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Identifying and Analyzing Determinants of Allocated Revenue to NCAA FBS Athletic Departments

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More than 85% of NCAA Football Bowl Subdivision (FBS) athletic departments rely on some form of allocated revenue, such as student fees or other type of subsidy from their respective university. However, there is no standard operating procedure that governs the allocation of this support. As a result, it can be difficult for both athletic and academic administrators to compare each institution's allocated revenue against other institutions, which makes it challenging to justify their own allocated revenue streams. Thus, this study seeks to identify various factors that are predictive of the amount of allocated revenue to athletic departments, then utilize the most influential factors to create a predictive model that estimates how much allocated revenue each athletic department should receive. Data was collected across 107 public FBS institutions. Results demonstrate that variables representing enrollment at Group of Five institutions, changes in conference affiliation, game attendance, graduation rates, and total university expenditures were statistically significant predictors of allocated revenue. In addition to providing empirical evidence of the efficacy of predictive modeling in the context of intercollegiate athletics finance, the model assists both athletic and academic administrators in determining an optimal level of allocated revenue based on a variety of factors.

Keywords: intercollegiate athletics, finance, revenue, predictive modelling

National Collegiate Athletic Association (NCAA) Division I colleges and universities bring in millions of dollars of revenue every year from intercollegiate athletics, but much of the money comes from the institutions themselves. These institutional dollars are integral to operation for most athletic departments. In fiscal year 2018-19, all but 15 public FBS athletic departments received funds from their parent institution (Knight Commission on Intercollegiate Athletics, 2020). However, in an age when the cost of a college education in the United States is viewed as too high by people across the political and social spectrum, the millions of dollars flowing from institutions to athletics can be hard to justify. They are often ridiculed by the media as a symptom, or even a cause, of growing college expenses (Jones et al., 2018). Therefore, there is a need for executive level university and athletic department staff members to explain why and to what degree a subsidy to their athletic department is necessary.

Revenue sources and allocations vary widely among FBS member institutions. A major factor in understanding the differences is whether a school is a "have" or a "have not" (Weiner, 2009). In its simplest form, most "haves" are members of Power Five conferences: Southeastern (SEC), Big Ten, Atlantic Coast (ACC), Pac-12, and Big-12. Most "have nots" are members of Group of Five conferences: American Athletic (AAC), Mountain West, Mid-American (MAC), Sun Belt, and Conference USA (C-USA). Take, for example, the University of North Carolina-Chapel Hill (UNC-CH). At UNC-CH, total athletic department revenues for 2018 were almost $105 million. According to data from the Knight Commission, over a quarter (29%) came from the ACC conference distribution and media rights, a quarter (25%) came from ticket sales, and a fifth (20%) came from donor contributions. Just 9% of total revenue came from institutional sources, such as student fees and direct support from the university. Meanwhile, at Miami University, athletic department revenues for 2018 were about $37 million. Of that, the combined proportion from the MAC conference distribution and media rights, ticket sales, and donor contributions made up under a fifth (18%) of athletic department revenue. Subsidies from the university contributed over two thirds (69%) of the proportion of Miami's total athletic department revenue (Knight Commission on Intercollegiate Athletics, 2020). Despite this variance in revenue, both athletic departments receive millions of dollars in subsidy.

Prior research demonstrated that athletic fees (a component of subsidies) increased over time (Alexander & Kern, 2009; Cheslock & Knight, 2015; Ott, 2009), but to a similar or even lesser degree than total college expenses (Jones et al., 2018; Jones & Rudolph, 2015; Smith, 2012). As expected, stakeholders such as students, administrators, and legislators have varying opinions on their use (Bass et al., 2015; Intercollegiate Athletics Programs; Format for Each Institution to Report Revenues and Expenses, 2015; Denhart & Ridpath, 2011; Howard, 2016; Ott, 2009; Pine, 2010; Ridpath et al., 2015). Quantitative research also supported that technical efficiency, a measure of the relationship between athletic subsidies and expenses, has differing implications on allocated revenue depending on whether an institution is in a power conference or not (Jewell, 2020). However, we do not know the degree to which different factors contribute to the propensity of universities to subsidize their athletic departments. This study has two primary research questions:

RQ 1: Which factors are predictive of differences in allocated revenue for Division I FBS athletic departments?

RQ 2: What athletic departments are receiving a larger or smaller subsidy than expected?

By creating a model that gives predicted values, ranges, and comparisons to peer institutions, athletic department staff could better negotiate support with university officials and students. The model could give credence to their estimates, which is needed amongst the negative sentiment of spending in higher education. By giving a predicted range, the model can account for room in negotiation. Depending on the core values of institutions and their athletic departments, both could consider where they would want to be on a sliding scale, rather than looking at a single value.

Furthermore, understanding the practical significance that factors in the final model may have to the current subsidy can show the cost of changing coefficients. While athletic departments could look at the factors as reasons why a certain value of subsidy is justified, universities could look at them as ways to justify reducing the subsidy in the future. Knowing the university and athletic department could look at this model with different goals in mind, a mutual understanding between athletic department administrators and university officials could lead to a better future. That is, more concrete ways to agree on a subsidy could better protect against varying personalities and objectives of the academic institution and its athletic department.

Literature Review

NCAA Division I FBS Athletic Department Revenues and Expenses

The NCAA divides funding into two broad categories: generated and allocated revenue sources. Examples of generated revenue sources include ticket sales, donor contributions, conference and NCAA payouts, and broadcast rights. Meanwhile, mandatory athletic fees and institutional subsidies are allocated revenue sources (NCAA, 2020). This study focuses on allocated revenue. While components of these two categories stayed largely the same over the last ten years, the proportion of generated revenue from some components changed dramatically. For example, in 2009, donor contributions constituted 30% of generated revenue among FBS institutions (Weiner, 2009). Today, they constitute just 18% (NCAA, 2020). The proportion of ticket revenue declined at a similar rate (NCAA, 2020; Weiner, 2009). Total generated revenues have not declined, however. Rather, the proportion of revenue from broadcast rights increased, especially as Power Five conferences added more institutions (Jensen et al., 2020). Additionally, the proportion of allocated revenue also increased. In real dollars, between 2004 and 2009, allocated revenue grew by almost 96% (Denhart & Ridpath, 2011). Furthermore, Jewell (2020) noted that between 2004 and 2016, the proportion of generated revenue as a part of total revenue fell from 81% to 77%. This meant the proportion of allocated revenue increased from 19% to 23%. Thus, the monetary increase in allocated revenue was not solely a result of increased overall athletic department revenues, but a shift toward using them to fund a larger proportion of athletic departments' operations.

Defining where money comes from for Division I intercollegiate athletic departments helps guide our understanding of where money goes. Recently, the largest spending category has been salaries, while scholarships and facilities have not lagged far behind (Weiner, 2009). The explosion of new facilities and an unregulated college coaching market have been continuous points of contention (Hoffer & Pincin, 2016), especially as scholarships were largely seen as fixed costs (Weiner, 2009). Because athletic departments operate under the non-profit realm of public education, athletic departments spend as close to the entirety of their revenues every year to avoid significant surpluses (Clotfelter, 2011; McEvoy et al., 2013). It has been widely opined that the growing revenues of intercollegiate athletics, in conjunction with the need to spend them immediately, led to an "arms race" (Denhart & Ridpath, 2011; Thelin & Wiseman, 1990;

Weiner, 2009). In 1987, Chancellor Ira Heyman of the University of California-Berkeley cited the "athletics arms race" and took aim at the three categories mentioned above: salaries (particularly coaching salaries), facilities, and scholarships. At the time, there was pressure to reduce the number of grant-in-aid scholarships because they were not based on financial need. Moreover, coaches' salaries were deemed too high and came with too many perks, and universities spent money on what some would consider unnecessary amenities (Thelin & Wiseman, 1990). The amenities and high coaching contracts in the 1980s and 1990s paled in comparison to what exists in present day intercollegiate athletics.

In their research on the effects of revenue changes on athletic departments, Hoffer and Pincin (2016) found that, "expenditures for coaches are 7.5 times more than direct expenditures for student-athletes for all NCAA Division I colleges" (p. 94). They also noted numerous facility upgrades with items such as hydrotherapy areas and flat screen monitors for player itineraries-products that evolve as technology changes. Athletic facility expenditures also increased because of bonds used to finance upgrades. Bonds contributed a significant portion of debt service to athletic departments because of the interest universities needed to pay on an increasingly higher principal (Weiner, 2009). As costs increased, it became more difficult to see intercollegiate athletics as a zero-sum game; that is, there have not been an equal number of winners and losers, nor have budgets always balanced without support from institutions. In fact, it has been argued that intercollegiate athletics be accepted as revenue consuming (Thelin & Wiseman, 1990).

The Mandatory Fee and Other Forms of Subsidy to Athletic Departments

Mandatory fees have been levied on college students since the 19th century. They have been used to support university entities like clubs and facilities in addition to intercollegiate athletics (Ott, 2009). Since the beginning of intercollegiate athletics, macroeconomic changes never appeared to hurt the use of activity fees. Even amidst the Great Depression, fees continued to go toward athletics because officials believed they would pay off down the line (Ott, 2009; Stinson et al., 2012). Despite the increase in use of mandatory activity fees in their early years, the amount increased linearly until after the mid-20th century. Fees increased at a faster rate since. In 1990, a full 51% of NCAA Division I athletic department revenue came via fees and institutional subsidies (Thelin & Wiseman, 1990). In 2020, the proportion was almost 25% among FBS institutions and far higher across the whole of Division I. Proportional differences between allocated and generated revenues at Power Five and Group of Five conference members in the FBS also rapidly increased (Cheslock & Knight, 2015; NCAA, 2020).

Some academics, administrators, and pundits alike argued that large tuition and fee increases to support funding for intercollegiate athletic departments have been widespread (Alexander & Kern, 2009). They contended that, in attempts by individual athletic departments to keep up with each other, some needed to find better ways to leverage current sources of funding and students have borne the brunt of the burden (Cheslock & Knight, 2015; Longman, 2009). Justifications for increases ranged from them being a result of an athletic department's success (Alexander & Kern, 2009; Smith, 2012), to wanting increased athletics success (Morton, 2017), removing the necessity of charging for student tickets (Denhart & Ridpath, 2011), and positive externalities created by athletic departments outweighing negative ones (Howard, 2016; Stinson et al., 2012). However, the notion that a heavier burden has been placed on students is disputed (Jones & Rudolph, 2015; Kelchen, 2016; Smith, 2012).

Smith (2012) stated that the growth of athletics expenditures far surpassed the growth of the burden placed on students. A study by Jones and Rudolph (2015) went further. They found little evidence of an increased burden on students even via an increased activity fee, writing, "the

popular notion that institutions of higher education are increasingly subsidizing athletics programs on the backs of students was not supported" (p. 21). Kelchen (2016) also supported the finding that growth in athletics revenues was not related to a subsequent increase in student activity fees. Despite the focus by major media outlets on universities that significantly hiked the student burden, implementation has been limited to relatively few (Jones et al., 2018; Jones & Rudolph, 2015). Thus, evidence that students bore a large burden of increased athletics expenditures at the FBS level remained mixed at best. Many researchers, however, saw a need for further study on the utilization of allocated revenue to athletic departments (Cheslock & Knight, 2015; Kelchen, 2016).

In an effort to show more transparency, colleges and universities were required to separate tuition and fees in their reports beginning in 1999 (Kelchen, 2016). However, total allocated revenues had never been completely captured via mandatory athletic fees. Most athletic departments additionally received revenue through direct institutional and state support (Denhart & Ridpath, 2011; Jewell, 2020). Furthermore, many universities reported mandatory athletic fees as a part of the direct support from their institution, rather than under a separate header (Denhart & Ridpath, 2011; Kelchen, 2016; Knight Commission on Intercollegiate Athletics, 2020). This made individual analysis of mandatory fees, separated from the total allocated revenue, difficult (Jones et al., 2018; Lipford & Slice, 2017). Because this paper assesses total allocated revenue to the athletic department by each FBS university, mandatory fees and most forms of institutional support are included together. Facilities debt service is not counted as a part of allocated revenue because universities include facility debts as a separate item in budgets, not as a part of athletic department revenues or expenses. Table 1 explains the components of allocated revenue received by athletic departments.

Perceptions of subsidies for Athletic Departments

An important part of the continued use of institutional subsidies at public institutions has been the support, or lack thereof, from students, institutional leaders, and state governments. Between 1999 and 2016 there were 21 instances in which an NCAA Division I university gave its students an option of whether to raise or lower student fees to the athletic department (Howard, 2016). Since then, there have been at least five more—at Tarleton State University, North Texas University, the University of Texas at San Antonio (UTSA), Texas A&M University, and Sam Houston State University. Combined, 15 passed and 11 failed, representing a 58% pass rate.

Some fee increases passed by an overwhelming majority in student referendums. The University of Alabama-Birmingham (UAB) increased their mandatory fee to the athletic department by $25 per semester in 2015, with the backing of over 84% of students. In addition, the student government voted for the measure unanimously. Crucial to the overwhelming support was the return of three sports, including football. At UAB, average voter participation had been, "typically around 1,200" (Bakken, 2015, para. 2). Participation in the referenced vote was over 4,000 (Bakken, 2015). In a referendum at Tarleton State University, students increased their activity fee to athletics to $35 per credit hour with 68% in support of the measure. Paramount to the increase was the move by Tarleton to Division I (Texan News, 2019). In both situations, a major change coincided with the increase in the activity fee.

Other fee increase referendums have been more mixed. The University of North Texas recently increased activity fees, which was backed by its student body. However, the increase was not coincidental with a major change in the athletic department. Overall, 55% of students voted to support the measure, despite unanimous passage by the student government. Just 7% of

the student population participated in the vote (Perez, 2018). In 2018 UTSA proposed an $2 per credit hour activity fee increase, despite undergoing no major changes to their athletic department. In their student referendum, the fee increase was soundly defeated. Almost 77% voted against it in the largest voter turnout ever at UTSA (Clevenger, 2018). Other commonalities among universities that voted down increases were their commuter school status, or the university lacking either a football program in general or a major football program (Longman, 2009).

To gain a deeper understanding of student opinions on funding their athletic departments, researchers did case studies on students in the MAC. The MAC was picked because of its members' large student fee structure. Ott (2009), Denhart and Ridpath (2011), and Bass et al. (2015), all found that a majority of students were aware that they paid a general fee to their institution. However, Ott (2009) and Denhart and Ridpath (2011) found that students were unaware of how much they paid. Furthermore, Ott (2009), Denhart and Ridpath (2011), and Bass et al. (2015) found the majority of students were unaware that fee monies went athletic departments, or underestimated the proportion. After being told about the athletic fee (and that it subsidized student tickets), students were asked their opinions on the future fee amount. At Ohio University, 63% of students surveyed wanted the fee reduced (Denhart & Ridpath, 2011). In the MAC, 49% of students surveyed wanted a reduction. A further 25% preferred no change (Ridpath et al., 2015). Implications of these studies included being more transparent about fee structure and showing benefits of athletic departments to students (Denhart & Ridpath, 2011; Ott, 2009; Ridpath et al., 2015).

Quantitative Approaches Assessing Athletic Department subsidies

Although the literature on the perceptions of subsidies has been quite extensive, quantitative approaches addressing their application have been sparse. The quantitative literature covering how subsidies affect athletic departments and institutions has fallen generally under two main categories. They are, modelling the impact of athletics subsidies on tuition rates and understanding relationships between athletic department budgets and institutional subsidies. Jones and Rudolph (2015) conducted a study that examined the relationship between the total subsidy to athletics and tuition rates among Division I schools, using fixed effects regression models. They hypothesized that the relationship between subsidies and student costs was positive. However, only one of their overall models (using in-state, out-of-state, and net costs as dependent variables) showed significance, with the relationship between subsidies and tuition rates coming up as a slight negative coefficient. When institutions were split by Carnegie classification, Jones and Rudolph (2015) found a statistically significant, albeit small, positive relationship between subsidies and in-state student cost. Ultimately, not enough evidence was found to support the notion that athletic subsidies had a positive effect on tuition rates. Jones and Rudolph (2015) suggested institutions could be reallocating funds from elsewhere in the university to increase funding to athletic departments.

Jones et al. (2018) also studied the relationship between subsidies (specifically looking at student fees) and tuition rates. Their primary goal was, "to examine the growth of […] athletics fees as a percentage of total student costs" (p. 176), using growth curve modeling. Models were created by Jones et al. (2018) to study the growth trajectory of total athletics fees, per full time equivalent (FTE) athletics fees, and athletics fees as a percentage of costs. Their data suggested that fees accounted for a median of 3.1% of student costs, which supported previous literature that considered athletics fees as nominal (Jones & Rudolph, 2015; Kelchen, 2016). Jones et al. (2018) found that athletics fees increased nonlinearly since 2004-05 among public Division I

universities, but that there had been a statistically significant decline in more recent years. In addition, fees differed significantly based on NCAA affiliation; schools moving up in affiliation status were the most burdened by proportionally high athletics fees.

The other category of quantitative literature focuses more on relationships between subsidies and the athletic department, rather than the institution overall. Research by Hoffer and Pincin (2016) included a model that measured, "how changes in revenue categories affect[ed] the size of the athletic subsidy" (p. 90). Their results suggested ticket sales were used as a substitute for subsidies across the Power Five and Group of Five conferences, albeit at a lower rate among Power Five schools. Jewell (2020) used a stochastic frontier model to estimate technical efficiency of revenue production among FBS athletic departments. Technical efficiency was determined by how the proportion of different parts of generated revenue compared to predicted values. That is, an athletic department with a higher efficiency proportion produced more generated revenue than expected, based on the coefficients. Jewell (2020) then compared the modeled efficiency with allocated revenue sources. His results indicated efficiency varied over time and across conferences. Additionally, less efficient athletic departments throughout the FBS depended more on allocated revenue for funding. The notion that less efficient athletic departments relied more on student fees, as a component of allocated revenue, was supported among Power Five schools, but not within the Group of Five. Overall, these two papers supported that there was a significant lack of parity in allocated revenue at FBS institutions and examined reasons as to why it existed. However, neither provided a broad-based set of factors that attempted to define the determinants of allocated revenue.

This study extends the current literature by examining possible determinants of allocated revenue across a broad cross-section of athletic departments and then uses them to predict allocated revenue. The lack of research, specifically related to quantitative approaches assessing allocated revenue, can be attributed to a shortage of granular intercollegiate financial data until recently (Jewell, 2020). Indeed, only two studies have been done to parse out potential determinants. Denhart and Vedder (2010) examined the effects of enrollment, core expenses, profit/loss of the athletic department without a subsidy, and the percent of students receiving Pell Grants on a 2008 cross-section of data. They found allocated revenue to be higher at schools with lower enrollment, lower core expenses, and a higher percentage of Pell Grant recipients. The other study, by Jewell (2020), was mentioned earlier in this section. Because of the lack of research on this topic, most written work on allocated revenue has come from popular media, which often focuses on anecdotal evidence rather than empirical research (Jones et al., 2018). Additionally, even academic studies on allocated revenue have sometimes been done on a small number of institutions rather than a broad group, impacting the generalizability of the research (Kelchen, 2016). This was obvious particularly in the qualitative surveys mentioned earlier, one of which expressed frustration that even when only surveying MAC schools, some had to be omitted due to a low response rate (Ridpath et al., 2015). By using purely quantitative data, this paper hopes to avoid the issue, as well as to improve generalizability across all public FBS institutions.

Method

To begin, a dataset of athletic department and institutional information was collected using multiple secondary sources. These included the Knight Foundation's College Athletics Financial Information (CAFI) Database, the United States Department of Education's Integrated Postsecondary Education Data System (IPEDS), and the NCAA's Equity in Athletics Data Analysis (EADA) database. Additionally, financial data was cross-checked with data published

by *USA Today*. Each database collects different groups of information related to post-secondary education and intercollegiate athletics. The CAFI database includes athletic department financial data, IPEDS aggregates federally reported institutional data, and the EADA has institution and team specific athletics data. Compiling information from all of these sources is necessary to accurately answer the research questions in this paper and has also been a common theme throughout financial intercollegiate athletics literature (Jewell, 2020; Jones et al., 2018).

In total, data from 107 FBS schools during fiscal years 2017-18 and 2018-19 was collected. The FBS represents the highest level of competition among NCAA institutions sponsoring football. All 107 institutions in this study are public, as private institutions do not provide sufficient budgetary data. Military academies are omitted because student tuition costs are fully subsidized (Jones & Rudolph, 2015). In addition, Temple University and the University of Pittsburgh are omitted because public institutions are exempt from Freedom of Information Act (FOIA) requests in the state of Pennsylvania (Knight Commission on Intercollegiate Athletics, 2020). Nevertheless, the sample size is robust, comprising of over 80% of the population of schools in the FBS. This sample is similar to Jewell's (2020) study on generated and allocated revenue ($N = 107$) and the FBS related part of Hoffer and Pincin's (2016) study on athletic department expenditures ($N = 100$).

Measures

The dependent variable in this model is a combination of direct institutional support, state support, and student fees, minus transfers made by the athletic department back to the university. Additional information on the components can be found in Table 1. Some institutions collate all institutional support under one heading, while others spread it out over multiple, leading to vast data discrepancies as mentioned earlier (Jones et al., 2018). Thus, using an aggregated sum of allocated revenue lessens the effect of differing accounting practices on the results, making it a more ideal variable to measure. Cheslock and Knight (2015), Hoffer and Pincin (2016), Jones and Rudolph (2015), and Jewell (2020) all used an aggregated version of athletics subsidy in their modeling.

The independent variables shown in Table 2 are based upon prior literature and reflect data on five different sectors that could affect allocated revenue: athletic department controls, institutional controls, change, academic prestige, and athletic prestige. Variables reflective of athletic department controls include annual debt service (Hoffer & Pincin, 2016), the athletic budget as a percentage of an institution's overall budget (Jones et al., 2018), and a count of unduplicated student-athletes (Jensen et al., 2020; Jewell, 2020). In addition, variables reflective of institutional controls include in-state cost of attendance (Alexander & Kern, 2009; Jones & Rudolph, 2015; Smith, 2012), core expenses (Denhart & Vedder, 2010), and undergraduate enrollment (Jensen et al., 2015, 2020; Jewell, 2020; Smith, 2012). Change can be measured via the athletic department and the university. The variable operationalized to represent this in the athletic department is a conference change variable (Hoffer & Pincin, 2016). Furthermore, the average change in enrollment over the previous five years to 2017-18 represents growth on the institutional level (Popp et al., 2019). The academic prestige of the university is operationalized by the acceptance rate (Kelchen, 2016) and four-year graduation rate (Stinson et al., 2012). Meanwhile, athletic prestige is measured in this research by average football and men's basketball attendance (Cheslock & Knight, 2015; Jensen et al., 2015, 2020), whether the institution is in a Power Five conference (Jensen et al., 2020; Smith, 2012), whether the institution charges students for football tickets, and logged Director's Cup points (Morton,

2017). The Director's Cup variable was logged because the relationship was nonlinear between it and allocated revenue. Figure 1 shows the linear line of best fit and a LOESS line of best fit.

Additionally, three interaction terms were added to the dataset. These included interactions between core expenses and Power Five institutions, and core expenses and Group of Five institutions (knowing that there would be multicollinearity issues). When building models, only one version of this interaction variable was used. In addition, an interaction was created between Group of Five member schools and undergraduate enrollment. This variable was added because a scatterplot (see Figure 2) showed that the relationship between undergraduate enrollment and the allocated revenue was strong when Group of Five members were used, but weak when Power Five members were also included.

Statistical Analysis

Before model building, tests were performed to ensure no assumptions were violated and to identify outliers. Then, to assess significance and multicollinearity between independent variables, a correlation matrix was created. Predictors that did not vary significantly ($p < .1$) with total allocated revenue were dropped. Predictors that varied too much with each other (Pearson's $r > .8$) were also dropped. Using a similar approach to Denhart and Vedder (2010) and Morton (2017), an OLS multiple linear regression model was created to identify the most significant predictors of total allocated revenue in fiscal year 2017-2018. Employing the holdout method of cross validation, data from 2018-19 was used as a test set. Results from the model (using 2017-18 data) were then compared against actual results (2018-19 data). This approach was similar to that of Jensen et al. (2015) and Jensen et al. (2020). Using this method made it possible to determine which athletic departments were receiving more or less total allocated revenue than expected.

Results

Descriptive Statistics

An analysis of descriptive statistics shows that over \$1.402 billion (*M* = \$13.104M, *SD* = \$11.203M) was allocated by institutions to their athletic departments during the 2017-18 fiscal year, even after subtracting transfers made by 11 athletic departments back to their institutions totaling \$48.370 million (*M* = \$4.397M, *SD* = \$3.345M). Athletic departments receiving the 10 largest amounts of allocated revenue in the dataset are shown in Table 3. The range of allocated revenue in fiscal year 2017-18 was \$39.041 million. Twelve athletic departments received no allocated revenue from their institution. Meanwhile, Connecticut received the most, at \$39.041 million. Rutgers was the only Power Five conference member in the top ten most heavily allocated athletic departments.

As shown in Table 4, allocated revenue varied significantly across the FBS conferences. There were some clear differences. For example, every Group of Five conference was more heavily subsidized than any Power Five conference. On the bottom end, SEC athletic departments in the dataset (*N* = 13) were allocated a combined total of \$18.011 million (*M* = \$1.385M, *SD* = \$1.706M) by their institutions. In contrast, each AAC athletic department in the dataset (*N* = 7) received more than the total distributed by all SEC members (Min = \$20.937M, *M* = \$27.956M, *SD* = \$5.659M), illustrating the lack of parity between Power Five and Group of Five conferences. Outside of the AAC, very little variation was seen between Group of Five

Table 1
Components of Allocated Revenue

Component	Explanation
Mandatory Fees	Fees paid by students for direct use by the athletic department
Direct State or Other Government Support	Funding from government agencies specifically for use by the athletic department
Direct Institutional Support	Funding from the institution to the athletic department. Includes unrestricted funds, work study support, unrestricted endowment income, and other investment income to athletics
Indirect Institutional Support	Value of costs and services provided, but not charged to athletics. Examples: Human Resources, Accounting, IT, Maintenance, Security, Risk Management, and Utilities. Typically cancelled out.
Transfers Back (negative)	Positive net revenues generated by athletics and transferred back to the institution for non-athletics purposes
NOT INCLUDED *Indirect Institutional Support for Athletics, Facilities Debt Service, Lease, and Rental Fees*	Debt services from facilities, leases, and rental fees not charged to the athletic department.

Source. The Knight Foundation's CAFI Database.

conferences. The MAC (*M* = $22.410M, *SD* = $5.085M), C-USA (*M* = $20.215, *SD* = $5.834), Sun Belt (*M* = $19.979M, *SD* = $6.195M), and Mountain West (*M* = $19.850, *SD* = $4.088) all had close profiles. Across the Power Five, the ACC (*M* = $8.944M, *SD* = $3.397M) and Pac-12 (*M* = $7.957, *SD* = $6.648) were similar. Meanwhile, the Big Ten (*M* = $5.122M, *SD* = $8.650M), aside from Rutgers, was similar to the Big-12 (*M* = $1.472M, *SD* = $1.622) and the SEC.

Regression Results

The independent variables explained in Table 2 are shown again in Table 5. This table orders the variables by their correlations to allocated revenue in absolute terms. That is, variables with strong positive and negative correlations both show up at the top. Power had the strongest correlation, at .648. Other strongly correlated variables include average football attendance (r = .599), undergraduate enrollment in non-Power schools (r = .595), and whether an institution charged for football tickets (r = .555). Acceptance rate had the weakest correlation with allocated revenue (r = .009).

Independent variables in Table 5 had previously been grouped into categories in Table 2. However, not every variable shown in Table 5 was usable for modelling purposes due to multicollinearity. For example, two variables related to athletic prestige, namely Power and

Table 2
Independent Variables

Variable	Source	Group	Description
4Year_Grad_Rate	IPEDS	Academic Prestige	4-year graduation rate.
Accept_Rate	IPEDS	Academic Prestige	Acceptance rate.
Annual_Debt_Service	CAFI	Athletic Dept Control	Annual debt service from athletics facilities.
Athletics_PctofOverall	CAFI	Athletic Dept Control	Athletic budget as a percentage of total core expenses.
Average_MBB_Att	NCAA	Athletic Prestige	Average Men's basketball attendance.
Average_FB_Att	NCAA	Athletic Prestige	Average football attendance.
Conf_Chg_Last10	Various	Change	1 if an institution changed conferences in last 10 years. 0 if not.
Expense_NoPower	Various	Institutional Control	Interaction between *Power* and *Univ_Expense*. 0 if Power Five institution.
Expense_Power	Various	Institutional Control	Interaction between *Power* and *Univ_Expense*. 0 if Group of Five institution.
In_State_Cost	IPEDS	Institutional Control	COA for in-state students.
logDir_Cup	Learfield	Athletic Prestige	Logged Learfield IMG Director's Cup points. See Figure 1.
Power	NCAA	Athletic Prestige	1 if member of Power Five conference. 0 if Group of Five.
SA_Count	CAFI	Athletic Dept Control	Number of unduplicated student-athletes.
Ticket_Charge	Various	Athletic Prestige	1 if institution charges students for athletic tickets.
UG_Enroll	IPEDS	Institutional Control	Undergraduate enrollment.
UG_Enroll_NoPower	Various	Institutional Control	Undergraduate enrollment at non-Power Five institutions.
UG_Yearly_Delta_Last5	Various	Change	Average yearly change in undergraduate population over the last 5 years.
Univ_Expense	IPEDS	Institutional Control	University operating expenses.

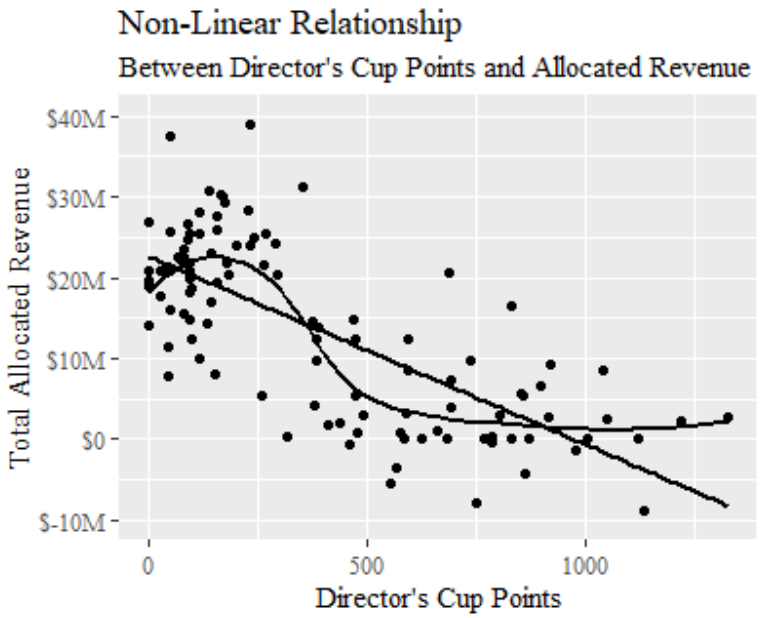

Figure 1.
Director's Cup Points Plot

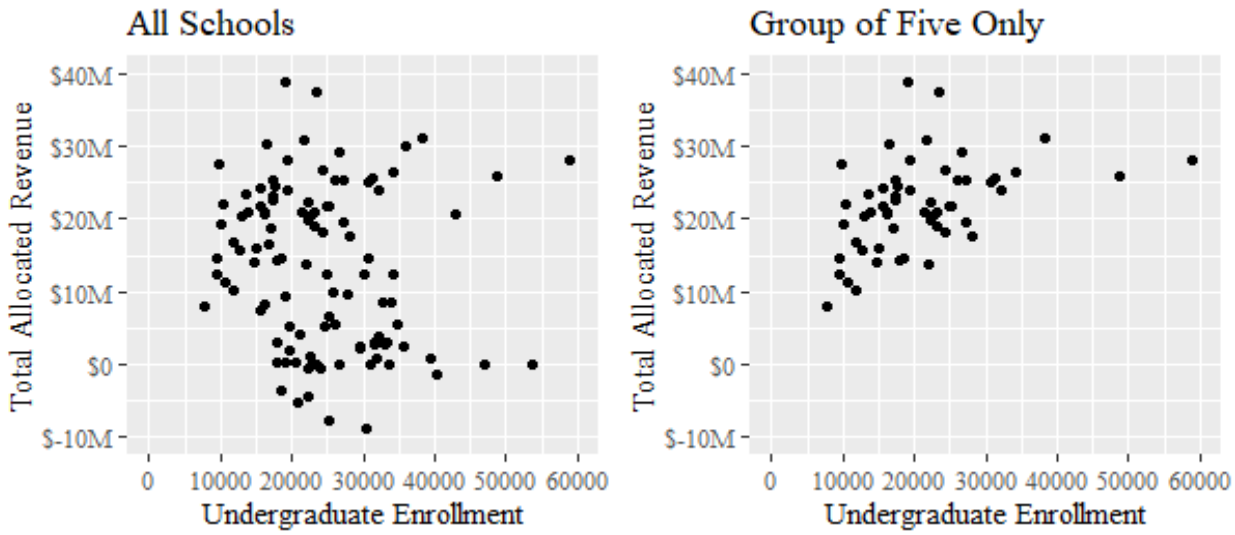

Figure 2.
Enrollment Plots

Table 3
Largest Amounts of Allocated Revenue by Institution in Dataset (FY 2017-18)

Institution	Conference	Allocated Revenue
Connecticut	AAC/Independent	$39.041
Massachusetts	Independent	$37.524
Houston	AAC	$31.179
Buffalo	MAC	$30.813
Central Michigan	MAC	$30.379
Rutgers	Big Ten	$29.981
Cincinnati	AAC	$29.239
Central Florida	AAC	$28.274
Old Dominion	C-USA	$28.028
Coastal Carolina	Sun Belt	$27.501

Notes. Dollar amounts are in millions. Connecticut has since moved to the Big East Conference.

Table 4
Allocated Revenue by Conference (FY 2017-18)

Conference	*N*	Mean	Median	SD
Independent	1	$37.524	$37.524	NA
AAC	7	$27.956	$28.274	$6.113
MAC	12	$22.410	$21.395	$5.085
C-USA	13	$20.215	$20.864	$5.834
Sun Belt	11	$19.979	$22.005	$6.195
Mountain West	11	$19.850	$20.372	$4.088
ACC	8	$8.944	$8.301	$3.397
Pac-12	10	$7.957	$7.550	$6.648
Big Ten	13	$5.122	$.809	$8.650
Big-12	8	$1.472	$1.077	$1.622
SEC	13	$1.385	$.105	$1.775
All	***107***	***$13.557***	***$14.020***	***$10.567***

Note. Dollar amounts are in millions.

Table 5
Descriptive Statistics for Independent Variables

Variable	Correlation to Allocated Revenue	Max	Min	Mean	Median	SD
Power	*(.805)*	1	0	N/A	N/A	N/A
Average_FB_Att	*(.774)*	111589	9899	41670	34754	27275.76
UG_Enroll_NoPower	.771	58821	0	10705	9350	12464.04
Ticket_Charge	*(.745)*	1	0	N/A	N/A	N/A
Expense_NoPower	.651	3028.818	0	376.914	189.534	548.09
Average_MBB_Att	*(.618)*	21874	998	7532	6882	4987.24
Expense_Power	*(.577)*	8356.836	0	1149.877	0	1675.14
logDir_Cup	*(.541)*	7.19	0	5.362	5.664	1.56
Annual_Debt_Service	*(.479)*	23271881	0	6749922	4635979	6316145
Conf_Chg_Last10	.474	1	0	N/A	N/A	N/A
Univ_Expense	*(.408)*	8356.836	140.419	1526.792	1043.955	1493.83
SA_Count	*(.400)*	1065	318	499	471	137.13
4Year_Grad_Rate	*(.388)*	.880	.110	.390	.360	.18
Athletics_PctofOverall	*(.205)*	.185	.012	.071	.061	.04
In_State_Cost	*(.196)*	36989	19012	25570	25306	3547.87
UG_Enroll	*(.162)*	58821	7788	23071	24344	9541.21
UG_Yearly_Delta_Last5	.144	1.284	*(.041)*	.018	.009	.12
Accept_Rate	.095	1	.14	.688	.720	.19

Note. Dollar amounts are in millions for university expenses.

logged Director's Cup points, were highly correlated with Football and Men's Basketball attendance. Thus, only the two attendance variables were used in modelling. Furthermore, as a result of adding interaction terms, a number of variables had to be dropped. These included overall university expenses, undergraduate enrollment, and expenses at Power Five institutions. Of the interactions and their parent terms, only undergraduate enrollment at Group of Five schools and university expenses at Group of Five schools were kept. From the remaining variables, two base models were created. One used institutional factors to predict allocated revenue, while the other used athletic factors. Variables in both models were inserted hierarchically, as in Jensen et al. (2015) and Jensen et al. (2020).

The group of institutional control variables (in-state cost, undergraduate enrollment in Non-Power Five schools, and expenses in Group of Five schools) explained more than 63% of the variance in allocated revenue ($R^2 = .631$). This was deemed to be a statistically significant amount of variance, $F(3,103) = 58.730$, $p < .001$. Individually, both interaction terms, $t = 7.386$, $p < .001$ and $t = 3.053$, $p = .003$, were also shown to be statistically significant predictors of allocated revenue, while in-state cost was not a statistically significant predictor, $t = .598$, $p = .551$, consistent with research published by Jones and Rudolph (2015). Each additional undergraduate student enrolled in a Group of Five school increased allocated revenue by $560.59

in the model. Additionally, every $1 increase in core expenses at Group of Five schools, was worth about a cent in allocated revenue.

Next, to evaluate whether academics and success played a role in allocated revenue to athletic departments, the acceptance rate and four-year graduation rate variables were entered into the model. As shown in Table 6, these did not positively impact the amount of variance explained by the model. In fact, this group of variables incrementally decreased the overall variance explained by 1.5%, $F(5,101) = 34.980$, $p < .001$. Additionally, these variables were not individually significant, nor did they impact the significance of the institutional control variables.

The last variable entered into the model served as a proxy for change or growth of an institution, investigating whether the rate of growth of the student body had an effect on allocated revenue. This variable increased the variance explained by 3.6%, $F(6,100) = 34.100$, $p < .001$ and was statistically significant, $t = 3.390$, $p = .001$. Based on the unstandardized coefficient, each percentage point increase in the average yearly change of undergraduate students increased the pool of allocated revenue for athletic departments by $181,513.96. Overall, this final model explained 65.2% of the variance in allocated revenue ($R^2 = .652$).

A separate base model was created to examine the effect of athletics related variable categories on allocated revenue. Athletic department control variables (annual debt service, student-athlete count, and the athletic budget as a percentage of the total university) were entered first, and explained 35.4% of the variance in allocated revenue ($R^2 = .354$). This was a statistically significant amount of variance explained, $F(3,103) = 18.850$, $p < .001$. All three individual variables were also statistically significant. According to the unstandardized coefficients for these variables, each additional dollar of annual debt service decreased allocated revenue in the model by $0.60, $t = -3.95$, $p < .001$. Every student-athlete at an institution decreased allocated revenue by $28,525.32, $t = -3.95$, $p < .001$. Furthermore, each one percent increase of the athletic budget in proportion to the overall university budget decreased allocated revenue by $805,155.29, $t = -3.13$, $p = .002$.

To investigate the effect of the public interest level in athletics, average football attendance, average men's basketball attendance, and a binary variable for whether a university charged students for football tickets were entered into the model. As shown in Table 7, these did significantly impact the model, increasing the amount of incremental variance explained by 35.9%, $F(6,100) = 41.510$, $p < .001$. Individually every variable was significant and removed significance from every athletic department control variable. Based on the unstandardized coefficient, each one person increase in average attendance at football games decreased allocated revenue by $189.62, $t = -4.98$, $p < .001$. Meanwhile, each one person increase at men's basketball games decreased allocated revenue by $444.97, $t = -2.77$, $p = .007$. Also, charging students for football tickets reduced allocated revenue by $8,395,032.52, $t = -4.58$, $p < .001$, in the context of Model 2, supporting modelling by Hoffer and Pincin (2016).

Finally, to account for change in university athletic departments, a binary variable operationalizing whether an athletic department switched conference affiliation in the last 10 years was added. Adding this variable incrementally increased the variance explained by the model by 3.7% ($\Delta R^2 = .037$) and was statistically significant, $t = 3.79$, $p < .001$. Altogether, this model explained 75% of the variance in allocated revenue, $F(7,99) = 42.370$, $p < .001$, at public FBS institutions.

Final Predictive Model

A final model was created using information from the previous hierarchical models seen in Table 6 and Table 7, and other descriptive statistics seen in Table 5. This model was created to

explain the largest proportion of variance, while also reducing degrees of freedom, and incorporating multiple hierarchical categories. Variables were eliminated in rounds. The five variables dropped before the hierarchical models were run were dropped from consideration in the final model as well. In the first round, acceptance rate (r = .095), the five-year average percent change in attendance (r = .144), in-state cost (r = -.196), and the athletics budget as a percentage of the overall university budget (r = .205), were dropped because the absolute values of their correlation coefficients with allocated revenue were < .30. Independent variables with correlation coefficients with the dependent close to zero implies that there is little to no linear relationship (Mendenhall & Sincich, 2012). After the preliminary eliminations and first round, nine variables remained. In a second round of eliminations, student-athlete count, annual debt service, and average men's basketball attendance were dropped. These variables were eliminated to reduce degrees of freedom by creating a more parsimonious model and because a *leaps* plot showed that they were not included in the best performing models.

After the second elimination step, six variables remained, representing four of the six hierarchical categories. A principal component analysis assessment was completed on the remaining variables, to see if the final model would be a viable candidate. Principal component analysis is a method that reduces the dimensionality of a dataset by transforming all variables into one or a few principal components. The standard deviation of the first principal component was 2.051, indicating that these variables could benefit from principal component analysis. However, seeing as there were only six variables on 107 observations $F(6,100) = 68.830$, $p < .001$, dimensionality was not an issue. Thus, principal component analysis was not necessary. Additionally, the average variance inflation factor (VIF) for this model was 2.012 (the highest was 2.649) indicating that multicollinearity was not an issue. As indicated in Table 8, the final model explains 80.5% of the variance ($R^2 = .805$) in allocated revenue for FY 2017-18. Every variable in the model was significant. The two athletic prestige related variables, average football attendance $t = -5.18$, $p < .001$ and whether a university charged students for football tickets $t = -4.205$, $p < .001$, had negative coefficients indicating that they were substitutes for allocated revenue. Conversely, undergraduate enrollment at Group of Five schools $t = 4.288$, $p < .001$, whether an institution changed conferences in the last ten years $t = 2.353$, $p = .021$, the four-year graduation rate $t = 2.717$, $p = .008$, and expenses at Group of Five schools $t = 2.145$, $p = .034$, had positive coefficients indicating that they were complements of allocated revenue. This ran in contrast to Denhart and Vedder (2010), who concluded that schools with lower enrollment and core expenses (per student) had higher rates of allocated revenue.

As mentioned in the methods section, data from FY 2018-19 was held out as validation data. This was done to ensure that the final model had at least some predictive utility and did not overfit. Predicted values explained almost 89% of the variance in allocated revenue (r = .887), indicating that the model performed better on the validation data than the test data. The mean difference between the predicted and actual values was $867,546.50. These are shown in Figure 3, which splits between Power Five and Group of Five member institutions. Overall, allocated revenue grew by an average of $1,043,484 per school, a 7.96% increase from FY 2017-18. Schools in Table 9 had the largest absolute changes in allocated revenue between FY 2017-18 and FY 2018-19.

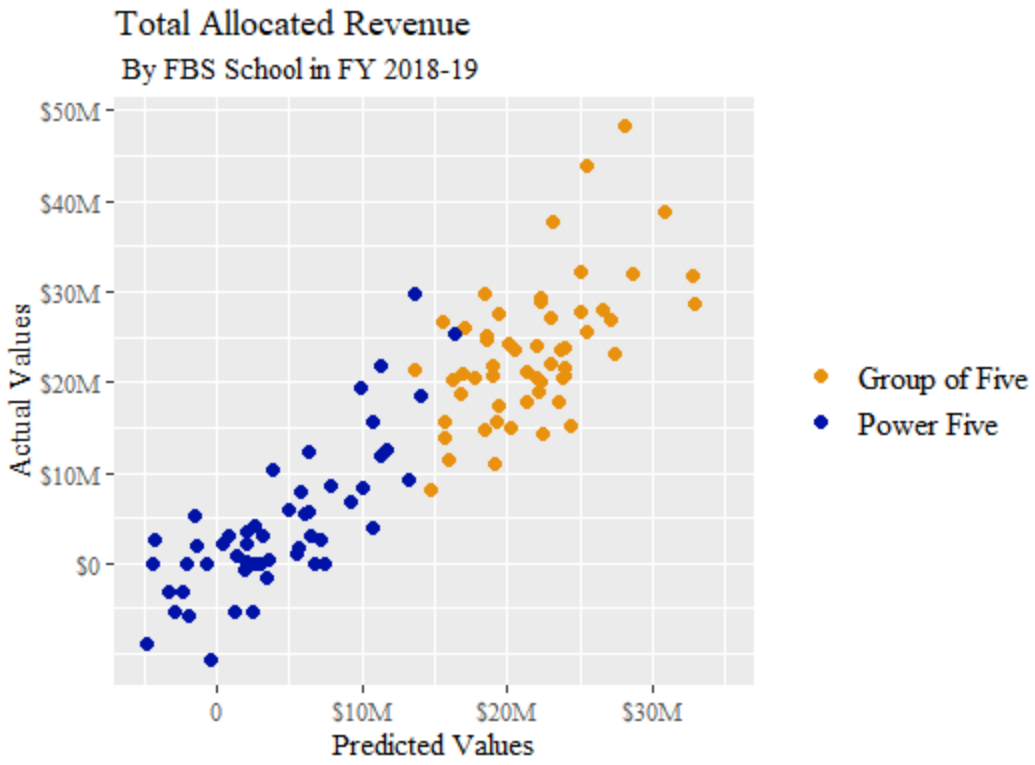

Figure 3.
Comparing actual and predicted values of allocated revenue

Table 6
Hierarchical Regression Analysis for Institutional Factors

Independent Variables	**Model 1**	**Model 2**	**Model 3**
Intercept	2119963.46 (.39)	1011972.46 (.13)	1579015.95 (.22)
Institutional Controls			
In_State_Cost	120.62 (.60)	213.76 (.93)	65.76 (.30)
UG_Enroll_NoPower	560.59 (7.39)**	541.62 (6.46)***	560.47 (7.00)***
Expense_NoPower	.01 (3.05)**	.01 (3.01)**	.01 (3.23)**
Academic Prestige			
4Year_Grad_Rate		-37927.33 (-.68)	-1360.58 (-.03)
Accept_Rate		5949.59 (.13)	43742.90 (.54)
Institutional Change			
UG_Yearly_Delta_Last5			181513.96 (3.39)**
F-statistics	58.730	34.98	34.10
R^2	.631	.616	.652
ΔR^2	.631	-.015	.036

Note: T-values in parentheses; * $p < .05$; ** $p < .01$, *** $p < .001$

Table 7
Hierarchical Regression Analysis for Athletics Factors

Independent Variables	**Model 1**	**Model 2**	**Model 3**
Intercept	37152726.71 (8.62)	24617118.78 (7.82)	20426877.72 (6.47)
Athletic Dept Controls			
Annual_Debt_Service	-.60 (-3.95)***	.02 (.21)	.03 (.29)
SA_Count	-28525.32 (-3.95)***	8872.78 (1.46)	11013.38 (1.92)
Athletics_PctofOverall	-805155.29 (-3.13)**	-240655.44 (-1.30)	-168320.55 (-.97)
Athletic Prestige			
Avg_FB_Att		-189.62 (-4.98)***	-180.81 (-5.05)***
Avg_MBB_Att		-444.97 (-2.77)**	-424.15 (-2.81)**
FB_Charge		-8395032.52 (-4.58)***	-7722941.21 (-4.46)***
Athletics Change			
Conf_Chg_Last10			4755867.59 (3.79)***
F-statistics	18.85	41.51	42.37
R^2	.354	.713	.750
ΔR^2	.354	.359	.037

Note: T-values in parentheses; * $p < .05$; ** $p < .01$, *** $p < .001$

Table 8
Final predictive model

Variable	**Coefficient**	***t*-statistic**	**Standard Error**	**Significance**
(Constant)	13,108,889.50	7.021	1,866,983.68	< .001 ***
UG_Enroll_NoPower	278.28	4.288	64.89	< .001***
Conf_Chg_Last10	2,788,330.13	2.353	1,185,193.59	.021 *
Avg_FB_Att	*(150.43)*	*(5.184)*	29.02	< .001***
4Year_Grad_Rate	91,741.77	2.717	33,762.22	.008 **
Expense_NoPower (per $1m)	2,667.00	2.145	1,244.00	.034 *
FB_Charge	*(6,263,170.88)*	*(4.205)*	1,489,364.17	< .001***
			F-statistic	68.83
			Significance	< .001***
			R^2	.805
			Adjusted R^2	.793

Note: * $p < .05$; ** $p < .01$, *** $p < .001$

Table 9
Greatest Changes in Allocated Revenue Between FY 2018 and FY 2019

Institution	Conference	Allocated Revenue
Houston	AAC	$17.194
East Carolina	AAC	$16.755
Maryland	Big Ten	$10.668
Arizona	Pac-12	$9.422
South Florida	AAC	$8.067
Texas	Big-12	$7.579
Florida State	ACC	$7.113
Oklahoma	Big-12	*($5.363)*
Central Michigan	MAC	*($5.150)*
Nebraska	Big Ten	*($5.129)*

Note. Dollar amounts are in millions.

Discussion

The final model confirms much of what is already known about the drivers of allocated revenue to athletic departments at the highest level of Division I. Allocated revenue is influenced by both institutional and athletic related factors. As many studies have shown, student fees make up a large proportion of allocated revenue (Cheslock & Knight, 2015; Denhart & Ridpath, 2011; Knight Commission on Intercollegiate Athletics, 2020; Ott, 2009), particularly at Group of Five schools (Cheslock & Knight, 2015; NCAA, 2020). Ticket sales are indeed used as a substitute (Hoffer & Pincin, 2016), and changing conference affiliation results in an increase (Jones et al., 2018). This study also confirms higher cost of attendance has little to do with allocated revenue (Jones & Rudolph, 2015; Kelchen, 2016).

In addition, factors not directly related to previous literature are included and excluded from the final model. Growing or shrinking enrollment numbers had little to do with allocated revenue and were thus left out. Meanwhile, total institutional expenses, not just undergraduate enrollment (a proxy for student fees), at Group of Five schools should be considered as a factor. Graduation rates (a measure of institutional prestige) could be a factor of differentiation as well.

The other research question posed at the beginning of this study involved exploring schools that were the most under-allocated and over-allocated. To help account for variation in the data and differing philosophies across FBS institutions, confidence intervals were included in Table 10. Schools were not considered true outliers unless their actual values of allocated revenue were outside the predicted 80% confidence interval (roughly $6.5m on each side of the predicted best fit). A total of 17 athletic departments fell outside the confidence interval on the high end, while 7 were outside the interval on the low end. Of the schools receiving significantly less than expected, four were Power Five and three were Group of Five. No conference had more than two severely under-allocated institutions. On the other hand, only six Power Five schools were severely over-allocated, while eleven Group of Five schools fit into that category. The only conference without a school in either list was the ACC. The outliers alone suggest that extremes in allocated revenue are not confined to one conference, nor are they only a Group of Five issue.

While the predictive power of the final model was very good, there were some schools that fell far out of line with expectations (outside the 80% confidence interval). This indicated

Table 10
Actual and Predicted Values

Institution	Actual FY 2018-19	Predicted Best Fit	Difference	Predicted Upper	Predicted Lower
Houston	$ 48.372	$ 28.151	**$ 20.221**	$ 34.973	$ 21.329
Connecticut	$ 43.856	$ 25.512	**$ 18.345**	$ 33.264	$ 17.759
Rutgers	$ 29.859	$ 13.665	**$ 16.194**	$ 20.531	$ 6.800
East Carolina	$ 37.693	$ 23.189	**$ 14.504**	$ 29.900	$ 16.479
Cincinnati	$ 29.702	$ 18.462	**$ 11.240**	$ 25.433	$ 11.492
Troy	$ 26.596	$ 15.618	**$ 10.978**	$ 22.349	$ 8.888
Arizona	$ 21.886	$ 11.290	**$ 10.596**	$ 18.033	$ 4.547
Arizona State	$ 19.356	$ 9.841	**$ 9.515**	$ 16.591	$ 3.091
Maryland	$ 25.364	$ 16.356	**$ 9.008**	$ 23.331	$ 9.380
Akron	$ 26.011	$ 17.071	**$ 8.941**	$ 23.808	$ 10.333
Coastal Carolina	$ 27.530	$ 19.397	**$ 8.134**	$ 26.162	$ 12.631
Massachusetts	$ 38.932	$ 30.839	**$ 8.093**	$ 37.810	$ 23.867
Fresno State	$ 21.297	$ 13.566	**$ 7.732**	$ 20.479	$ 6.652
Buffalo	$ 32.129	$ 25.075	**$ 7.053**	$ 31.916	$ 18.235
Alabama	$ 2.655	*($ 4.329)*	**$ 6.984**	$ 2.498	*($ 11.157)*
San Diego State	$ 29.222	$ 22.328	**$ 6.894**	$ 29.159	$ 15.497
Auburn	$ 5.261	*($ 1.561)*	**$ 6.822**	$ 5.164	*($ 8.286)*
Central Michigan	$ 25.228	$ 18.583	**$ 6.645**	$ 25.301	$ 11.864
Old Dominion	$ 28.784	$ 22.279	**$ 6.505**	$ 28.978	$ 15.579
Virginia Tech	$ 10.278	$ 3.856	**$ 6.422**	$ 10.582	*($ 2.870)*
Western Michigan	$ 24.652	$ 18.649	**$ 6.003**	$ 25.366	$ 11.931
Colorado	$ 12.283	$ 6.305	**$ 5.978**	$ 13.139	*($ 0.529)*
Florida State	$ 15.607	$ 10.762	**$ 4.845**	$ 17.565	$ 3.960
Penn State	$ 0.000	*($ 4.465)*	**$ 4.465**	$ 2.376	*($ 11.306)*
Virginia	$ 18.430	$ 13.982	**$ 4.448**	$ 20.995	$ 6.968
Miami (OH)	$ 27.154	$ 22.987	**$ 4.167**	$ 29.849	$ 16.124
Wyoming	$ 20.328	$ 16.235	**$ 4.093**	$ 22.951	$ 9.519
South Alabama	$ 24.198	$ 20.167	**$ 4.031**	$ 26.968	$ 13.366
Eastern Michigan	$ 20.858	$ 16.951	**$ 3.907**	$ 23.703	$ 10.198
Georgia	$ 2.018	*($ 1.429)*	**$ 3.447**	$ 5.323	*($ 8.181)*
South Florida	$ 32.034	$ 28.605	**$ 3.428**	$ 35.465	$ 21.746
UNLV	$ 23.562	$ 20.574	**$ 2.988**	$ 27.371	$ 13.776
Toledo	$ 21.886	$ 18.958	**$ 2.928**	$ 25.715	$ 12.201
Memphis	$ 20.575	$ 17.823	**$ 2.753**	$ 24.560	$ 11.085
UNC Charlotte	$ 27.787	$ 25.129	**$ 2.658**	$ 31.837	$ 18.422
Minnesota	$ 7.973	$ 5.769	**$ 2.204**	$ 12.549	*($ 1.011)*
Wisconsin	$ 3.029	$ 0.846	**$ 2.183**	$ 7.548	*($ 5.856)*
Tennessee	$ 0.000	*($ 2.152)*	**$ 2.152**	$ 4.589	*($ 8.893)*

Middle Tennessee	$ 23.945	$ 22.024	**$ 1.922**	$ 28.745	$ 15.303
Florida	$ 2.262	$ 0.345	**$ 1.917**	$ 7.085	*($ 6.395)*
Louisiana Lafayette	$ 18.623	$ 16.753	**$ 1.870**	$ 23.501	$ 10.006
UTEP	$ 20.797	$ 19.065	**$ 1.732**	$ 25.830	$ 12.300
Washington	$ 4.152	$ 2.544	**$ 1.608**	$ 9.260	*($ 4.172)*
North Texas	$ 28.103	$ 26.538	**$ 1.565**	$ 33.283	$ 19.793
Texas Tech	$ 3.518	$ 2.021	**$ 1.497**	$ 8.746	*($ 4.704)*
Louisville	$ 5.924	$ 4.969	**$ 0.954**	$ 11.813	*($ 1.874)*
Illinois	$ 8.653	$ 7.764	**$ 0.889**	$ 14.645	$ 0.882
Utah	$ 12.594	$ 11.752	**$ 0.843**	$ 18.610	$ 4.893
Texas A&M	$ 0.00	*($ 0.697)*	**$ 0.697**	$ 6.221	*($ 7.615)*
Oregon State	$ 11.812	$ 11.259	**$ 0.553**	$ 18.013	$ 4.505
Ohio State	*($ 3.032)*	*($ 3.294)*	**$ 0.261**	$ 3.516	*($ 10.104)*
Georgia State	$ 25.616	$ 25.416	**$ 0.201**	$ 32.124	$ 18.707
Iowa State	$ 2.054	$ 1.979	**$ 0.075**	$ 8.673	*($ 4.715)*
Marshall	$ 15.724	$ 15.680	**$ 0.044**	$ 22.383	$ 8.976
Hawaii	$ 21.248	$ 21.275	***($ 0.027)***	$ 28.042	$ 14.508
Mississippi	$ 3.095	$ 3.168	***($ 0.072)***	$ 9.895	*($ 3.559)*
Utah State	$ 23.496	$ 23.707	***($ 0.210)***	$ 30.410	$ 17.003
Texas State	$ 26.910	$ 27.142	***($ 0.232)***	$ 33.915	$ 20.368
Colorado State	$ 23.735	$ 23.998	***($ 0.262)***	$ 30.794	$ 17.202
Michigan State	$ 0.886	$ 1.414	***($ 0.528)***	$ 8.101	*($ 5.273)*
Washington State	$ 5.462	$ 6.038	***($ 0.576)***	$ 12.867	*($ 0.790)*
Clemson	$ 5.602	$ 6.356	***($ 0.754)***	$ 13.261	*($ 0.548)*
Texas	*($ 3.193)*	*($ 2.321)*	***($ 0.872)***	$ 4.446	*($ 9.088)*
Appalachian State	$ 22.027	$ 23.012	***($ 0.985)***	$ 29.784	$ 16.240
Central Florida	$ 31.739	$ 32.820	***($ 1.081)***	$ 40.283	$ 25.357
Ball State	$ 20.551	$ 22.061	***($ 1.510)***	$ 28.823	$ 15.299
Georgia Tech	$ 8.257	$ 9.978	***($ 1.720)***	$ 16.724	$ 3.231
Arkansas State	$ 13.897	$ 15.689	***($ 1.792)***	$ 22.402	$ 8.975
Oklahoma State	$ 0.088	$ 2.086	***($ 1.998)***	$ 8.799	*($ 4.628)*
New Mexico State	$ 17.375	$ 19.471	***($ 2.096)***	$ 26.218	$ 12.724
Ohio	$ 19.992	$ 22.336	***($ 2.343)***	$ 29.074	$ 15.598
North Carolina State	$ 6.852	$ 9.202	***($ 2.350)***	$ 15.971	$ 2.432
San Jose State	$ 21.512	$ 23.969	***($ 2.457)***	$ 30.714	$ 17.224
Kansas State	$ 0.000	$ 2.529	***($ 2.529)***	$ 9.270	*($ 4.212)*
Michigan	*($ 5.402)*	*($ 2.857)*	***($ 2.545)***	$ 4.044	*($ 9.759)*
Iowa	*($ 0.700)*	$ 1.938	***($ 2.638)***	$ 8.627	*($ 4.752)*
Arkansas	$ 0.000	$ 3.037	***($ 3.037)***	$ 9.752	*($ 3.677)*
Oregon	$ 0.453	$ 3.554	***($ 3.101)***	$ 10.263	*($ 3.154)*
Florida Atlantic	$ 20.701	$ 23.958	***($ 3.257)***	$ 30.661	$ 17.255

UTSA	$ 20.488	$ 23.762	***($ 3.274)***	$ 30.499	$ 17.025
Kent State	$ 18.874	$ 22.182	***($ 3.307)***	$ 28.918	$ 15.445
Western Kentucky	$ 17.903	$ 21.367	***($ 3.464)***	$ 28.097	$ 14.637
Indiana	$ 2.954	$ 6.421	***($ 3.466)***	$ 13.224	*($ 0.382)*
Bowling Green	$ 15.625	$ 19.274	***($ 3.649)***	$ 25.982	$ 12.565
Northern Illinois	$ 14.846	$ 18.510	***($ 3.663)***	$ 25.257	$ 11.762
Kansas	$ 1.746	$ 5.603	***($ 3.857)***	$ 12.395	*($ 1.189)*
Oklahoma	*($ 5.877)*	*($ 1.917)*	***($ 3.960)***	$ 4.820	*($ 8.655)*
North Carolina	$ 9.163	$ 13.218	***($ 4.055)***	$ 20.183	$ 6.253
LSU	*($ 8.948)*	*($ 4.838)*	***($ 4.109)***	$ 2.018	*($ 11.694)*
UAB	$ 23.109	$ 27.442	***($ 4.333)***	$ 35.346	$ 19.538
Florida International	$ 28.558	$ 32.905	***($ 4.347)***	$ 39.921	$ 25.890
Southern Mississippi	$ 11.522	$ 15.910	***($ 4.388)***	$ 22.613	$ 9.207
Missouri	$ 1.015	$ 5.523	***($ 4.508)***	$ 12.343	*($ 1.297)*
UCLA	$ 2.577	$ 7.130	***($ 4.553)***	$ 14.000	$ 0.260
Purdue	*($ 1.500)*	$ 3.398	***($ 4.898)***	$ 10.104	*($ 3.308)*
Boise State	$ 15.024	$ 20.230	***($ 5.276)***	$ 27.033	$ 13.567
Georgia Southern	$ 17.806	$ 23.510	***($ 5.703)***	$ 30.222	$ 16.797
Mississippi State	*($ 5.365)*	$ 1.146	***($ 6.512)***	$ 7.888	*($ 5.596)*
Louisiana-Monroe	$ 8.033	$ 14.715	***($ 6.682)***	$ 21.475	$ 7.955
South Carolina	$ 0.000	$ 6.702	***($ 6.702)***	$ 13.584	*($ .181)*
West Virginia	$ 3.903	$ 10.698	***($ 6.795)***	$ 17.574	$ 3.821
Cal	$ 0.000	$ 7.435	***($ 7.435)***	$ 14.323	$ 0.546
Kentucky	*($ 5.380)*	$ 2.523	***($ 7.903)***	$ 9.235	*($ 4.189)*
Nevada	$ 14.384	$ 22.409	***($ 8.025)***	$ 29.109	$ 15.709
Louisiana Tech	$ 10.958	$ 19.127	***($ 8.169)***	$ 25.881	$ 12.374
New Mexico	$ 15.260	$ 24.404	***($ 9.144)***	$ 31.951	$ 16.857
Nebraska	*($ 10.565)*	*($ 0.412)*	***($ 10.153)***	$ 0.647	*($ 7.291)*

Note. Dollar amounts are in millions. 80% prediction interval.

that those schools were severely under/over-allocating their athletic departments, or that other factors were at play not accounted for in the model. Nebraska, for example, saw their athletic department transfer back $10.565 million (see bottom of Table 10). The predicted best fit from the model was a transfer of about $400,000. It is worth noting that the state of Nebraska has no professional sports teams and no other FBS athletic departments against whom to compete. New Mexico and Kentucky also have no professional sports teams in their state and similarly fall into the top five most under-allocated athletic departments. Meanwhile, the state of Louisiana cut its funding for higher education institutions by 37.7% between 2008 and 2019, the second highest rate in the nation (Jackson & Saenz, 2021). This may have impacted support from public universities to their athletic departments. Louisiana Tech is the third most under-allocated and Louisiana-Monroe is just outside of the top five according to the model (LSU is also under-allocated, but the actual value is within the confidence interval).

In contrast, the final model also found some athletic departments to be severely over-allocated. As mentioned previously, 17 athletic departments received allocated revenue that was outside the high end of their predicted confidence interval (see top of Table 10). Rutgers's athletic department received $29.859 million, well over the expected $13.665 million. Notably, Rutgers will not receive a full share of the conference distribution from the Big Ten until 2027 (Newman, 2019). The other four schools in the top five competed in the AAC in FY 2018-19. East Carolina received a one-time subsidy for expanding their football stadium (Boyd, 2018). Houston announced a massive boost in allocated revenue, receiving $48.372 million, as the athletic department made a play for Power Five status (Baby, 2018). The play paid off, as Houston was accepted into the Big-12 this past year along with Cincinnati (also in the top five), Central Florida, and Brigham Young (Myerberg, 2021).

Managerial Implications

One of the overarching goals of this study was to better understand factors that impact how (and the degree to which) institutions choose to subsidize their athletic departments. As mentioned in the literature review, most information published on the topic of allocated revenue is anecdotal (Jones et al., 2018). It focuses on attention grabbing headlines rather than taking a deep dive into the underlying data. It relies on the generalization that athletics should be viewed separately from any other department on a college campus. Based on this study, future researchers and pundits alike can deduce why a selected school receives what it receives and compare to others. Likewise, students, faculty, university leadership, boards of trustees, and athletic administrators can come to the table with a base understanding of factors that drive allocated revenue. They can use this data and modelling to then justify past decisions, or influence future ones.

A base understanding can be especially important for two groups: institutional and athletic administrators; that is, the professionals making year to year decisions on funding. When making these decisions as they pertain to athletics, university administrators can use this research as a guide for how they want to prioritize. Do they want to prioritize student and faculty opinions? Do they want to prioritize keeping up with highest spending athletic departments? Are they okay with accepting athletics as revenue consuming, zero-based, or do they expect the department to turn a profit? To analyze and help support their philosophy, institutional administrators can find other schools with similar profiles based on the modelling in this study and use it when meeting with athletic administrators.

Similarly, athletic administrators can identify peer institutions based on the model. The model can be used as a tool to visualize if a school aligns with the rest of its conference, or if a conference has continuity across institutions. What athletic administrators find could be surprising. For example, the data shows that Southern Mississippi receives subsidies more similar to Oregon State, Colorado, and Utah, than its Sun Belt peers. If the best fit amount were used, however, Southern Mississippi would look much more like Georgia Southern and new member Marshall, its actual Sun Belt peers. Armed with this information, the athletic department at Southern Mississippi may consider asking for an increase in institutional funding. Other athletic department administrators may come to the same or different conclusions about their department's subsidy.

Finally, this research can bring all sides of subsidy negotiations together for the common good. Ultimately, an FBS institution wants its athletic programs to be a positive outward reflection of the institution as a whole (Smith, 2012; Stinson et al., 2012). Decision makers can look at factors with strong or weak, positive or negative correlations to allocated revenue, and

take these into account when negotiating. They could look for ways that the athletic department can change to better the university and that the university can change to better the athletic department, so that both can benefit. While it might not serve as the guidebook for all decisions on subsidization of athletic departments, using the modelling presented in this paper, one can see if an institution's financial decisions match up to its core values. All in all, each extension of previous research adds context to discussions. This research adds a data driven element sorely lacking in discussions related to allocated revenue at FBS schools.

Limitations and Future Research

A primary limitation of this study is the time period that it covers. Since only two years are used, a major increase in allocated revenue for a facilities project, as was the case at East Carolina University (Boyd, 2018), can change the predicted results. It is difficult to determine if that increase was indeed short-term, or if it would be rolled into the yearly subsidy for the foreseeable future. Furthermore, FBS revenues have been steadily increasing year over year (Knight Commission on Intercollegiate Athletics, 2020; NCAA, 2020). This model includes no term that accounts for that increase. Future research could analyze a longitudinal dataset so modelling could be more predictive over a longer period of time, as well as to isolate predictors of change over time. It could also include an inflation factor for year over year change.

An additional limitation of this research is a linear model is just that, linear. Using a model to predict outcomes assumes that the goal is to move data into a straight line. In reality, decisions involving a number of parties with different goals in mind are not this simple. Allocated revenue levels depend on the humans setting them, not a model. Again, the research is not meant to be used as the "end all be all"; rather it is meant as a tool for those making the decisions. Still, the problem remains. To build on the utility of this research, it would be useful to conduct qualitative research with institutional and athletic administrators, sharing the model and asking how they decide on allocated revenue.

A couple major developments since FY 2018-19 should also inspire new research. In FY 2019-20, the COVID-19 pandemic cancelled spring sports. Two years later, higher education and intercollegiate athletics are still feeling the effects. Rutgers, the most heavily allocated Power Five school, received almost $43 million in allocated revenue in FY 2020-21. The athletic department still reported a loss of about $30 million (Koloff & Rimbach, 2022). Some schools attacked budget shortfalls differently than others. According to NCAA reports, Ohio State and UCLA each lost more than $60 million in FY 2020-21; neither receive much allocated revenue. Wisconsin's athletic department secured a $20 million loan from the school (Milewski, 2021). On the other hand, Arizona State received an additional $50 million in allocated revenue as a part of their, "proactive plan to address the shortfall" (Berkowitz, 2022). The SEC allocated a $23 million one-time advance to its conference members to be deducted from future conference distributions (Berkowitz, 2022). While this study sought to ensure that COVID did not influence the data analyzed, future research should be performed on the ramifications of COVID-19 to athletic budgets, with specific interest on decisions made to address deficits. The past year also marked with a fresh round of conference realignment. Oklahoma, Texas, UCLA, and USC announced moves within the Power Five, four schools announced moves into the Power Five (BYU, Cincinnati, Houston, and UCF), and additional changes trickled down to Group of Five conferences, the Football Championship Subdivision (FCS), Division II, and Division III (Myerberg, 2021). Conference change is a variable in the final model, indicating that it affects allocated revenue, so upcoming changes may very likely have an impact on future distributions. Thus, conference realignment presents another area of future research.

References

Alexander, D. L., & Kern, W. (2009). The Impact of Athletic Performance on Tuition Rates. *International Journal of Sport Finance*, *4*(4), 240–254.

Baby, B. (2018, May 17). Athletic limbo: University of Houston pouring cash into sports, but will its "Power Five" push pay off? *Dallas Morning News*.

Bakken, J. (2015, September 30). *UAB students vote YES to self-imposed fee in support of athletic programs*. UAB News.

Bass, J. R., Schaeperkoetter, C. C., & Gordon, B. S. (2015). *Student Perceptions of Institutional Support for Athletics in NCAA Division I*. Amateur Sport Research Center.

Berkowitz, S. (2022, February 5). *Arizona State leads Power Five public schools that paid millions to boost athletics during pandemic*. USA TODAY.

Boyd, D. (2018, January 12). *Athletic renovations promise benefits for students, fans*. East Carolina University News Services.

Cheslock, J. J., & Knight, D. B. (2015). Diverging Revenues, Cascading Expenditures, and Ensuing Subsidies: The Unbalanced and Growing Financial Strain of Intercollegiate Athletics on Universities and Their Students. *Journal of Higher Education*, *86*(3), 417–447.

Clevenger, C. (2018, February 8). *UTSA students vote down athletics and transportation fee proposals*.

Clotfelter, C. T. (2011). *Big-Time Sports in American Universities*. Cambridge University Press.

Intercollegiate athletics programs; format for each institution to report revenues and expenses, HB 1897, 2015, Code of Virginia (2015).

Denhart, M., & Ridpath, D. (2011). Funding the Arms Race: A Case Study of Student Athletic Fees. *Center for College Affordability and Productivity*.

Denhart, M., & Vedder, R. (2010). Intercollegiate Athletics Subsidies: A Regressive Tax. *Center for College Affordability and Productivity*.

Hoffer, A., & Pincin, J. A. (2016). The Effects of Revenue Changes on NCAA Athletic Departments' Expenditures. *Journal of Sport and Social Issues*, *40*(1), 82–102.

Howard, M. L. (2016). *Public Goods Generated by Intercollegiate Athletics: Student's Willingness-to-Pay Increased Athletic Fees*. Florida State University.

Jackson, V., & Saenz, M. (2021, February 17). *States Can Choose Better Path for Higher Education Funding in COVID-19 Recession*. Center on Budget and Policy Priorities.

Jensen, J. A., Spreyer, J., Lipsey, J., Popp, N., & Malekoff, R. (2020). Assessing Demand for Intercollegiate Athletic Departments: An Investigation of Multimedia Rights Agreements. *Journal of Global Sport Management*, *5*(1), 62–82.

Jensen, J. A., Turner, B. A., & McEvoy, C. D. (2015). Resource valuation of non-profit organizations: The case of the intercollegiate athletics industry. *International Review on Public and Nonprofit Marketing*, *12*(2), 169–187.

Jewell, R. T. (2020). NCAA Expenditure and Efficiency: Analyzing Generated and Allocated Revenue in the Football Bowl Subdivision. *Journal of Sports Economics*, *21*(4), 363–390.

Jones, W. A., & Rudolph, M. J. (2015). *Athletic Subsidies and College Costs: Are Students Paying for Rising Costs in Intercollegiate Athletics Spending*.

Jones, W. A., Rudolph, M. J., & Brown, M. (2018). A Growth Curve Analysis of Mandatory Student Athletics Fees. *Journal of Intercollegiate Sport*, *11*(2), 172–192.

Kelchen, R. (2016). An Analysis of Student Fees: The Roles of States and Institutions. *The Review of Higher Education*, *39*(4), 597–619.

Knight Commission on Intercollegiate Athletics. (2020). *College Athletics Financial Information Database*.

Koloff, A., & Rimbach, J. (2022, January 19). *Rutgers athletics rang up a $73M deficit last year. Students, taxpayers were on the hook.* USA TODAY.

Lipford, J. W., & Slice, J. K. (2017). Cost spreading in college athletic spending in the United States: Estimates and implications. *Education Economics*, *25*(4), 379–393.

Longman, J. (2009, May 30). As Costs of Sports Rise, Students Balk at Fees. *The New York Times*.

McEvoy, C. D., Morse, A. L., & Shapiro, S. L. (2013). Factors Influencing Collegiate Athletic Department Revenues. *Journal of Issues in Intercollegiate Athletics*, *6*, 249–267.

Mendenhall, W., & Sincich, T. (2012). *A Second Course in Statistics Regression Analysis* (Seventh). Prentice Hall.

Milewski, T. D. (2021, September 30). *Wisconsin athletics covers budget shortfall with $20 million no-interest loan from campus*. Madison.Com.

Morton, J. T. (2017). Impact of student fees on winning in the NCAA. *Journal of Contemporary Athletics*, *11*(2), 73–82.

Myerberg, P. (2021, September 3). *Big 12 Conference settles on adding BYU, Houston, UCF, Cincinnati*. USA Today.

NCAA. (2020). *15-Year Trends in Division I Athletics Finances*.

Newman, J. (2019, February 1). *Rutgers says full Big Ten share delayed until 2027*. Asbury Park Press.

Ott, K. (2009). *Students' awareness and perceptions of the activity fee at the University of Toledo: A descriptive research study*. The University of Toledo.

Perez, Z. (2018, February 19). Athletic fee increase passes student referendum, set to go to Board of Regents. *North Texas Daily*.

Pine, N. (2010). The Role of Athletics in the Academy: An Alternative Approach to Financial Investment. *Journal of Sport and Social Issues*, *34*(4), 475–480.

Popp, N., Jensen, J. A., McEvoy, C. D., & Weiner, J. (2019). Quantifying the Impact of Adding a Proactive Outbound Ticket Sales Force on Revenues of NCAA Athletics Departments. *Journal of Issues in Intercollegiate Athletics*, *12*, 205–225.

Ridpath, B. D., Smith, J., Garrett, D., & Robe, J. (2015). Shaping Policy and Practice in Intercollegiate Athletics: A Study of Student Perceptions of Resource Allocation for Athletics and its Effect on Affordability of Higher Education. *The Journal of SPORT*, *4*(1), 19–46.

Smith, D. R. (2012). The Curious (and Spurious?) Relationship Between Intercollegiate Athletic Success and Tuition Rates. *International Journal of Sport Finance*, *7*(1), 3–18.

Stinson, J., Marquardt, A., & Chandley, J. (2012). An Empirical Examination of University Intercollegiate Athletic Expenditures. *Sports Marketing Quarterly*, *21*, 104–114.

Texan News. (2019, October 18). *"Tarleton deserves that."- Students vote yes to increase in the athletic fee.* Texan News Service.

Thelin, J., & Wiseman, L. (1990). Fiscal fitness? The peculiar economics of intercollegiate athletics. *Capital Ideas*, *4*(7), 2–16.

Weiner, J. (2009). *College Sports 101: A Primer on Money, Athletics, and Higher Education in the 21st Century*. Knight Commission on Intercollegiate Athletics.