase in overall university spending (4.9%) over this same timespan (Wieberg & Berkowitz, 2009).

This escalation in athletic spending has, surprisingly, not resulted in a substantial increase in empirical research on the impact of college athletics expenditures. The few studies which have attempted to examine the effect of athletic spending have focused on outcomes such as overall student quality (Osborne, 2004), alumni giving (Litan, Orszag, & Orszag, 2003; Orszag & Orszag, 2005; Zimbalist, 1999), revenues generated (Litan et al., 2003; Orszag & Orszag, 2005), and student-athlete participation (Cheslock, 2008). While these are important outcomes, many athletic directors would likely proclaim that one of the primary goals of their athletics expenditures is to field successful intercollegiate athletic teams. For example, as part of Iowa State University's 2007 Athletic Department Strategic Plan, various measures of athletic competitiveness such as winning conference championships and overall Directors' Cup rankings were highlighted as important departmental goals (Iowa State University, 2007). Little research, however, has attempted to empirically examine the relationship between institutional athletic expenditures and team on-field success. The few studies which have attempted to examine this relationship (Lawrence, Li, Regas, & Kander, 2009; Litan et al., 2003; Orszag & Israel, 2009; Orszag & Orszag, 2005; Won, 2004) have important limitations which suggest the need for further research in this area.

This study used regression analyses with fixed effects and several control variables to investigate the relationship between institutional athletic department expenditures and overall athletic department on-field success. The following section of this article describes recent research on this topic. In presenting this research, limitations are noted which suggest the need for continued study in this area. This is followed by a presentation of the methods used for the study, the study results, and implications of the findings as well as suggestions for future research in this area.

Research on the Relationship Between Athletic Expenditures and On-field Success

One of the first empirical treatments of the relationship between athletic expenditures and team on-field success was done by Litan et al. in 2003. As part of their larger study on the empirical effect of college athletics, Litan et al. (2003) examined how changes in institutional spending on football impacted football team on-field success as measured by football team winning percentage. Using a panel data set with year and institutional fixed effects, the researchers found no statistically significant relationship between institutional expenditures on football and football team winning percentages among Division I-A (now FBS) colleges and universities from 1993-2001.

A similar analysis was done by Orszag and Orszag (2005) on a different subset of NCAA institutions. In this study, the authors used panel data from 1993-2003 to explore how changes in institutional spending on football impacted football team winning percentages at Division II colleges and universities. Again, no statistically significant correlation was found between spending on football and team on-field success. As with the Litan et al. (2003) study, the model used to estimate the relationship between football expenditures and football success included year and institutional fixed effects. The model also included controls for whether a college/university was public or private and whether the institution moved from Division I to Division II between 1993 and 2003.

Recently, Orszag and Israel (2009) examined the relationship between expenditures and team on-field success at FBS institutions using data from 2004-2007. This study expanded their previous research in this area by exploring how spending impacts both football and men's basketball team performance as well as examining the impact of spending on various measures of team on-field success (not just overall team winning percentages). The findings of this study were different than the results from previous studies in that a small, positive, statistically significant relationship was found between overall operating expenditures and team success in football. Specifically, a \$1 million increase in football expenditures was estimated to increase team winning percentage by 1.8 percentage points and the likelihood of finishing a season in the Associated Press Top 25 poll by 5%. Regarding men's basketball, the study did not find a statistically significant relationship between changes in total operating expenditures and team winning percentage or the probability of reaching the NCAA tournament.

While each of these studies provide important information on the relationship between expenditures and on-field success, an argument can be made that each is limited in scope. Each study detailed to this point examined the relationship between expenditures and on-field success in football or men's basketball only. These are only 2 of the 25 sports sponsored by the NCAA (NCAA, 2010). Therefore, the aforementioned studies tell us very little about how overall athletic spending is associated with the on-field success of the entire athletic department.

In an attempt to address this shortcoming, two studies have attempted to examine the relationship between athletic expenditures and overall athletic department on-field success. The first was conducted by Won (2004) as part of his doctoral dissertation. Won looked at how tangible athletic department resources such as departmental expenses were related to athletic department performance goals. In contrast to the studies from Litan et al. (2003), Orszag and Orszag (2005), and Orszag and Israel (2009), the Won study looked at broader athletic department on-field success by operationalizing institutional performance goals as college/university National Association of Collegiate Directors of Athletics (NACDA) Directors' Cup scores.² Using structural equation modeling on a sample of 324 institutions from the 2003-2004 season, Won found a positive, statistically significant relationship between athletic department resources and performance goals. Athletic departments that spent more on athletics were found to have higher Directors' Cup scores.

A second study conducted by Lawrence, Li, Regas, and Kander (2009) also looked at how athletic department resources were associated with an institution's Directors' Cup standings. Using data on 400 NCAA and National Association of Intercollegiate Athletics (NAIA) institutions from the 2006-2007 season, Lawrence et al. found that total operating expenditures had a positive, statistically significant correlation with Directors' Cup scores among NAIA colleges and universities only. Among NCAA Division I, II, and III institutions, there was no relationship found between overall operating expenditures and Directors' Cup scores.

Though the Won (2004) and Lawrence et al. (2009) studies have a broader scope in that they focus on the relationship between athletic expenditures and overall athletic department on-field success, these studies are limited with regard to their methodology. Specifically, both studies employ cross-sectional data analyses which leave their coefficient estimates susceptible to omitted variable bias. Though several covariates are used in each study to control for characteristics which are correlated with both athletic department expenditures and institutional team on-field success, non-controlled for variables such as institutional athletic tradition or the region of the country in which an institution is located could lead to a significant correlation between the model error term and institutional athletic expenditures. This would result in biased coefficient estimates. This suggests the need to reestimate the relationship between athletic expenditures and team on-field success using a methodology which limits the potential for omitted variable bias.

To summarize, there has been some research in recent years which has attempted to examine the relationship between institutional athletic expenditures and team on-field success. While each of these studies contribute important knowledge to the education and athletics community, they each have limitations which suggest the need for further research in this area. Some of these studies have limited scope in that they focus on the on-field success of only one or two sports instead of the on-field success of the entire athletic department. Others are limited methodologically by the fact that their estimation models leave coefficients open to omitted

variables bias. In an effort to address these shortcomings, this study addressed the following research questions:

Among NCAA Division I institutions, what is the impact of changes in athletic expenditures on the overall on-field performance of an athletic department, *ceteris paribus*?

Is the relationship between changes in athletic expenditures and overall on-field performance different for institutions within the FBS, the Football Championship Subdivision (FCS), and the Division I-Non Football subdivision (DI-NF), *ceteris paribus*?

Among FBS institutions, is the relationship between changes in athletic expenditures and overall on-field performance different for schools in Bowl Championship Series (BCS) conferences and schools in non-BCS conferences, *ceteris paribus*?

Sampling and Research Methodology

As noted in the aforementioned research questions, this study focused only on colleges and universities classified as NCAA Division I institutions. Institutional NCAA affiliation was collected via the U.S. Department of Education Equality in Athletics Disclosure Act (EADA) data set. Every year, the Department of Education requires colleges and universities which have intercollegiate athletic programs and that participate in any Title IV federal student financial assistance program to prepare a report detailing athletic participation, staffing, revenues, and expenses for their men's and women's teams (U.S. Department of Education, 2011). These reports contain information on the NCAA divisional affiliation of colleges and universities. Any institution which self-classified as NCAA Division I from 2006-2009 was included in the analytic group for this study.³ Institutions that moved from NCAA Division II or III into Division I were excluded from analysis. Institutions which moved down from NCAA Division I into Division II or III were also excluded from analysis.

This procedure resulted in an initial group of 335 institutions which self-identified as NCAA Division I institutions every year from 2006-2009. After removing two community colleges which incorrectly self-identified as Division I institutions and the three United States Military Academies,⁴ a final group of 330 institutions was used for analysis.

Several sources were used to collect data on the institutions used. The outcome variable, institutional overall athletic department on-field performance, was operationalized as an institution's overall score in the NACDA Directors' Cup standings. Each year, the NACDA sponsors a competition among NCAA and NAIA colleges and universities in an effort to crown that year's most successful intercollegiate athletic program. The goal of this program, according to the NACDA, is to honor "institutions maintaining a broad-based program, achieving success in many sports, both men's and women's" (National Association of Collegiate

Directors of Athletics [NACDA], 2011). The scoring system used by the NACDA awards points to each institution's intercollegiate athletic team based on the on-field success of that team. Teams winning the NCAA or NAIA championship in their sport in a given season receive 100 points for their institution while teams not winning a championship receive various amounts of points based on their success relative to other institutions.⁵ Teams finishing below a certain threshold receive zero points. For example, during the 2009-2010 school year, the University of Alabama football team won the BCS National Championship and the institution received 100 The publication of the Directors' Cups standings for that performance. During that same year, the University of Alabama women's soccer team finished 6-11-1, did not qualify for the NCAA Woman's Soccer Tournament, and earned zero Directors' Cup points for the institution. At the University of Kentucky during the 2009-2010 school year, the women's gymnastics team completed their season 8-19 overall, finishing sixth at the NCAA regionals, and earned 46.5 Directors' Cup points for the University of Kentucky.

For NCAA Division I institutions, 20 men's and women's sports are applied toward an institution's overall Directors' Cup score. The Directors' Cup points earned by an institution's 10 top performing men's teams and an institution's 10 top performing women's teams are totaled and comprise an institution's total Directors' Cup score. These scores are rank ordered and published on the NACDA website.

Total Directors' Cup points were used as the dependent variable for the regression analyses run. Directors' Cup points were also used to determine the number of years in which data would be collected for each school in the study. While NACDA Directors' Cup standings are publically available dating back to 1993, in both 2004-2005 and 2005-2006 institutional Directors' Cup scores are only available for the 100 highest ranked Division I colleges and universities. After attempting unsuccessfully to gain access to the full Directors' Cups standings for those 2 years, it was decided that this study would focus its analyses on the four most recent years of Directors' Cup standings data, the 2006-2007 standings, the 2007-2008 standings, the 2008-2009 standings, and the 2009-2010 standings. Each of these years contained full Directors' Cup point information for Division I colleges and universities.⁶

The primary independent variable of interest was overall athletic department expenditures. This information was collected from two sources. In previous research examining the relationship between athletic expenditures and team success, EADA expenditure data have been the primary measure of institutional expenditures on athletics. EADA data were also used in this study. Institutional grand total athletic expenditures on men's and women's sports as reported by the EADA was one source of athletic expenditure data used for this study.

A second expenditures measure came from the *USA Today* College Athletics Finance Database. Despite the popularity of EADA expenditure data in research on college athletics, there are some who question the validity and reliability of the information contained in this data set (NCAA Research Staff, personal

communication, November 11, 2010). It has been suggested that one way in which EADA data can be triangulated is by comparing it to college athletics financial data collected from a different source. Each year since 2004, *USA Today* has sent public records requests to public institutions of higher education asking for detailed college athletics financial information on everything from ticket sales revenue to game day expenses (Upton & Gillum, 2010).⁷ Institutional total athletics expenditure figures from this data set was used as the independent variable of interest in separate regression models in an effort to triangulate the findings of the regression models using EADA athletics expenditures data as the independent variable of interest. Because, only public institutions report data to the *USA Today* College Athletics Finance Database, the number of institutions used in running the regression models using *USA Today* data was smaller than the number of institutions used for running models using EADA data. Only 223 institutions reported data to the *USA Today* in at least 3 of these 4 years (2006-2009) used in this study.⁸ Of these 223 institutions, nine were not Division I institutions and two did not report data to the EADA. Therefore, regression models which used *USA Today* Data as the independent variable of interest used a sample of 212 colleges and universities.

Several covariates were also used to help ensure the unbiased estimation of the relationship between institutional athletic expenditures and team on-field performance. Due to the use of panel data and the presence of institutional fixed effects, athletic department characteristics which do not change from year to year such as institutional control (public/private), institutional location, institutional selectivity, and institutional athletic “tradition” are controlled for in the model estimations used. Year fixed effects were also used in all model estimations to control for yearly trends which effect all institutions of higher education such as inflation and national economic conditions.

Other variables, however, which can change from year to year and that are correlated with both institutional athletic expenditures and athletic department team on-field success are not controlled for by fixed effects and therefore must be included in models to avoid omitted variable bias. Four such variables were controlled for in this study. The total number of student participating in intercollegiate athletics was controlled for using data from the EADA. While this is clearly correlated with expenses in that the number of student athletes in an athletic department would likely impact the amount an athletic department spends on travel, lodging, and other operating cost, the number of student athletes may also be correlated with on-field success. More athletes on a team may lead to increased competition for positions and playing time. This could improve athletic abilities and result in better overall on-field performance. If this is the case, the total number of student-athletes is an important variable that if not accounted for could bias estimations.

EADA data were also used to control for changes in the number of intercollegiate men’s and women’s sports sponsored from one year to the next. It would be expected that the number of sports sponsored by an institution is strongly correlated with

athletic expenditures. Adding or dropping an athletic program may also be correlated with institutional Directors' Cup points, given that Directors' Cup scoring incorporates the success of all an institution's athletic programs.

The final covariate used accounted for institutional movement between NCAA Division I subdivisions. Over the 4 years covered in this study, a number of institutions moved from one Division I subdivision to another. Because this movement would be expected to correlate with both institutional athletic expenditures and athletic department on-field success, it was controlled for using a multiple dummy variable setup. Each institution in this data set fell into one of the four categories: No change in subdivision affiliation, move from FCS to DI-NF, move from FCS to FBS, or move from DI-NF to FCS. No other subdivision transition took place over the years covered.

The mathematical notation for the base regression model estimated was:

$$\begin{aligned} \text{Directors' Cup}_{it+1} = & \beta_0 + \beta_1 \ln \text{Athletic Expenditures}_{it} + \beta_2 \text{Student Athletes}_{it} \\ & + \beta_3 \text{Change Men's Sports}_{it} + \beta_4 \text{Change in Women's Sports}_{it} \\ & + \beta_5 \text{Change in Division I Subdivision}_{it} + \gamma i + \eta t + \varepsilon_{it}. \end{aligned} \quad (1)$$

To ensure the linearity of the independent variable of interest, both EADA and *USA Today* expenditure data were log-transformed.

To address Research Questions 2 and 3, Equation 1 was estimated with the inclusion of interaction terms. For Research Question 2, athletic expenditures were interacted with Division I subdivision affiliation. Given the structural differences between FBS, FCS, and DI-NF institutions with regard to athletic department mission, resources, and infrastructure it was of interest to determine if the relationship between expenditures and team success was different at each Division I level.

To address Research Question 3, athletic expenditures were interacted with BCS conference affiliation among FBS institutions. The distinction between BCS and non-BCS institutions refers to whether an institution's intercollegiate football team is affiliated with one of the six conferences⁹ which receive automatic qualification for BCS bowl games. Though this distinction technically only refers to an institution's football program, the BCS/non-BCS distinction also serves to differentiate the highest revenue producing athletic programs. Of the 65 FBS college and university athletic departments which generated the highest overall revenue in 2008, only two (Brigham Young University and Texas Christian University) were non-BCS programs (Robbins, 2009). Given this distinction in revenue between BCS and non-BCS institutions (and the different athletic department structures which are likely to be a consequence of this distinction), it was important to examine whether the relationship between athletics expenditures and team on-field success among FBS schools was moderated by BCS status.

Study Findings

Descriptive Results

Two sets of summary statistics are presented in Table 1. Variables with the EADA suffix are summary statistics for institutions used in regression models where EADA expenditure data are the independent variable of interest. Variables with the *USA Today* suffix are summary statistics for institutions used when *USA Today* expenditure data are the independent variable of interest. In looking at the summary statistics for the larger EADA data set, it is noted that the mean total Directors' Cup points for the institutions used was 194.60 with a standard deviation of 274.19. This suggests a fairly large variance in institutional Directors' Cup scores between 2006 and 2009. This same large variance can be seen when looking at the descriptive statistics for the number of total student athletes at an institution. The lowest number of student athletes at an institution in a given year was 91 with the highest number being 1,272. This offers some insight into the differences between larger and smaller Division-I athletics programs with regard to the number of students participating in intercollegiate athletics.

From 2006-2009, Table 1 shows that Division I institutions did not change very much with regard to the number of intercollegiate athletics programs sponsored. From one year to the next, the average institution in this data set cut and/or added less than one male or female intercollegiate sport.

Table 1 also displays the magnitude of college and university financial expenditures on athletics. The average Division I institution, according to EADA data, spent over 22.9 million dollars on intercollegiate athletics each year from 2006-2009. Again, the differences in the amount spent by larger and smaller athletic programs are illustrated by the sizable standard deviation of this variable as well as the minimum and maximum amount spent by institutions. Among the Division I colleges and universities which reported data to the *USA Today*, average institutional expenditures on athletics was 27.2 million dollars per year over the time frame studied here. This five million dollar difference between EADA and *USA Today* data are likely due to the fact that many of the institutions with the smallest athletic budgets are private institutions which did not report expenditures data to the *USA Today*. As a result, it would be expected that *USA Today* expenditure data would be skewed upward. The sizable standard deviation of the *USA Today* expenditures data again indicates that athletic expenditures differ significantly from institution to institution.

To examine the claims of those who question the validity and reliability of the information contained in the EADA data set (NCAA Research Staff, personal communication, November 11, 2010), institutional athletic expenditures as reported to the EADA and *USA Today* were compared for those institutions which reported information to both data sets. As noted in Table 1, mean expenditure data reported by institutions to the *USA Today* was 27.2 million dollars with a standard deviation of 21.1 million dollars. Among those same institutions, mean athletics expenditures as reported to the EADA data set was 25.4 million with a standard deviation of 23.5

Table 1. Summary Statistics for Noncategorical Variables.

Variable Name	M	SD	Number of Observations	Min	Max
Total Directors' Cup Points (EADA)	194.60	274.19	1,320	0	1,508.5
Total Directors' Cup Points (USA Today)	215.64	292.45	848	0	1,310
Total Expenditures on Athletics (EADA)	\$22,904,215	\$21,153,520	1,320	\$2,102,031	\$113,952,320
Total Expenditures on Athletics (USA Today)	\$27,247,499	\$25,317,370	827	\$2,527,671	\$130,436,534
Total Student-Athletes (EADA)	464	193	1,320	91	1,272
Total Student-Athletes (USA Today)	457	169	848	91	1,059
Change in Total Men's Sports (EADA)	-.025	.34	1,320	-4	2
Change in Total Men's Sports (USA Today)	-.031	.34	848	-4	2
Change in Total Women's Sports (EADA)	.009	.32	1,320	-4	2
Change in Total Women's Sports (USA Today)	.002	.322	848	-3	2

Note. EADA = Equality in Athletics Disclosure Act.

million. This roughly two million dollar difference, which t test showed was statistically significant, $t(826) = -13.54$, $p < .001$, provides some evidence that colleges and universities indeed reported different expenditure data to the EADA and *USA Today* databases. Though different, the correlation between EADA and *USA Today* athletics expenditures data was an extremely high .989. This suggests that while there is a statistically significant difference in the athletic expenditures reported by the EADA and the *USA Today*, the two data sets are very strongly correlated.

In Table 2, institutional athletics expenditures are displayed by NCAA Division I subdivision and year. As would be expected, expenditures at FBS institutions are on average much higher than expenditures at non-FBS institutions in both the EADA and the *USA Today* data sets. Expenditure increases from year to year also appear to be significantly greater at FBS institutions. Among FBS colleges and universities, the average yearly increase in athletic expenditures was over \$2 million dollars in both the EADA and the *USA Today* data sets. Among FCS institutions, the average change was over \$700,000 per year and among DI-NF institutions the average change was over \$600,000 in the EADA data set and over \$450,000 in the *USA Today* data set.

Table 3 displays the distribution of observations based on the categorical variables used in this study. Perhaps, the most interesting aspect of this table is the lack of movement between NCAA Division I subdivision. In over 99% of observations, an institution remained in the same subdivision as it was in the year before. Given the time and effort necessary for an institution to move from one subdivision to another, these results were not surprising.

Regression Results

Table 4 displays the results of regression equations run to estimate Research Question 1. In looking at the control variables used in these models, two are statistically significant. In the model with EADA expenditure data as the independent variable of interest, moving from FCS to FBS was positively related to institutional Directors' Cup points ($\hat{\beta} = 137.78$, $p < .000$) while moving from DI-NF to FCS was negatively associated with Directors' Cup points ($\hat{\beta} = -61.35$, $p < .01$). Very similar relationships were found in the model using *USA Today* expenditure data as the independent variable of interest. In this model, a positive relationship was found between moving from FCS to FBS and Directors' Cup points ($\hat{\beta} = 139.46$, $p < .000$) while a negative relationship was found between moving from DI-NF to FCS and Directors' Cup points ($\hat{\beta} = -80.87$, $p < .000$).

With regard to the relationship between athletics expenditures and Directors' Cup points, both models found that, using traditional markers for statistical significance, there was no relationship between changes in institutional athletic expenditures and team on-field success. Using more liberal markers of statistical significance, however, this relationship could be labeled as marginally significant. When EADA data were the independent variable of interest, the β coefficient of institutional athletic

Table 2. Institutional Expenditures on Intercollegiate Athletics by NCAA Division I Subdivision and Year.

	2007 Athletic Expenses		2008 Athletic Expenses		2009 Athletic Expenses		2010 Athletic Expenses	
	EADA	USA Today	EADA	USA Today	EADA	USA Today	EADA	USA Today
FBS	\$40,075,721	\$41,706,692	\$42,658,403	\$45,647,183	\$45,310,672	\$47,631,048	\$46,809,584	\$49,409,885
FCS	\$11,165,636	\$10,457,290	\$12,171,881	\$11,403,425	\$12,937,214	\$12,290,556	\$13,509,481	\$12,610,781
DI-NF	\$9,346,847	\$8,831,484	\$10,273,434	\$9,549,611	\$10,840,024	\$9,968,013	\$11,180,567	\$10,190,390

Note. FBS = football bowl subdivision; FCS = football championship subdivision; DI-NF = division I-non football subdivision.

Table 3. Distribution of Observations for Categorical Variables.

Variable	EADA Data Set %	USA Today Data Set %
Division I subdivision affiliation		
Football bowl subdivision (FBS)	35.30	45.52
Football championship subdivision (FCS)	35.98	33.73
Division I-non football (DI-NF)	28.71	20.75
Change in division I subdivision		
No change in subdivision	99.47	99.53
Move from FCS to DI-NF	.15	0
Move from FCS to FBS	.08	12
Move from DI-NF to FCS	.30	35
BCS affiliation (among FBS institutions)		
BCS	44.21	45.08
Non-BCS	55.79	54.92

Note. BCS = bowl championship series.

expenditures was 36.71 with a ρ value of .06. When *USA Today* data were used, the β coefficient of institutional athletics expenditures was 50.54 with a ρ value of .08. Because of the presence of both year and institutional fixed effects, each model had an adjusted R^2 of over .95.¹⁰

The results of the regression model run to address Research Question 2 are presented in Table 5. These findings suggest that the impact of institutional athletic expenditures on team on-field success is conditional on NCAA Division I subdivision. When using EADA data, it was found that among FBS institutions a 1% increase in athletics expenditures was correlated with a 1.08 increase in Directors' Cup points ($\hat{\beta} = 107.67$, $\rho < .01$). Among FCS institutions, however, this relationship was significantly more negative ($\hat{\beta} = -109.21$, $\rho < .02$). This finding suggests that the Directors' Cup points earned by FBS and FCS athletic departments are affected very differently by changing in athletic expenditures. When comparing FBS institutions with DI-NF institutions using EADA data, no statistically significant difference was found ($\hat{\beta} = -61.31$, $\rho = .19$) in the relationship between athletic expenditures and Directors' Cup points. At both FBS and DI-NF institutions, there appears to be an overall positive relationship between athletic expenditures and team on-field success.

The regression model using *USA Today* expenditure data produced very similar results as the regression model using EADA data. Among FBS institutions, there was a positive, statistically significant relationship between expenditures and Directors' Cup points ($\hat{\beta} = 174.92$, $\rho < .00$). Among FCS institutions, this relationship was again significantly less positive in comparison to FBS institutions ($\hat{\beta} = -187.04$, $\rho < .00$). In contrast to the EADA model, however, the *USA Today* model found that DI-NF institutions were also significantly different than FBS institutions with regard

Table 4. Regression of Institutional Athletic Expenditures on Team On-Field Success.

	EADA Data as Independent Variable of Interest	USA Today Data as Independent Variable of Interest
In EADA total expenditures	36.71 (0.06)	
In USA Today total expenditures		50.54 (0.08)
Change in men's sports	-6.31 (0.38)	-2.18 (0.82)
Change in women's sports	3.34 (0.64)	-2.11 (0.83)
Total student-athletes	0.04 (0.59)	0.05 (0.53)
Move from FCS to DI-NF	-4.42 (0.84)	—
Move from FCS to FBS	137.78*** (0.00)	139.46*** (0.00)
Move from DI-NF to FCS	-61.35* (0.01)	-80.87** (0.00)
2008	-2.84 (0.54)	-0.26 (0.96)
2009	-5.01 (0.41)	-4.92 (0.53)
2010	-6.78 (0.33)	-7.91 (0.37)
Constant	-427.83 (0.19)	-647.90 (0.18)
Observations	1320	827
Adjusted R ²	.952	.953
Number of institutions	330	212
ρ	.924	.936

Notes. FBS = football bowl subdivision; FCS = football championship subdivision; DI-NF = division i-non football subdivision. p values in parentheses, robust standard errors used dependent variable: NACDA Total Directors' Cup Points * $p < .05$, ** $p < .01$, *** $p < .001$ omitted variables: No change in NCAA subdivision; Year 2007.

to the relationship between expenditures and team success ($\hat{\beta} = -127.87, \rho < .05$). In sum, the models estimated to address Research Question 2 indicate that there is a positive, statistically significant relationship between institutional athletic expenditures and team on-field success among FBS institutions. This relationship is much less positive among both FCS and DI-NF institutions.

The findings presented in Table 6 indicate that, among FBS institutions, being affiliated with a BCS conference has no moderating effect on the relationship between institutional athletic expenditures and team on-field success. The interaction between

Table 5. Regression of Institutional Athletic Expenditures on Team On-Field Success With Interactions by NCAA Division I Subdivision Affiliation.

	EADA Data as Independent Variable of Interest	USA Today Data as Independent Variable of Interest
In EADA total expenditures	107.67* (0.01)	
In USA today total expenditures		174.92** (0.00)
In EADA expenditures FCS*	-109.21* (0.02)	-187.04*** (0.00)
In USA today expenditures DI-NF*	-61.31 (0.19)	-127.87* (0.04)
Change in total men's sports	-7.38 (0.31)	-3.08 (0.74)
Change in total women's sports	4.64 (0.52)	-0.95 (0.92)
Total student-athletes	0.04 (0.55)	0.05 (0.53)
Move from FCS to DI-NF	-11.28 (0.64)	— —
Move from FCS to FBS	166.64*** (0.00)	166.09*** (0.00)
Move from DI-NF to FCS	-30.64 (0.12)	4.69 (0.83)
2008	-3.49 (0.45)	-3.43 (0.55)
2009	-6.66 (0.28)	-9.12 (0.25)
2010	-8.55 (0.22)	-12.66 (0.15)
Constant	-1685.44* (0.02)	-2,834.64** (0.00)
Observations	1320	827
Adjusted R ²	.952	.954
Number of institutions	330	212
ρ	.939	.926

Notes. FBS = football bowl subdivision; FCS = football championship subdivision; DI-NF = division i-non football subdivision. p values in parentheses, robust standard errors used dependent variable: NACDA total directors' cup points * $p < .05$, ** $p < .01$, *** $p < .001$ omitted variables: No change in NCAA subdivision; Year 2007.

EADA expenditures and BCS Conference affiliation ($\hat{\beta} = 64.15$, $\rho = .35$) as well as *USA Today* expenditures and BCS conference affiliation ($\hat{\beta} = 148.67$, $\rho = .12$) was found to be statistically insignificant.

Table 6. Regression of Institutional Athletic Expenditures on Team On-Field Success With Interactions by BCS Affiliation Among FBS Institutions.

	EADA Data as Independent Variable of Interest	USA Today Data as Independent Variable of Interest
In EADA total expenditures	64.15 (0.35)	
In USA today total expenditures		148.67 (0.12)
In EADA expenditures × non-BCS	16.56 (0.84)	-8.62 (0.93)
Change in total men's sports	-16.52 (0.54)	-2.38 (0.93)
Change in total women's sports	14.18 (0.48)	-11.20 (0.70)
Total Student-Athletes	0.12 (0.42)	0.04 (0.81)
Move from FCS to FBS	160.01*** (0.00)	167.06*** (0.00)
2008	8.79 (0.39)	8.74 (0.43)
2009	4.50 (0.75)	-0.77 (0.96)
2010	4.16 (0.80)	-2.07 (0.91)
Constant	-893.42 (0.31)	-2156.38 (0.07)
Observations	466	384
Adjusted R ²	.943	.942
Number of institutions	117	97
ρ	.959	.875

Notes. FBS = football bowl subdivision; FCS = football championship subdivision; DI-NF = division I-non football subdivision. *p* values in parentheses, robust standard errors used dependent variable: NACDA Total Directors' Cup Points **p* < .05, ***p* < .01, ****p* < .001 omitted variables: No change in NCAA subdivision; Year 2007.

Limitations and Post Hoc Analysis

Despite the efforts taken to ensure the accurate estimation of the relationship between institutional athletic expenditures and team on-field success, several limitations should be considered in interpreting the results of this study. Athletic expenditure data reported to the EADA and the *USA Today* are self-reported by colleges and universities. If this information has been reported inaccurately, the estimates presented in this study would also be inaccurate. In addition, the reporting of data to the *USA Today* may suffer from selection bias. Not every public

institution of higher education responded to the *USA Today*'s request to release athletic expenditures data. If the institutions which chose not to release athletic expenditures data are systematically different than the institutions which did release athletic expenditures data, models estimated using *USA Today* expenditure data could be biased.

Another potential limitation is omitted variable bias. Though several control variables as well as year and institutional fixed effects were included in the analyses used, noncontrolled for institutional characteristics which are correlated with institutional athletics expenditures could lead to omitted variable bias. Given the methodology of this study, however, it is not believed that this is a significant threat.

One other potential limitation of this study comes from the fact that the relationship between institutional athletics expenditures and team on-field success may reflect reverse causality. For many intercollegiate athletics programs, increased on-field success could lead to additional games through the bowl system or as part of NCAA tournament play. These extra games could lead to increased expenditures meaning that athletic success may be resulting in increased athletic expenditures.

In order to determine whether institutional athletics expenditures was proper exogenous in the ordinary least squares models estimated, endogeneity tests using an instrumental variable model was estimated. To do this, institutional expenditures on intercollegiate athletics was instrumented using total undergraduate enrollment and total institutional assets. Institutions with larger undergraduate enrollment would likely have a greater number of student athletes participating in intercollegiate athletics, which would likely influence athletic expenditures. Undergraduate enrollment, however, would not be expected to directly influence institutional athletic team performance. Institutional assets, a proxy for institutional wealth, was used because of its expected relationship with institutional expenditures on intercollegiate athletics in that wealthier colleges and universities might be expected to spend more on all auxiliary services, including athletics. Overall institutional wealth, however, would be expected to be exogenous to athletic team on-field success.

The endogeneity test used is defined as the difference between two Hausman tests: one where the independent variable of interest (in this case institutional expenditures on athletics) is treated as endogenous, and one where the independent variable of interest is treated as exogenous (Baum, Schaffer, & Stillman, 2010). The test statistics which comes out of this comparison, which is often called a *C* Statistic or Generalized Method of Moments (GMM) distance statistic is distributed as a Chi-square with the null hypothesis being that the variable in question is properly exogenous (Baum, 2009). The *C* statistic for the endogeneity test using EADA data was .003 with a p value of .9532, while the *C* statistic of the model using *USA Today* data was .002 with a p value of .9689. These values indicate that there is not enough evidence to reject the null hypotheses meaning that institutional athletic expenditures appear to be properly exogenous in the models estimated in this study. This helps alleviate some of the aforementioned fears of simultaneous causality.¹¹

Discussion and Conclusion

Given the fiscal constraints encountered by most colleges and universities, many commentators decry the fact that institutional athletic expenditures continue to escalate. While several rationales have been proposed to explain this increased athletic expenditure, arguably one of the most salient among college and university athletic directors is their belief that increased spending is needed for their athletic teams to be successful. This study attempted to empirically examine whether increased athletic expenditures are directly correlated with institutional athletic team on-field success, controlling for other factors. The findings indicated that in the aggregate the relationship between changes in institutional expenditures and athletic team on-field success (as measured by institutional NACDA Directors' Cup points) was only marginally significant using more liberal indicators of statistical significance. When examining specific subdivisions within Division I, however, it was evident that among FBS institutions there was a positive, statistically significant relationship between athletics expenditures and team on-field success. This relationship, however, was not found among FCS and DI-NF colleges and universities.

Several interesting discussion points emerge from the findings of this research. As noted earlier, despite the popularity of EADA data in research on college athletics, there are some who question the validity and reliability of the information contained in this data set (NCAA Research Staff, personal communication, November 11, 2010). This study provides some evidence that the information reported by colleges and universities to the EADA and *USA Today* data sets are highly correlated. While there was some difference in the amount reported to the two data set, the very high correlation between EADA and *USA Today* data and the fact that regression analyses yielded very similar results when using both sets of data suggest that this difference may not be enough to affect the research findings. This should assuage some of the concerns of individuals who question the reliability of EADA data. Whether the expenditure information reported in these data set is valid, however, could not be assessed here.

The findings may also provide some explanation for what has been called the "arms race" among FBS athletic departments. Increased expenditures were found to result in increased team on-field success among FBS institutions. Given the pressure faced by coaches and athletic directors within this subdivision, the continued increase in expenditures is not entirely surprising. Athletic departments at the FBS level, more than institutions in any other subdivision, are under tremendous pressure to produce winning athletic teams. If, as the results of this study indicate, spending is correlated with winning, then athletic directors at the FBS level would be expected to spend more on their athletic programs if given the opportunity. Put differently, the findings suggest that any analysis of institutional spending on college athletics, at least at the FBS level, should consider that spending on college sports may be a

by-product of the win-at-all-cost culture which has developed around NCAA athletics especially at the FBS level.

One question that arises from these results is why institutional expenditures on athletics has such a strong positive correlation with on-field success at FBS institutions but not at non-FBS institutions. One explanation could be that yearly increases in institutional funding could be used differently by FBS and non-FBS institutions. Given the pressure to win at the FBS level, it could be the case that these colleges and universities assign new funding in a given year to elements directly associated with athletic success such as recruiting and coaches' salaries. Non-FBS institutions, on the other hand, may allocate new funding toward areas not directly related to competitive success such as administrative costs or increasing the number of student athletics participating in intercollegiate athletics. A second explanation, which is somewhat related to the first, may be that increases in athletic expenditures at FBS institutions may come with greater pressure to perform. Due to the importance of winning at the FBS level, athletic directors at these institutions who increase their athletic budgets may place much more pressure (both spoken and unspoken) on coaches and athletes to be successful. This pressure, which could translate into greater on-field success at the FBS level, may not be as salient at the FCS and DI-NF level.

Subdivision incentive environments could also play a role understanding the findings. Many contracts of athletics directors at the FBS level contain monetary incentives related to the on-field success of athletics teams. For example, the contract for University of Maryland athletic director Kevin Anderson offers him a \$5,000 bonus if 10 or more of Maryland's 27 athletic teams qualify for postseason competition. Anderson also receives a \$5,000 bonus if Maryland makes the top 30 of the Directors' Cup standings (Barker, 2010). The contract of University of Arkansas athletic director Jeff Long also contains several incentives related to team on-field success. Long can receive monetary bonuses when athletic teams participate in NCAA postseason competition and when athletic teams win NCAA national championships (Bahn, 2010). If these types of incentives are not present in the contracts of athletic directors at the FCS and DI-NF level, it may be that different incentive environments within each Division I subdivision leads to expenditures having a differential impact of team success at FBS and non-FBS institutions.

Each of these explanations should be explored in future research on the relationship between institutional athletics expenditures and team on-field success. In addition, future research should examine whether other measures of institutional athletic expenditures (i.e., expenditures per sport or expenditures per student athlete) has an impact on other tangible and intangible measures of athletic department success. These may include student-athlete graduation rates, athletic department revenue, and alumni giving. The methodology used in this study should also be employed to examine the relationship between spending and team success at NCAA Division II and Division III institutions. Research in each of these areas would contribute significantly to the higher education community's understanding of impact of

increasing intercollegiate athletic expenditures and possibly why college athletics expenditures continue to rapidly increase.

In conclusion, given the data and statistical methodologies used in this research, this study provides arguably the most empirically sound evidence currently available regarding the relationship between athletics expenditures and team on-field success. It is hoped that this research serves as a catalyst for increased empirical study of athletic spending in higher education.

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Notes

1. Colleges and universities competing at the NCAA Division I level are subdivided by the NCA A into three groups; FBS institutions, FCS institutions, and DI-NF institutions.
2. The NACDA Directors' Cup program ranks colleges and universities based on the overall on-field success of their intercollegiate athletic teams. This program is discussed in more detail later in this article.
3. The years 2006-2009 were used due to data availability. This is further detailed later in this section.
4. U.S. Military Academies do not report athletic expenditures data to the EADA and therefore were not included in this study.
5. The number of points award to nonchampionship winning teams varies based on the sport, for a complete breakdown of the NACAD scoring structure, see <http://www.nacda.com/directorscup/nacda-directorscup-scoring.html>.
6. The NACDA does not include in their published rankings institutions that receive a total of zero Directors' Cup points in a given year. Therefore, if a Division I institution is not listed in the Directors' Cup rankings in a given year, they were given a value of zero with regard to their total Directors' cup score for that year.
7. Requests are sent only to public colleges and universities because public institutions are obligated to release this information upon request. Private institutions are not obligated to release this information.
8. In order to estimate regression models with balanced panel data, it was decide that only those institutions with 3 out of 4 years of data would be studied.
9. Currently, the six BCS conferences are the Pacific 12 (PAC 12), Big 12, Big 10, Southeast Conference (SEC), Atlantic Coast Conference (ACC), and Big East.

10. The mean variance inflation factors for all the models estimated in this study were well below 4. This indicated the absence of problematic multicollinearity among the control variables used.
11. *F* test for each model run in this study was statistically significant at a .05 level.

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