JOURNAL OF ISSUES IN INTERCOLLEGIATE ATHLETICS

Analyzing Big Data in Intercollegiate Athletics:

An Application to Athletic Donor Behavior

Jonathan A. Jensen
University of North Carolina at Chapel Hill

Liz Wanless
Ohio University

Kaya Hedt
University of North Carolina at Chapel Hill

Emily Wayland
University of North Carolina at Chapel Hill

Intercollegiate athletic departments rely on fundraising for a significant percentage of their overall revenue. Therefore, the retention of donors is a critical issue. In an effort to better understand the factors that influence this important outcome, this study undertakes the first longitudinal analysis of donor behavior data from multiple universities in a major athletic conference (i.e., the Power Five), a total of 34,057 donors spanning 169,479 observations. After inserting covariates into a survival model, the effects of the economy are apparent, with economic growth decreasing the probability of a donor exiting and inflation increasing the probability of exiting, with results consistent across both universities. Living in the same state as the university and wins in the NCAA Tournament both decrease the probability of exiting, for both universities. These results support the efficacy of analyzing big data in the intercollegiate athletics industry, while also providing novel managerial insights for intercollegiate fundraisers.

Keywords: analytics, longitudinal data, intercollegiate athletics, athletic fundraising, donor behavior

In the intercollegiate athletics industry, donations from supporters have historically been an important revenue source for National Collegiate Athletic Association (NCAA) programs. Over the past 15 years, revenue from fundraising has rivaled ticket sales for the top spot among athletic-generated revenue streams in the Football Bowl Subdivision (FBS; Fulks, 2017). As an illustration, in athletic fiscal year 2016 median contributions across FBS institutions ($9,155,000) exceeded median ticket sales ($8,937,000; Fulks, 2017). While fundraising reigns supreme among athletic-generated revenues for FBS institutions, expenses still outpace revenue for the vast majority of intercollegiate athletic programs. In 2016, total FBS median expenses exceeded median revenues by just over 19 million. (Fulks, 2017). Given these figures, intercollegiate athletic development officers are tasked with maximizing the athletic donor lifecycle.

Two primary research lines in the athletic fundraising literature, predicting annual athletic contributions and profiling donors based on their motivations, have dominated the dissemination of empirically derived conclusions for understanding intercollegiate athletic donors (e.g., Martin, Stinson, Kang & Jubenville, 2010; Popp, Barrett, & Weight, 2016). Alternate perspectives are needed to both complement past research streams and better inform donor relationship management strategy. In the case of predicting donor funds raised, the heavy emphasis on athletic success as a predictor may ignore other important factors. In the case of donor motivations, the emphasis on motivation theory may be a limited vantage point by which to consider donor behavior. To help fill this gap in the athletic fundraising literature and create comparative insights emanating from the analysis of data from multiple universities, this study applies an advanced statistical methodology to assess a variety of factors that may be predictive of a donor's decision to stop donating to a university, across longitudinal datasets provided by two major university athletic departments.

Literature Review

Modeling Athletic Contributions

Since the 1970's, research analyzing athletic fundraising largely focused its attention toward modeling annual fund movement (Martinez et al., 2010). Because of the significant financial investment colleges and universities make to their athletic programs in order to generate on-field athletic achievement, econometric approaches with predictor variables representing athletic success measures populated the studies orchestrated to better understand yearly contributions generation (Budig, 1976; McEvoy, 2005). Research in this area considered a range of variables to represent athletic success measures and a variety of efforts made to control for institutional heterogeneity. Conclusions from this well-populated research line varied according to type of institution, donor population, fund, and sport offerings (Martinez et al., 2010). At times, research conclusions presented contradiction. In terms of considering the value of this line to understanding donors, studies modeling athletic contributions are completely removed from primary and secondary characteristics of the donor.

Regarding institution type, Humphreys and Mondello (2007) concluded that public institutions were impacted by football and men's basketball success, while Stinson and Howard (2007) found an increase in athletic giving across all school levels. Both agreed that athletic

donors to private schools (Humphreys & Mondello, 2007) and specifically top-ranked academic schools in the case of Stinson and Howard (2007), were affected differently. In consideration of alumni status, studies concluded that alumni increased giving in years of athletic success achievement (Rhoads & Gerking, 2000; Stinson & Howard, 2004) and non-alumni also increased giving in response (Stinson & Howard, 2004). In contradiction, studies instead concluded that neither alumni (Sigelman & Carter, 1979) nor non-alumni (Rhoads & Gerking, 2000) increased giving as a result of athletic success. Research most often positioned football and men's basketball athletic success measures together in the modeling process. Authors deduced that successful football and men's basketball teams positively influenced the number of donors and total donation amount for gifts both athletically and academically (e.g., Stinson & Howard, 2008). Studies found that postseason appearances, such as bowl games and participation in the NCAA Division I Men's Basketball Tournament (i.e., "March Madness") were predictive of increased athletic contributions (e.g., Baade & Sundberg, 1996). The type of fund studied also impacted results. While some concluded that restricted giving to the athletic department was most affected leaving unrestricted giving unaffected (Humphreys & Mondello, 2007; Sigelman & Bookheimer, 1983), others concluded both types of funds were positively influenced (e.g., Stinson & Howard, 2008).

Martinez et al. (2010) applied a meta-analytic approach to form consensus surrounding the history of studies evaluating athletic success as a fundraising predictor. In a review of 14 different qualifying studies on the subject, researchers concluded that measures of athletic success, while significant, only predicted small increases in intercollegiate funds with "varying degrees of influence" (p. 44) depending on moderating variables. The meta-analysis revealed that overall, the effect is strongest when considering consolidated academic and athletic funds as the dependent variable. Increased alumni giving in years of athletic success achievement doubled the rate of non-alumni giving. Institutions with membership to higher tiers of athletic competition saw increased giving with athletic success achievement than institutions with membership at lower tiers. The public/private distinction in fundraising responsivity to athletic success did not, however, manifest in the meta-analysis. For institutions including football among their sport offerings, fund increases were 60% larger than increases as a result of basketball success.

Because a magnifying glass was applied to the effect of athletic success, however, the literature has struggled to incorporate other predictors beyond athletic success (Wanless & Stinson, 2020). This represents a drawback of the approaches, particularly in an era in which the analysis of "big data" has gained momentum. While economic and athletic success measures have been considered at depth, an opportunity exists to consider additional variables. Longitudinal athletic department variables such as wealth indicators, a donor's relationship with the institution, and a donor's residence region, for example, may influence athletic fundraising success. In addition, in terms of informing a donor retention strategy, studies modeling athletic contributions are completely removed from primary and secondary characteristics of the donor. While annual fluctuations are a meaningful area of study, athletic development departments consider metrics beyond annual increases or decreases especially regarding the consideration of more strategic variables over the long term which have been sparingly considered in literature (Stinson & Howard, 2007; Wanless & Stinson, 2020). For Power Five institutions with a large volume of donors, this requires the analysis of large volumes of data.

Understanding Donor Motivations

Realizing that athletic contributions comprise a considerable portion of athletic-generated revenues, athletic development researchers explored the range of social exchange affiliated with donating to an athletic program. Like donors for non-profits at large, the exchange extends beyond purely economic values (e.g., parking privileges), a concept well-rooted in social exchange theory, which has been applied widely across the nonprofit marketing literature (Arnett, German, & Hunt, 2003). Gladden, Mahony, and Apostolopoulou (2005) highlighted that intercollegiate athletic programs present a unique fundraising experience in comparison with the traditional non-profit; the field of play and pursuit of athletic success create a distinctive exchange.

Throughout the athletic donor motivations literature, researchers applied various motivation theories and narrowed in on a donor's psychographic profile. Specifically, researchers considered a donor's motivations to contribute to the athletic fund. Motivations range from the desire to reap the benefits associated with a preferred game experience to the aspiration to improve the athletic program and student-athlete experience (Gladden et al., 2005; Ko et al., 2014; Popp et al., 2016; Mahony, Gladden, & Funk, 2003; Verner, Hecht, & Fansler, 1998). Most recently, through an extensive literature review Ko et al. (2014) derived motivations that were later categorized into ERG (Existence, Relatedness, and Growth) theoretical constructs for research purposes:

> (a) philanthropy (e.g., feel good and support the department), (b) vicarious achievement (e.g., intrinsic rewards, achievement, and basking in reflected glory), (c) commitment (e.g., love for the school and athletes), (d) affiliation (e.g., sense of belongingness), (e) socialization (e.g., associate with other donors), (f) public recognition (e.g., ego enhancement), (g) tangible benefits (e.g., better seats, parking, and suites), and (h) power (e.g., involvement in programmatic decisions). (p. 527)

Institutional differences (Gladden et al., 2005), as well as demographic differences in motivations (Shapiro & Ridinger, 2011; Staurowsky, Parkhouse, & Sachs, 1996), were noted as key outcomes in the history of these investigations. In Gladden et al. (2005), donors of one institution were twice as likely to cite improving the athletic program than the other two as a primary motive. In the study of gender and athletic donations, female athletic donors were likely to be younger than male athletic donors (Staurowsky et al., 1996), to contribute lower amounts (Shapiro & Ridinger, 2011; Staurowsky et al., 1996), and to show increased affinity for women's athletic programs (Staurowsky et al., 1996).

A primary limitation with the nature of the research, however, involves the temporal limitations of a cross-sectional design. In addition, secondary variables potentially housed in large volumes of data for institutions with significant donor bases thought to be important to a donor's decision to persist over time, such as regional location, economic variables, and reactions to athletic success achievement, have not been included or have limited discussion in the cross-sectional designs (Shapiro & Ridinger, 2011). While a donor's motivations for donating are important considerations, the sole focus inward on the donor neglects donor behavior over time.

In response, Wanless, Jensen, and Poliakoff (2019) piloted an initial application of an advanced quantitative research methodology (i.e., survival analysis) to donors of one institution

in a Group of Five athletic conference. The study revealed that donors are most susceptible to dissolution within the first two years, while the probability of persistence increases over time. Regionality, employment status, athletic department contact, and athletic success played a role in predicting donor defection. The generalizability of the study was limited, however, given that the data was limited to one institution that did not enjoy membership in a top athletic conference (i.e., the Power Five). Therefore, the purpose of this investigation is to not only analyze data from an athletic department at the highest level of intercollegiate athletic competition, but also to improve generalizability by analyzing data from more than one institution. Capacity measures, economic conditions, geographic, and athletic success measures were included as potential covariates, based on the availability of data from each institution. The results of the current study are designed to inform donor retention strategy, provide a basis for comparison between two Power Five institutions, and to help fill an important gap in the intercollegiate athletics literature.

Hypotheses

For the non-profit sector at large, it is widely noted throughout the literature (e.g., Arik, Clark, Raffo, 2016), as well as comprehensive annual philanthropy reports (Giving USA, 2019), that economic fluctuations will influence individual and corporate giving. Prior research in sport-specific environments framed the need to cultivate donor relationships within the context of economic shifts (Leone, 2013; Shapiro & Ridinger, 2011). Specifically, Shapiro and Ridinger (2011) suggested that athletic administrators take measures to understand donor behavior as a result of the most recent economic recession impacting one's decision to donate to an intercollegiate athletic program. Thus, we investigate the below hypothesis:

Hypothesis 1: The effects of the economy will influence a donor's decision whether to continue donating, with economic growth increasing the likelihood to continue donating and an inflationary economy decreasing the likelihood.

Regionality, or the proximity of the donor to the institution in which he or she is engaged, has been sparingly considered in donor motivation research. Although widely regarded as an important consideration in marketing and consumer behavior research (i.e., Woisetschläger, Backhaus, & Cornwell, 2017), a donor's proximity to campus has only been discussed in a small number of donor motivation studies (Gladden et al., 2005; Mahony et al., 2003). Both studies acknowledged that donors closer to the institution reported differing motives for donating than those living farther away. In the case of Gladden et al. (2005), donors from an athletic program located an average 181.4 miles from campus reported differing donation motives (e.g., wanting to invest in the community), in comparison with two athletic programs where donors lived on average 31.9 and 28.4 miles from campus. Therefore:

Hypothesis 2: The closer the donor's residential proximity to the university, the greater the probability of a donor continuing to donate.

The literature exploring the potential relationship between on-field athletic success and athletic contributions supports the premise that success in football and men's basketball could cause donors to extend their relationship with the athletic department (see Martinez et al. 2010 for an exhaustive review). For example, several studies have found that postseason appearances

in the NCAA Division I Men's Basketball Tournament were predictive of donor behavior, including Baade and Sundberg (1996), Humphreys and Mondello (2007), and Stinson and Howard (2007). Of specific interest to the current study, in terms of fluctuations in the overall number of athletic donors, Stinson and Howard (2007) noted that the effect of on-field success on athletic donations resulted from the generation of new donors, rather than increasing gift size among existing donors. Limited studies have shown that athletic success, or a lack thereof, has no effect on athletic donor dollars (Covell, 2005). Thus:

Hypothesis 3: An improvement in an institution's performance in men's basketball and football should result in an increase in the probability a donor continues to donate.

Methods

Data Description

In order to investigate a variety of factors that may impact the length of time a donor will maintain his or her relationship with an athletic department, one of the largest datasets ever constructed for the study of intercollegiate athletic donor behavior was compiled. The dataset includes data from a total of 34,057 individuals spanning 169,479 observations across 16 years (an average of 4.98 observations per individual). The donor dataset for University No. 1 was comprised of 18,733 individuals across 108,578 observations, a total of 7,953 of whom exited the dataset over a nine-year period (2009-2017). University No. 2's dataset spanned seven years and was smaller, comprised of 15,324 individuals spanning 60,901 observations over seven years (2011-2017). Of those 15,324 individuals who gave to University No. 2 over the seven-year time period, 6,250 had exited the dataset. Both universities are members of the highest tier of intercollegiate athletic competition, members of the same athletic conference, and located in the Eastern United States. Various data about the individuals' relationship with the athletic departments and their giving history, as well as their location, were collected by both universities in a longitudinal dataset.

In order to investigate the potential influence of the economy, variables reflecting both economic growth during each year of the period and the presence of an inflationary economy were included in the model. Economic growth was reflected via the annual percentage growth rate in Gross National Income (GNI) per capita, which is gross national income divided by midyear population (The World Bank Group, 2018). GNI, formerly Gross Domestic Product, is an accepted measure of economic growth on a global and domestic basis (e.g., Barro, 1991). This measure of economic growth was combined with data on annual growth in inflation from The World Bank's inflation dataset (The World Bank Group, 2018). Inflation was measured by the Consumer Price Index (CPI), a universally accepted metric utilized to measure changes in prices; a variable crucial to almost any economic issue (Boskin, Dulberger, Gordon, Griliches, & Jorgenson, 1998).

Next, the potential effects of the donor's geographic location were isolated by including a number of binary variables reflecting whether the individual lived in the same state as the university, and if not, a variety of different geographic locations. Beyond living in the same state, variables were also created noting whether the individual lived in the Mid-Atlantic area (Washington, D.C., Maryland, or Virginia), or Southeast (i.e., South Carolina, Georgia, or Florida), or whether the individual lived farther away, in the Northeast (including New York,

New Jersey, or Connecticut), or in New England (Massachusetts, Rhode Island, New Hampshire, Vermont, or Maine).

In order to operationalize not just men's basketball tournament appearances but also the university's relative success in those tournaments, a variable was created that reflected the number of "March Madness" wins each season. On-field performance in football has been considered a number of different ways, including winning percentage (Grimes & Chressanthis, 1994; Tucker, 2004; Turner, Meserve, & Bowen, 2001), bowl appearances (Baade & Sundberg, 1996), and bowl wins (Rhoads & Gerking, 2000). Considering the potential weight of each and every football game (as opposed to one individual basketball game), in this study success in football was operationalized by a variable reflecting the number of wins in each and every season across the 16-year span of the study. At both universities, donors have until the end of the year to decide whether to continue donating or not. Thus, the total number of NCAA Tournament and football wins earned by the university in each year are known to the donor prior to the decision being made.

As explained by Spector and Brannick (2011), the use of control variables can help ensure any observed relationships are not due in part to the influence of variables that may be extraneous to the study's hypotheses. This practice is naturally important in secondary data studies (e.g., Mazodier & Rezaee, 2013). Given that the purpose of this study was not to predict the amount that any one individual would donate but one's decision whether to continue as a donor, the total amount given by each individual across his or her lifetime was also inserted as a control variable. This variable was included first, to ensure that this important factor would be controlled for throughout the subsequent analysis. Descriptive statistics and correlations for each of the variables detailed above are included in Table 1.

Table 1
Descriptive Statistics and Correlations

	M	*SD*	LG	CPI	GNI	IS	MA	SE	NE	NEW	NCAA
Life Giving	59780	805987									
Inflation	1.46	1.05	.016*								
Econ. Growth	1.64	1.63	.014*	.981*							
In-State	0.78	0.42	-.008*	-.015*	-.013*						
Mid-Atlantic	0.31	0.46	.036*	.117*	.096*	.112*					
Southeast	0.62	0.24	.012*	-.006	-.004	-.479*	-.173*				
Northeast	0.28	0.16	.017*	.015*	.013*	-.315*	-.114*	-.043*			
New England	0.01	.066	.000	.005	.004	-.124*	-.045*	-.017*	-.011*		
NCAA Wins	2.25	2.03	-.023*	.123*	.187*	.035*	-.346*	.019*	-.029*	-.014*	
Football Wins	6.32	2.39	-.035*	-.403*	-.347*	.040*	-.437*	.023*	-.037*	-.015*	.069*

* $p < .01$

Methodology

Given that the stated goal of this study is to better understand the factors that may lead donors to continue or end their time as a donor, the survival analysis methodology was chosen. Survival analysis has been proven to be applicable across a wide variety of different academic fields, and according to Box-Steffensmeier and Jones (2004) is known alternatively as duration

analysis (econometrics), failure-time analysis (engineering), or event history analysis (demography). Survival analysis is generally applied in order to better understand the duration of time leading up to and the factors that may influence the probability of an event occurring. Survival models have numerous advantages over ordinary least squares (OLS) regression or logit models, particularly when they are being applied to longitudinal data. First, they allow for censored observations, or observations for which the event occurrence of interest has not yet occurred. In the instance of this study, we have data that is both left and right-censored. Left-censoring is prevalent across both datasets given that no data was collected by the universities prior to the start of 2009 and 2011 respectively, which is common in the analysis of panel data by survival models. In addition, right-censoring is also observed, given that there are a large number of donors who have not experienced the event occurrence of interest, and still remain as a donor. Both occurrences are common and easily handled by a survival model. Survival models also allow for staggered entry into the dataset and are robust enough to handle skewed datasets (Meyers, Gamst, & Guarino, 2016).

As opposed to applying a logit model that would simply investigate whether a supporter decided to continue donating to the university (or not), a survival model goes beyond by featuring a dual-natured dependent variable that not only provides information on whether covariates either increase or decrease the probability a donor remains, but also when the event occurrence of interest occurs. As noted by Kleinbaum and Klein (2012, p. 112): "the Cox model uses more information, the survival times, than the logistic model, which considers a (0,1) outcome and ignores survival times and censoring." Thus, the employment of a survival model in this case not only provides information on the effects of the covariates in the model, but also various statistics (such as the survivor functions and hazard rates described below) that help the investigator understand time to event. It is for this reason that survival models are commonly referred to as "time-to-event" regression models, with the event occurrence of interest in the case of this study being the donor deciding to stop giving to the university. Once each individual decides to end their time as a donor by not donating during a particular year, a 1 is indicated in the event occurrence variable, which indicates the individual has experienced the event occurrence of interest (see Jensen & Turner, 2018 for a more thorough review of the advantages of survival models, and instances in which they are best employed). Yet another advantage of this methodology is that it can be utilized to isolate the effects of both time-varying and time-invariant covariates, or covariates that both do and do not vary other time. In the case of this study, it can be applied to analyze the effects of both continuous variables that change each and every year, such as economic data or whether or not the athletic department enjoys a successful football season, as well as binary variables that do not change over the period of the study. For these reasons a survival model is the appropriate choice for the analysis of a longitudinal dataset, in which the goal is to better understand factors that either increase or decrease the probability of a donor choosing to stop donating to a university athletic department.

Previous applications of this methodology have spanned the analysis of U.N. missions, the duration of wars, the careers of politicians, and the study of marriages (Box- Steffensmeier & Jones 2004). Other studies have utilized the duration of treatment programs for alcoholics (Cooney, Kadden, Litt, & Getter, 1991), the ideation of suicide by college students (Bolger, Downey, Walker, & Steininger, 1989), and whether (and when) criminals returned to prison (Furby, Weinrott, & Blackshaw, 1989; See Singer & Willett, 2003 for a more complete review). However, despite its application across a wide variety of different academic fields, it has been utilized sparingly in the sport literature. Early applications of survival models to sport data

included analyzing the effects of covariates on a professional athlete's career, with studies examining both when they were drafted (Staw & Hoang, 1995) and the player's race (Hoang & Rascher, 1999). Recently, Salaga and Juravich (2020) applied a survival model to determine whether a coach's race impacts his length of employment, finding that non-white coaches had longer tenures and no evidence that performance differed based on race. An application related to on-field performance examined whether the timing of a first goal in soccer impacted the probability of a subsequent goal being scored (Nevo & Ritov, 2013). The application of survival models has since expanded to sport business and decisions off of the field, such as the probability of a sport organization to survive based on the variety of different types of resources that sponsors provide (Cobbs, Tyler, Jensen, & Chan, 2017). In addition, the potential influences on a sponsor's decision to either renew or exit sponsorships have been investigated, across sponsorships of global mega-events (Jensen & Cornwell, 2017), U.S.-based title sponsorships (Jensen & Cornwell, 2018), and naming rights sponsorships (Jensen, Head, & Mergy 2020). Its application to the intercollegiate athletics industry has been limited, save for one prior utilization of the methodology to empirically examine the durations of college bowl sponsorships (Jensen & Caneja, 2018), and the aforementioned donor retention study utilizing data from a Group of Five institution (Wanless et al., 2019).

From a conceptual standpoint, there are two primary issues that are essential for an understanding of survival analysis: the survivor function and the hazard rate (Singer & Willett, 2003). These functions are loosely described as the descriptive statistics of survival analysis, or non-parametric results. First, we will review the Kaplan-Meier (1958) survivor function. It is designated as $S(t_{ij})$, and defined by Singer and Willett (2003) as the "probability that individual *i* will survive past time period *j*" (p. 334). For each individual in the dataset (in this case, the donor to the athletic department) each individual *i* cannot experience the event that is of interest in the *j*th time interval, and that person therefore then survives to the end of time period *j*. Accordingly, the random variable for time (T_i) for each individual in question *i* exceeds *j*. The survivor function is thusly indicated accordingly:

$$(t_{ij}) = \Pr[T_i > j]$$

Generally more useful than the survivor function is the hazard rate, which is defined as the probability that each individual (in this case, donor) experiences the event occurrence of interest, assuming that event in question has not previously occurred within the time interval (Box-Steffensmeier & Jones, 1997). We represent T_i as the time period *T* for each individual *i*, therefore the hazard rate is defined by Singer and Willett (2003) with the formula below:

$$h(t_{ij}) = \Pr[T_i = j | T_i \geq j]$$

All analyses and visuals were computed utilizing the STATA (Version 15.1) statistical software package. Given its versatility and no requirement for an *a priori* parametrization of the model's baseline hazard, the Cox proportional hazards (PH) model (Cox, 1972) is the most widely-utilized survival analysis modeling approach. "The Cox PH model is the most widely used model in survival analysis," explained Kleinbaum and Klein (2012, p. 554). "A key reason why it is so popular is that the distribution of the survival time variable need not be specified." Box-Steffensmeier and Jones (2004) also suggest the Cox model for discrete data and consequently, this model was chosen for the current study. In addition to analyzing each

variable's coefficient to determine if it either increased or decreased the probability of event occurrence, we are able to produce each variable's hazard ratio, the anti-log of the coefficient. The hazard ratio is interpreted similarly to that of an odds ratio in a logit model, with a ratio above one suggesting that the coefficient in question increases the probability of event occurrence and a ratio below one causing a reduction in the hazard of event occurrence. The Cox (1972) PH model utilized in this study is illustrated below. As is evident in the below equation, the model contains no constant term β0, as it is absorbed into the model's baseline hazard function:

$$h(t) = \exp(\beta_1 \text{LifetimeGiving} + \beta_2 \text{CPI} + \beta_3 \text{GNI} + \beta_4 \text{InState} + \beta_5 \text{MidAtlantic} + \beta_6 \text{Southeast} + \beta_7 \text{Northeast} + \beta_8 \text{NewEngland} + \beta_9 \text{NCAAWins} + \beta_{10} \text{FootballWins})\, h_0(t)$$

Results

Non-Parametric Results

To begin, graphs of the survivor functions (Figure 1) and hazard rates (Figure 2) for both universities are helpful to understand changes in donor retention over time for both universities, prior to covariates being inserted into the model. As visualized in Figure 1, a larger percentage of donors survive over time at University No. 1, when compared to University No. 2. In the first year, the survivor function of university No. 2 drops to .7744, as more than 20% of donors are lost at the end of the first year. Comparatively, University No. 1 lost less than 15% of its donors, equating to a survivor function after the first year of .8569. For both universities, the graph of each's survivor function flattens out as fewer and fewer donors are lost in subsequent years. For example, for University No. 1 its survivor function drops to .7840 after two years, to .7163 after three, .6687 after four, and .6286 after five years. Thus, after losing nearly 15% of donors in their initial year, less than 20% are lost over the subsequent three years. Results are similar for University No. 2. After more than 20% are lost after the first year, the survivor function drops to only .6872 after the second year, .6273 after the third, and only .5867 after the fourth. Similarly, less than 20% of all donors exit the dataset between years 2-4, after nearly 20% exit after the initial year. In order to determine whether the two university's survival curves illustrated in Figure 1 were significantly different, a long-rank test was performed. Results confirmed significantly different survival curves for University No. 1 and University No. 2, $\chi^2(1) = 77.62$, $p < .001$.

The graph of each university's smoothed hazard function (Figure 2) provides a useful visual of these trends over time. For University No. 1, their hazard function is much less steep, and gradual as a small number of donors exit the dataset each year. Conversely, University No. 2's curve is much steeper, as the hazard function starts higher and drops more quickly. For University No. 1, the hazard functions reflected in Figure 2 are .1431 after year one, .0851 after year two, .0863 after year three, and .0664 after four. In years 5-7 it is smaller still: .0599 in year five, .0459 in year six, .0417 in year seven and .0389 in year eight. Thus, the hazard function for University No. 1 gradually drops each year in a fairly linear fashion as the probability of a donor exiting the dataset falls in nearly each subsequent year. For University 2, its hazard function is initially much higher: .2256 in year one. Though it drops in both year two and year three, it is still fairly high, .1127 in year two and .0871 in year three. It drops to .0647 in year four and

.0411 in year five, demonstrating that for both universities the probability of a donor exiting the dataset decreases over time in each subsequent year the longer they remain and donor.

Figure 1.
Graph of Kaplan-Meier survival estimates by university

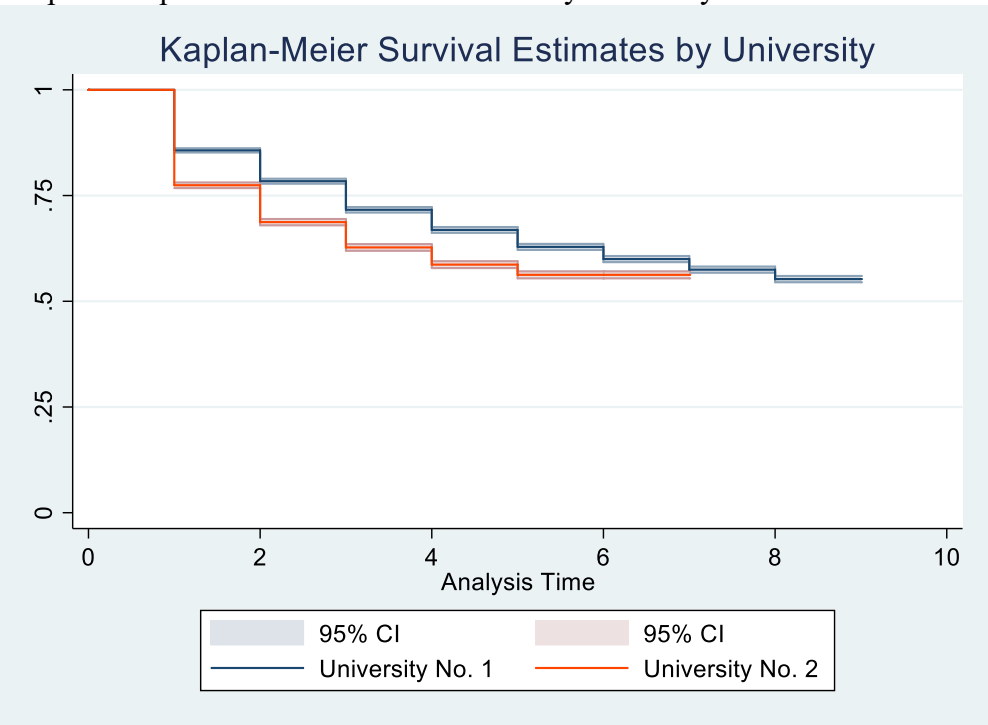
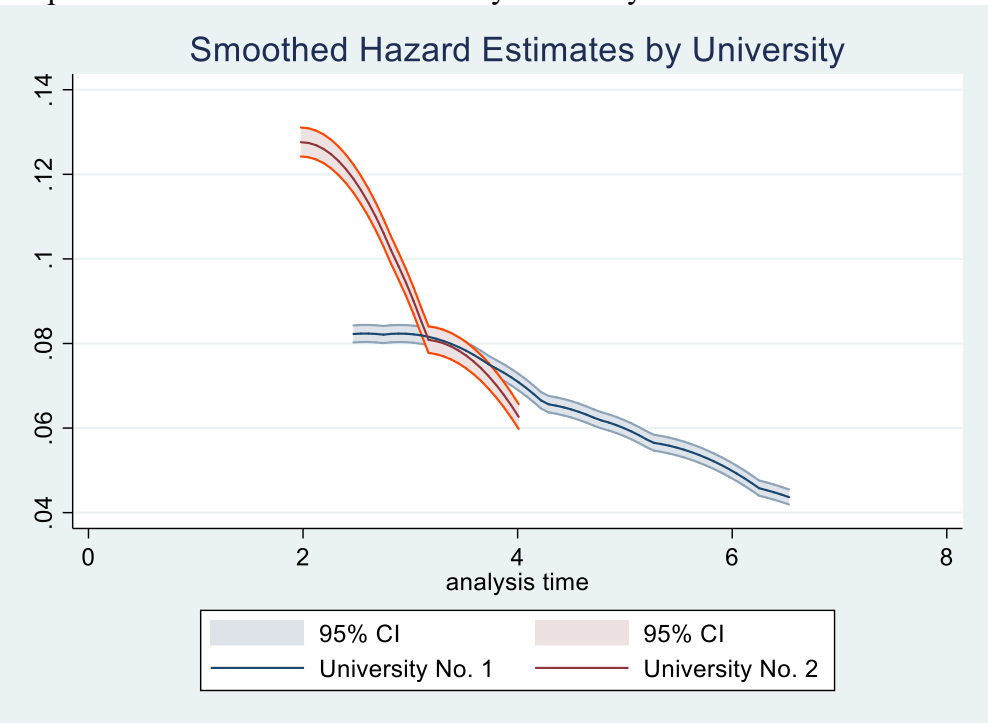


Figure 2.
Graph of smoothed hazard estimates by university



Semi-Parametric Results

To begin, results in Table 2 confirm that after controlling for lifetime giving, the effects of changes in economic conditions influence the decision of a donor to continue his or her giving. Results for the effects of both economic growth and inflation were significant for both universities. Across both universities, results indicate that economic growth on a national basis decreases the probability that a donor will exit, while an inflationary economy increases the probability that a donor will stop giving. Thus, H1 was confirmed. Every 1% increase in GNI on a national basis decreases the probability that a donor to University 1 will stop giving by 40.61% (z = -7.84, p < .001), compared to an 88.54% decrease for donors to University 2 (z = -19.79, p < .001). For inflation, results indicate that every 1% increase in the CPI results in an increase in the probability that donors to University 1 will end their time as a donor by 34.22% (z = 11.72, p < .001), compared to more than seven times as likely for University 2 (z = 22.96, p < .001). In order to generate more generalizable results, a merged dataset inclusive of data from both universities was created. Given the significant log-rank test comparing the two university's survival curves, a test of the proportional hazards assumption was performed. Given the significant test, $\chi^2(1) = 48.93$, $p < .001$, the model analyzing the merged dataset was stratified by university, with results detailed in Table 2. An analysis of the merged dataset inclusive of data from both universities indicates that a 1% increase in economic growth decreases the probability that a donor will leave by 17.6% (z = -4.64, p < .001), while a 1% increase in CPI increases the probability a donor will leave by 19.8% (z = 10.92, p < .001).

Results related to the potential influence of the donor's proximity to campus on donor persistence are also consistent with expectations. For both universities, a donor residing in the same state as the university results in a statistically significant decrease in the probability of ending their time as a donor. For University 1, being in-state reduces the probability of exiting by 14.24% (z = -3.44, p = .001), compared to 39.26% for University 2 (z = -8.42, p < .001). For University No. 1, being located in the Mid-Atlantic area also decreases the probability of exiting (by 14.11%, z = -2.38, p = .017), with residents of the Southeast also being significantly less likely to leave (by 16.39%, z = -2.90, p = .004). For University No. 2, residents of the Southeast were also less likely to exit, by 12.41% (z = -2.16, p = .031). Results from the model stratified by university indicate that living in-state (z = -11.27, p < .001), in the Mid-Atlantic (z = -10.71, p < .001), and in the Southeast (z = -5.86, p < .001) all contribute to a decreased probability to end their time as a donor, ranging from a reduction of 20.9% to 25.4%, while results for residents of both the Northeast (z = -0.46, p = .643) and New England (z = 0.50, p = .614) were nonsignificant. Thus, H2 was also confirmed.

As indicated in Table 2, results across both universities provide ample support for the influence of athletic success on donor retention. Each win in the NCAA Division I Men's Basketball Tournament decreases the probability that donors across both universities will exit, by 9.13% for University 1 (z = -12.15, p < .001) and by 82.62% for University 2 (z = -21.16, p < .001). Interestingly, results for both universities suggest that improvements in football, as measured by wins, result in a significant increase in the probability a donor will exit. Each win in football for University 1 increases the probability a donor will exit by 17.03% (z = 12.73, p < .001), compared to 71.41% for University No. 2 (z = 17.19, p < .001). Results from the stratified model indicate a nonsignificant effect of football wins (z = 1.77, p = .077), while a win in the NCAA Tournament decreases the probability of a donor exiting by 12.9% (z = -19.91, p < .001). Thus, H3 is partially supported. Figure 3 depicts the hazard function curve for both universities

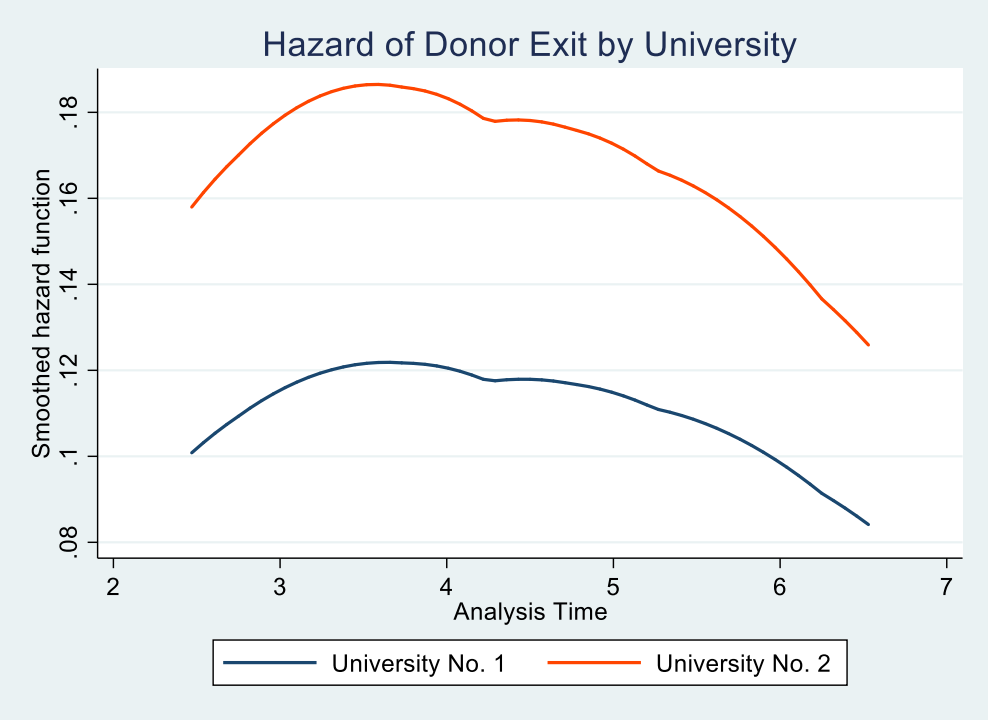
once covariates are included in the models. The curve not only reflects the fact that donors to University 2 are more likely to end their term as a donor than University 1, but the visualization of this semi-parametric model over time suggests a tipping point after year three in which donors are much less likely to exit.

Table 2
Results

Predictor Variables	University 1	University 2	Merged Model
Control Variable			
Lifetime Giving	0.99** (.01)	0.99** (1.0)	0.99** (.01)
Economic Conditions			
Inflation (CPI)	1.34** (.03)	7.12** (.61)	1.20** (.03)
Economic Growth (GNI)	0.59** (.04)	0.11** (.01)	0.82** (.03)
Regionality			
In-State	0.86** (.04)	0.61** (.04)	0.76** (.02)
Mid-Atlantic	0.86* (.05)	0.98 (.06)	0.75** (.02)
Southeast	0.84* (.05)	0.88* (.05)	0.79** (.03)
Northeast	0.91 (.07)	1.07 (.06)	0.98 (.04)
New England	0.74 (.16)	1.24 (.14)	1.05 (.10)
Athletic Performance			
NCAA Tournament Wins	0.91** (.01)	0.17** (.01)	0.87** (.01)
Football Wins	1.17** (.01)	1.71** (.05)	1.01 (.01)
Log-likelihood	-75260.348	-50674.989	-126642.48
Wald χ^2	1842.07**	1997.43**	2425.22**

Results from Cox model, with the Breslow method for handling ties; Hazard ratios are listed, with standard errors in parentheses.
Note: Merged model is stratified by university.
* $p < .01$; ** $p < .001$.

Figure 3.
Graph of the hazard function by university (including covariates)



Discussion and Implications

Athletic donor retention results across two large public universities in the same athletic conference in the Eastern U.S. generate several novel insights about donor behavior that can assist those tasked with retaining athletic department donors. Across longitudinal data from two athletic departments spanning more than 34,000 individuals, non-parametric results indicate that donors are most likely to leave after their initial year. After the subsequent two years, donors are far less likely to depart. An analysis of hazard functions reveals that across both universities, the probability of a donor exiting is less than 10% in each year after the donor's first two years. For donors from both universities, the probability decreases to under 7% after year four. These results are consistent with the findings of Wanless et al. (2019) from their analysis of donors from a Group of Five institution, suggesting that these results are likely generalizable across a wide spectrum of athletic departments. From a managerial standpoint, results across both universities suggest the first two years in a donor's relationship with the university are critical to achieving long-term retention. While many strategies focus on catering to and satisfying the whims of longer-term donors, this research suggests that care should be taken in the very beginning of the relationship. Given that a donor is far more likely to end his or her time as a donor in the first and second year of the relationship, a focus on retention in these first two critical years are necessary to ensure donors can one day become a benefactor with a multi-decade relationship to the university. This may be exemplified through new donor retention relationship management efforts and tailored benefits levels.

While the trends were similar, the actual proportion of donors lost after the two-year period, however, differed substantially among the institutions in this study, as well as the Group

of Five institutions in Wanless et al. (2019). For the Group of Five institution, 46% of donor relationships dissolved after the two-year period. For the Power Five institutions, 22% and 31% of donors defected at the same time period for University No. 1 and University No. 2, respectively. Power Five athletic programs may enjoy a stronger athletic brand and financial support to entice donors for retention, or this research result may reflect the diversity in athletic program donor cultivation efforts across the FBS. The differences among institutions also reflects the donor motivations literature (Gladden et al., 2005), a study in which athletic program contexts mattered in the reasons why donors decided to donate. Investigations into the donor-organization interaction surrounding this issue is warranted, as retention strategies may differ and produce different results between Power Five institutions. The increased development staff number and brand recognition at the Power Five level may eclipse retention rates at the Group of Five level. Additionally, primary donor motives that differ among institutions may be catalysts for greater rates of persistence.

While Wanless et al. (2019) did not find that changes in the economy affected the retention of donors in the context of the one Group of Five university studied, the current study found that both economic growth on a national level and the presence of an inflationary economy impacted donor decision-making, across two different Power Five schools. The results suggest that positive economic growth on a macro level impacts a donor's willingness to continue giving at the higher level of intercollegiate athletics competition. A potential reason for this discrepancy is that at this higher level, the price tag for athletic donor membership is likely also higher. Consequently, rising inflation, which typically increases the costs of goods and services across a wide range of industries, may make it difficult for a donor to justify consistent giving on a year-over-year basis at this higher level. While external factors such as economic conditions are outside the control of the athletics administrator, these results may help managers to anticipate and react to potential future decisions based on future changes in macro-economic indicators, particularly during recessionary economic periods. As an example, athletics fundraisers can focus attention on and cultivate philanthropic donors (i.e., those donors donating to help student-athletes/the athletic department rather than purely for a better game experience, as defined in donor motivation literature by Ko et al., 2014) in times of economic downturn.

Results related to the impact of a donor's proximity to the university in this study were consistent with that of Wanless et al. (2019) and indicate that the closer a donor lives to the institution, the longer they are likely to remain a donor. This result suggests that the proximate donor's increased likelihood to take advantage of transactional benefits affiliated with the game experience improves the possibility of long-term retention. Proximity may also contribute to one's level of affiliation and opportunities to socialize with fellow donors, each of which is more challenging the farther one lives from the institution. Athletic program development offices will need to consider what role distant donors will play in customer retention efforts. Special programs designated to interact and engage with donors outside the institution's home state and in neighboring metropolitan areas or states may be worthwhile investments to help retain donors that may not benefit from the in-game experience. Alternatively, understanding that donors in faraway regions of the country are less likely to be retained helps to allocate resources towards such donors.

Interestingly, while the donor literature has suggested that on-field success in football has traditionally had a greater impact on annual fundraising increases (Martinez et al., 2010), the results across this study as well as those of Wanless et al. (2019) suggest that ultimately success in the NCAA Tournament has a much greater influence on donor decision-making. Results

across the three institutions studied suggest just one win in the annual "March Madness" tournament decreases the probability an individual will end his or her time as a donor by 12.84%, 9.13%, and 82.62%, respectively. The stratified model analyzed in this study identified a "March Madness" effect equal to a 12.9% decrease in the probability a donor will exit for each postseason win. These findings support the generalizability of this "March Madness" effect, given that that these results are consistent across more than 40,000 individual donors from institutions in three different states. Although, again, the percentages by which donor persistence likelihood increases vary significantly across institutions. While success in football was nonsignificant in the study by Wanless et al. (2019), across these two universities results suggest that a winning football team has the potential to increase the probability for one to end his or her time as a donor. Results from the stratified model were nonsignificant, however. Results are suggestive that football success could potentially influence giving levels or the tangible benefits offered to individual donors, and the potential for a "crowding out" effect among donors, as demand for football-related benefits such as premium tickets and parking may increase as wins increase. Managers at institutions enjoying successful men's basketball and football seasons should be mindful of these issues and how they may impact the probability for a donor to continue their support into the future.

Limitations & Future Research

This study demonstrated success in contributing to an overall donor retention strategy. Results both complemented and contributed novelty to the studies in existence regarding investigations into athletic contributions. The results of the study, however, should be considered within the following limitations. The study was limited to the information each institution collected over the nine-year period. While a wealth indicator, economic variables, stakeholder status, and athletic success measures were considered, variables beyond these categories have the potential to affect donor dissolution. For example, in Wanless et al. (2019), athletic development department contacts with the donor was a significant covariate. As the era of analytics continues to advance data collection practices on behalf of organizations, future studies harnessing additional advanced quantitative methodologies with a wider variety of variables is warranted. A logical expectation is that as analytics becomes more of a priority across the intercollegiate athletics industry, more data will be collected on an annual basis, providing an opportunity to assess the impact of a larger number of potential influences moving forward.

References

Arik, M., Clark, L. A., & Raffo, D. M. (2016). Strategic responses of non-profit organizations to the economic crisis: Examining through the lenses of resource dependency and resourced based view theories. *Academy of Strategic Management Journal, 15*(1), 48-70.

Arnett, D. B., German, S. D., & Hunt, S. D. (2003). The identity salience model of relationship marketing success: The case of nonprofit marketing. *Journal of Marketing, 67,* 89-105.

Baade, R.A., & Sundberg, J. O. (1996). Fourth down and gold to go? Assessing the link between athletics and alumni giving, *Social Science Quarterly, 77*(4), 789-803.

Barro, R. J. (1991). Economic growth in a cross section of countries. *The Quarterly Journal of Economics, 106*(2), 407-443.

Bolger, N., Downey, G., Walker, E., & Steininger, P. (1989). The onset of suicidal ideation in childhood and adolescence. *Journal of Youth and Adolescence, 18*(2), 175-190.

Boskin, M. J., Dulberger, E. R., Gordon, R. J., Griliches, Z., & Jorgenson, D. W. (1998). Consumer prices, the consumer price index, and the cost of living. *Journal of Economic Perspectives, 12*(1), 3-26.

Box-Steffensmeier, J. M., & Jones, B. S. (1997). Time is of the essence: Event history models in political science. *American Journal of Political Science, 41*(4), 1414-1461.

Box-Steffensmeier, J. M., & Jones, B. S. (2004). *Event History Modeling: A Guide for Social Scientists*. Cambridge: University Press.

Cahan, E. M., Hernandez-Boussard, T., Thadaney-Israni, S., & Rubin, D. L. (2019). Putting the data before the algorithm in big data addressing personalized healthcare. *Digital Medicine, 2*(1), 1-6.

Cobbs, J., Tyler, B. D., Jensen, J. A., & Chan, K. (2017). Prioritizing sponsorship resources in Formula One Racing: A longitudinal analysis. *Journal of Sport Management, 31*(1), 96-110.

Cooney, N. L., Kadden, R. M., Litt, M. D., & Getter, H. (1991). Matching alcoholics to coping skills or interactional therapies: Two-year follow-up results. *Journal of Consulting and Clinical Psychology, 59*(4), 598-601.

Cox, D. R. (1972). Regression models and life tables. *Journal of the Royal Statistical Society, 34*(2), 187-220.

Fulks, D. L. (2017). Revenues and expenses, 2004–2016: NCAA Division I intercollegiate athletics programs report. Indianapolis, IN: NCAA. Retrieved from http://www.ncaa.org/sites/default/files/2017RES_D1RevExp_Entire_2017_Final_20180123.pdf

Furby, L., Weinrott, M. R., & Blackshaw, L. (1989). Sex offender recidivism: a review. *Psychological Bulletin, 105*(1), 3.

Guidestar (2019). *Directory of Charities and Nonprofit Organizations.* Retrieved from https://www.guidestar.org/NonprofitDirectory.aspx

Giving USA. (2019). "Giving USA 2019: Americans gave 427.71 billion to charity in 2018 amid complex year for charitable giving." Retrieved from https://lclsonline.org/wpcontent/uploads/2018/12/Giving-USA-2018-Annual-Report.pdf

Gladden, J. M., Mahony, D. F., & Apostolopoulou, A. (2005). Toward a better understanding of college athletic donors: What are the primary motives? *Sport Marketing Quarterly, 14*, 18-30.

Grimes, P. W., & Chressanthis, G. A. (1994). Alumni contributions to academics. *American Journal of Economics and Sociology, 53*(1), 27-40.

Hey, T., Tansley., S., & Tolle, K. (2009). Jim Grey on eScience: A transformed scientific method. In: Hey T, Tansley S and Tolle K (eds), *The Fourth Paradigm: Data-Intensive Scientific Discovery*. Redmond: Microsoft Research, pp. xvii–xxxi.

Hoang, H., & Rascher, D. (1999). The NBA, exit discrimination, and career earnings. *Industrial Relations: A Journal of Economy and Society, 38*(1), 69-91.

Humphreys, B. R., & Mondello, M. (2007). Intercollegiate athletic success and donations at NCAA Division I institutions. *Journal of Sport Management, 21*(2), 265-280.

Jensen, J. A., & Cornwell, T. B. (2017). Why do marketing relationships end? Findings from an integrated model of sport sponsorship decision-making. *Journal of Sport Man*agement, *31*(4), 401-418.

Jensen, J. A., & Caneja, N. (2018). An empirical approach to analyzing sponsorships in intercollegiate athletics: The case of NCAA bowl sponsorships. *Journal of Issues in Intercollegiate Athletics, 11*, 24-50.

Jensen, J. A., & Turner, B. A. (2018). Event history analysis of longitudinal data: A methodological application to sport sponsorship. In Skinner, J. & Engelberg, T. (Eds.), *Research Methodologies for Sports Scholarship* (pp. 198-215). London: Routledge.

Jensen, J. A., & Cornwell, T. B. (2018). Assessing the dissolution of horizontal marketing relationships: The case of corporate sponsorship of sport. *Journal of Business Research*. Retrieved from https://doi.org/10.1016/j.jbusres.2018.10.029.

Jensen, J. A., Head, D., & Mergy, C. (2020). Investigating sponsor decision-making: The role of schema theory, agency conflicts, and signaling theory in the persistence of naming rights agreements. *International Journal of Sports Marketing and Sponsorship, 21*(3), 467-486.

Kaplan, E. L., & Meier, P. (1958). Nonparametric estimation from incomplete observations, *Journal of the American Statistical Association, 53*(282), 457-481.

Kleinbaum, D. G., & Klein, M. (2012). *Introduction to Survival Analysis*. New York, NY: Springer.

Ko, Y. J., Rhee, Y. C., Walker, M., & Lee, J. (2014). What motivates donors to athletic programs: A new model of donor behavior, *Nonprofit and Voluntary Sector Quarterly 43*(3), 523-546.

Lichtenstein, D. R., Drumwright, M. E., & Braig, B. M. (2004). The effect of corporate social responsibility on customer donations to corporate-supported nonprofits. *Journal of Marketing, 68*(4), 16-32.

Mahony, D. F., Gladden, J. M., & Funk, D. C. (2003). Examining athletic donors at NCAA Division I institutions. *International Sports Journal 7*(1), 9-27.

Martinez, J. M., Stinson, J. L., Kang, M., & Jubenville, C. B. (2010). Intercollegiate athletics and institutional fundraising: A meta-analysis. *Sport Marketing Quarterly, 19*(1), 36-47.

Mazodier, M., & Rezaee, A. (2013). Are sponsorship announcements good news for the shareholders? Evidence from international stock exchanges, *Journal of the Academy of Marketing Science 41*(5), 586-600.

McEvoy, C. D. (2005). Predicting fund raising revenues in NCAA Division I-A intercollegiate athletics. *The Sport Journal*, *8*(1).

Meyers, L. S., Gamst, G., & Guarino, A. J. (2016). *Applied Multivariate Research: Design and Interpretation.* Thousand Oaks: Sage Publications.

Nevo, D., & Ritov, Y. A. (2013). Around the goal: Examining the effect of the first goal on the second goal in soccer using survival analysis methods. *Journal of Quantitative Analysis in Sports, 9*(2), 165-177.

Popp, N., Barrett, H., & Weight, E. (2016). Examining the relationship between age of fan identification and donor behavior at an NCAA Division I athletics department, *Journal of Issues in Intercollegiate Athletics 9,* 107-123.

Rhoads, T. A., & Gerking, S. (2000). Educational contributions, academic quality, and athletic success. *Contemporary Economic Policy 18*(2), 248-258.

Salaga, S., & Juravich, M. (2020). National Football League head coach race, performance, retention, and dismissal. *Sport Management Review*. Retrieved from https://doi.org/10.1016/j.smr.2019.12.005.

Shapiro, S. L., & Ridinger, L. L. (2011). An analysis of donor involvement, gender, and giving in college athletics. *Sport Marketing Quarterly, 20*(1)*,* 22-32.

Sigelman, L., & Bookheimer, S. (1983). Is it whether you win or lose? Monetary contributions to big-time college athletic programs. *Social Science Quarterly, 64*(2), 347-359.

Sigelman, L., & Carter, R. (1979). Win one for the giver? Alumni giving and big-time college sports. *Social Science Quarterly, 60*(2), 284-294.

Singer, J. D., & Willett, J. B. (2003). *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence.* Oxford: University Press.

Spector, P. E., & Brannick, M.T. (2011). Methodological urban legends: The misuse of statistical control variables, *Organizational Research Methods 14*(2), 287–305.

Staurowsky, E. J., Parkhouse, B., & Sachs, M. (1996). Developing an instrument to measure athletic donor behavior and motivation. *Journal of Sport Management, 10*(3), 262-277.

Staw, B.M., & Hoang, H. (1995). Sunk costs in the NBA: Why draft order affects playing time and survival in professional basketball. *Administrative Science Quarterly, 40*(3), 474-494.

Stinson, J. L., & Howard, D. R. (2004). Scoreboards vs. mortarboards: Major donor behavior and intercollegiate athletics. *Sport Marketing Quarterly, 13*(3), 129-140.

Stinson, J. L. & Howard, D. R. (2007). Athletic success and private giving to athletic and academic programs at NCAA institutions. *Journal of Sport Management, 21*(2), 235-264.

Stinson, J. L., & Howard, D. R. (2008). Winning does matter: Patterns in private giving to athletic and academic programs at NCAA Division I-AA and I-AAA institutions. *Sport Management Review, 11*(1), 1-20.

Tucker, I. B. (2004). A reexamination of the effect of big-time football and basketball success on graduation rates and alumni giving rates. *Economics of Education Review, 23*(6), 655-661.

Turner, S. E., Meserve, L. A., & Bowen, W. G. (2001). Winning and giving: Football results and alumni giving at selective private colleges and universities. *Social Science Quarterly, 82*(4), 812-82.

Warner, S., & Dixon, M. A. (2011). Understanding sense of community from the athlete's perspective. *Journal of Sport Management, 25*(3)*,* 257-271.

Wanless, L., Jensen, J. A., & Poliakoff, P. (2019). New applications of survival analysis modeling: Examining intercollegiate athletic donor relationship dissolution. *Journal of Sports Analytics, 5*(1), 45-56.

Wanless, L., & Stinson, J. (2020). A contemporary functional form for NCAA Division I FBS contributions: Internal and external considerations. *Journal of Sport Management, 34*(1), 22-37.

Woisetschläger, D. M., Backhaus, C., & Cornwell, T. B. (2017). Inferring corporate motives: How deal characteristics shape sponsorship perceptions. *Journal of Marketing, 81*(5), 121–141.

Zeithaml, V. A., Jaworski, B. J., Kohli, A. K., Tuli, W. U, & Zaltman, G. (2020). A theories-in use approach to building marketing theory. *Journal of Marketing, 84*(1), 32-51.