THE EFFECTS OF DIVISION I ICE HOCKEY SUCCESS ON VOLUNTARY GIVING TO COLLEGES AND UNIVERSITIES

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International Political Economy

Abstract

Academics, administrators, and development offices devote a great deal of time and energy attempting to increase giving because colleges and universities rely heavily on charitable contributions to operate. In this quest, a substantial amount of research has been conducted on the relationship between athletic success and giving; however, these studies have focused almost exclusively on the sports of football and basketball. Therefore, the purpose of this thesis is to evaluate the effects of Division I ice hockey success on voluntary contributions to colleges and universities. Looking at ten years of data, the study examines schools with NCAA Division I ice hockey teams. In order to test the relationship, the study uses ordinary least squares regressions and fixed effects models. Total giving, alumni giving, giving to athletics, and giving to academics are all considered. Success is measured by winning percentage, post season play, post season wins, and athletic tradition. Results indicate that giving is sensitive to athletic success, but the effects depend on the type of giving, measure of success, and type of school.

KEYWORDS: (Hockey, Giving, Athletics, Donations)

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CHAPTER I

INTRODUCTION

Over the years, a great deal of controversy has surrounded the presence of and focus on athletics in higher education. When the debate first emerged at the turn of the twentieth century, it centered on the violent play in college football; today, however, this central discussion has morphed and now focuses primarily on funding for college teams.[1] For instance, in 2004, at least ten public, Division I universities accrued budget deficits of five million dollars or more, while 20 schools spent more than 50 million dollars in the same year.[2] Generally, opponents argue that college sports divert resources that could be better allocated for educational purposes. In contrast, supporters of college athletics contend that athletic programs are worthwhile because they bring about positive externalities such as bigger and more qualified applicant pools and greater donations.

While this all has been taking place, schools have become increasingly reliant on charitable contributions to build endowments and fund essential programs. U.S. colleges and universities raise about $25 billion annually in voluntary support.[3] These

[1] Brendan M. Cunningham and Carlena Cochi-Ficano, "The Determinants of Donative Revenue Flows from Alumni of Higher Education. An Empirical Inquiry," *Journal of Human Resources* 37, no. 3 (2002): 540-569.

[2] "NCAA Financial Reporting Database," IndyStar.com, (November 14, 2011).

[3] Jessica Holmes, "Prestige, Charitable Deductions and Other Determinants of Alumni Giving: Evidence from a Highly Selective Liberal Arts College," *Economics of Education Review* 28, no. 1 (2009): 18.

charitable gifts are given to institutions under the speculation that they will be used to improve specific programs and the institutions in their entirety.[4]

Because institutions rely heavily on these gifts, an increased amount of focus is being devoted to developing strategies to promote giving. Thus, it is important to understand the determinants of college giving. Therefore, a subsection of literature on the effects of athletic success on giving has been growing. This paper aims to contribute to the literature on the determinants of college donations. Specifically, it will explore the link between ice hockey success and giving to colleges/universities. Although the effects of basketball and football success on giving have been considered by academics for decades, very little energy has been devoted to the sport of hockey. The purpose of this study is to uncover the impact of collegiate ice hockey success on giving. The paper will focus on schools with Division I men's teams and use regression analysis to study several measures of success and several types of giving. For the purpose of this paper, success will be measured by win percentage, NCAA post season appearances and championships during the study period, and NCAA championships prior to 2000.

Overview

Chapter II will include a detailed discussion of the previous studies conducted on giving to colleges and universities. This chapter will first review the literature that examines the determinants of giving to institutions in general. This will be followed by a summary of the literature on the relationship between athletic success and giving.

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[4] Brendan M Cunningham and Carlena K Cochi-Ficano, "The Determinants of Donative Revenue Flows from Alumni of Higher Education," The Journal of Human Resources, Volume 3, 2002: 540-569.

Finally, the chapter will conclude by reviewing the only other study on the affects of hockey success on giving. This review should provide an essential background on the topic and familiarize the reader with current arguments on the subject. Chapter III will discuss relevant economic models pertaining to giving to colleges and universities. It will include a more theoretical background, providing a maximization model and an exchange model of alumni donations. The theory chapter will also describe the dependent variables and explain why the independent variables were included.

Chapter IV will discuss the data that were collected to test the relationship between athletic success and giving. Chapter IV will clearly define the fixed effects and ordinary least squares models used in the paper. Chapter V will review the results from the empirical models created in Chapter IV. For each model, summary statistics, econometric problems, and results and implications will be in depth. The chapter will finish with a discussion of the study's limitations, areas for future research, and concluding remarks.

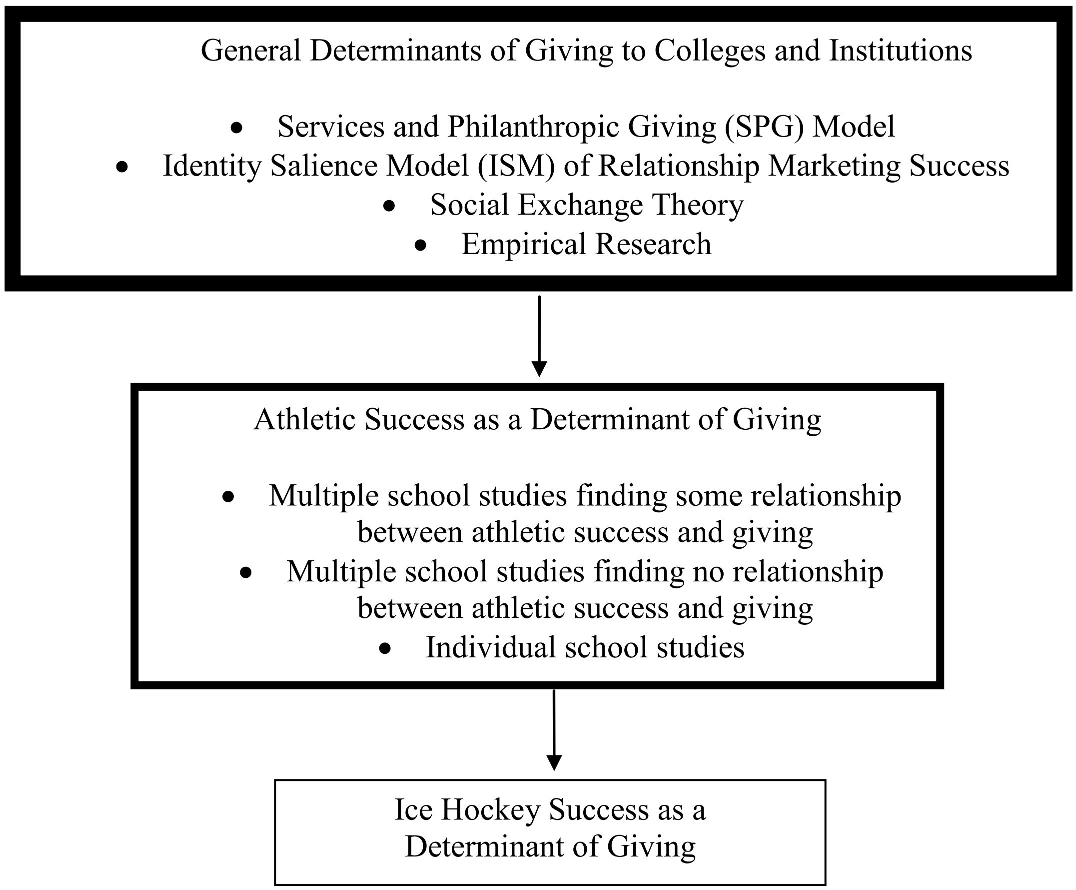
CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to review the existing scholarly literature about the determinants of voluntary giving to institutions of higher education. First, this chapter will provide a visual representation of the literature, Figure 2.1, which will act as a guide for the reader throughout the chapter. Looking specifically at the literature, the chapter will examine research on the general determinants of giving to colleges and universities. In order to do so, the section includes four subsections: Services and Philanthropic Giving (SPG) Model, Identity Salience Model (ISM), Social Exchange Theory, and Empirical Research. This should provide a broad scope and thorough background for the remainder of the chapter and study. Second, the chapter will delve into greater detail and specifically examine the literature on athletic success and giving. This section will first look at those studies which used data from multiple schools and found a relationship between athletic success and giving. From here, the section will examine the studies that also looked at multiple schools but found little or no relationship. Finally, the subsection will review key studies that examined individual schools. As a whole, these studies aim to show that donor behavior may be sensitive to various measures of athletic success. Lastly, the chapter will examine a single study that looks at voluntary giving in the context of college ice hockey success and provide conclusions.

FIGURE 2.1

Literature Review Guide



General Determinants of Giving to Colleges and Universities

A great deal of research and theory work has been conducted in the area of voluntary giving. The necessary framework for the remainder of this chapter and the study as a whole will be presented by briefly reviewing a few dominant theories and models as well as previous empirical research literature. The models and theories presented in the following subsections include the Services and Philanthropic Giving (SPG) Model, the Identity Salience Model (ISM), and Social Exchange Theory. The final subsection will review some of the empirical research on the determinants of giving to colleges and universities in general.

Services and Philanthropic Giving (SPG) Model

One of the various theories on giving specifically to colleges and universities is presented through the Services Philanthropic Giving (SPG) Model, which contends that giving to these institutions is a unique hybrid of voluntary donations and consumer purchasing. Brady, Noble, Utter, and Smith argue that these institutions are *charitable hybrids* which supplement traditional revenue streams with benevolent contributions. Considering this, they create a model that can explain giving from a consumer perspective in this unique situation. The researchers attempt to account for the business and service side of institutions, while also including factors such as perceived need, philanthropic predisposition, and organizational identification. The model breaks giving into these two segments, services and philanthropic effects. Service satisfaction is established solely through a judgment of quality in which higher quality, determined by the services received by the individual from the institution, results in greater satisfaction and ultimately donations. As mentioned above, the philanthropic side involves perceived need, donor willingness, and organizational identification.[1] FIGURE 2.2 depicts the relationship set forth in the SPG model showing the specific elements.

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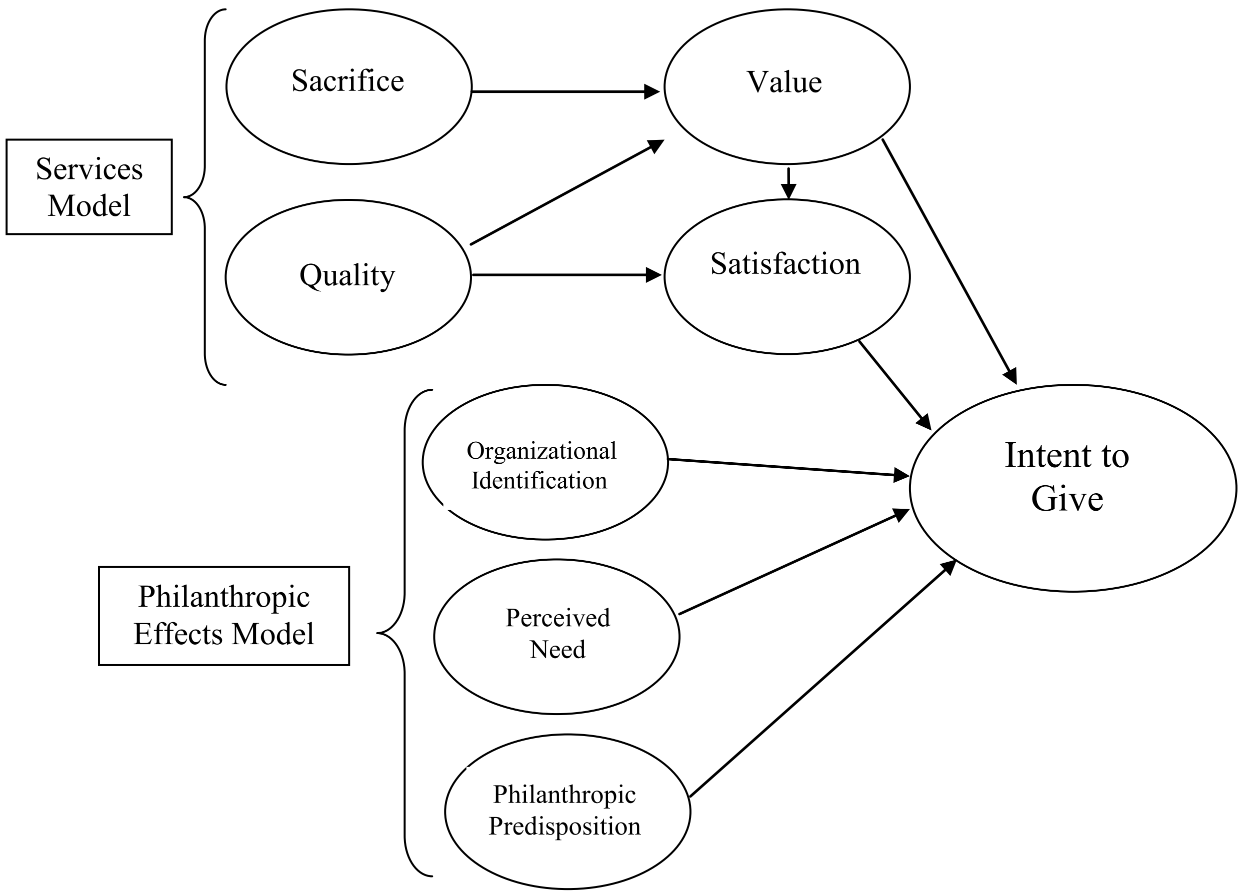
[1] Michael K. Brady et al., "How to Give and Receive: An Exploratory Study of Charitable Hybrids," *Psychology & Marketing* 19, no. 11 (2002): 919-944.

FIGURE 2.2

Services Philanthropic Giving Model



Source (adapted from): Michael K. Brady et al., "How to Give and Receive: An Exploratory Study of Charitable Hybrids," *Psychology & Marketing* 19, no. 11 (2002): 923.

Identity Salience Model (ISM) of Relationship Marketing Success

Next, Arnett, German, and Hunt propose a model developed from social identity theory, known as the Identity Salience Model (ISM) of Relationship Marketing Success. In the model, the authors argue that the relationship marketing often used to develop long-term relationships with key stakeholders in for-profit business is also valid for other organizations such as institutions of higher education. For these instances, they develop the ISM, which differs from previous relationship marketing theories because it involves individuals (opposed to business-to-business marketing) and is based on social exchange (instead of being economic in nature). Building on identity theory, the authors focus on the importance of identity salience in explaining support. Within the model, the more salient (or important) an identity is to a donor, the more likely they are to support this identity.[2] Laverie and Arnett exemplify this and find that women's basketball fans with more salient team related identities attend games more often.[3] Arnett et al. suggest four relationship inducing factors as part of their model: participation in university activities, reciprocity, prestige of institution, and satisfaction. Finally, they note that income and perceived financial need should impact donor behavior, even though they are not relationship inducing factors.[4] FIGURE 2.3 depicts the interactions set forth in the ISM between relationship inducing factors, non-relationship inducing factors, donations, and promoting support. Mael and Ashforth proposed a similar idea some years before, contending that, "Social identification leads to activities that are congruent with the identity and support for institutions that embody the identity and it reinforces the antecedents of identification."[5] In a later empirical study, the two find that organizational identification is a significant predictor of alumni

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[2] Dennis B. Arnett, Steve D. German, and Shelby D. Hunt, "The Identity Salience Model of Relationship Marketing Success: The Case of Nonprofit Marketing," *Journal of Marketing* 67, no. 2 (2003): 89-105.

[3] Debra A. Laverie and Dennis B. Arnett, "Factors Affecting Fan Attendance: The Influence of Identity Salience and Satisfaction," *Journal of Leisure Research* 32, no. 2 (2000): 225.

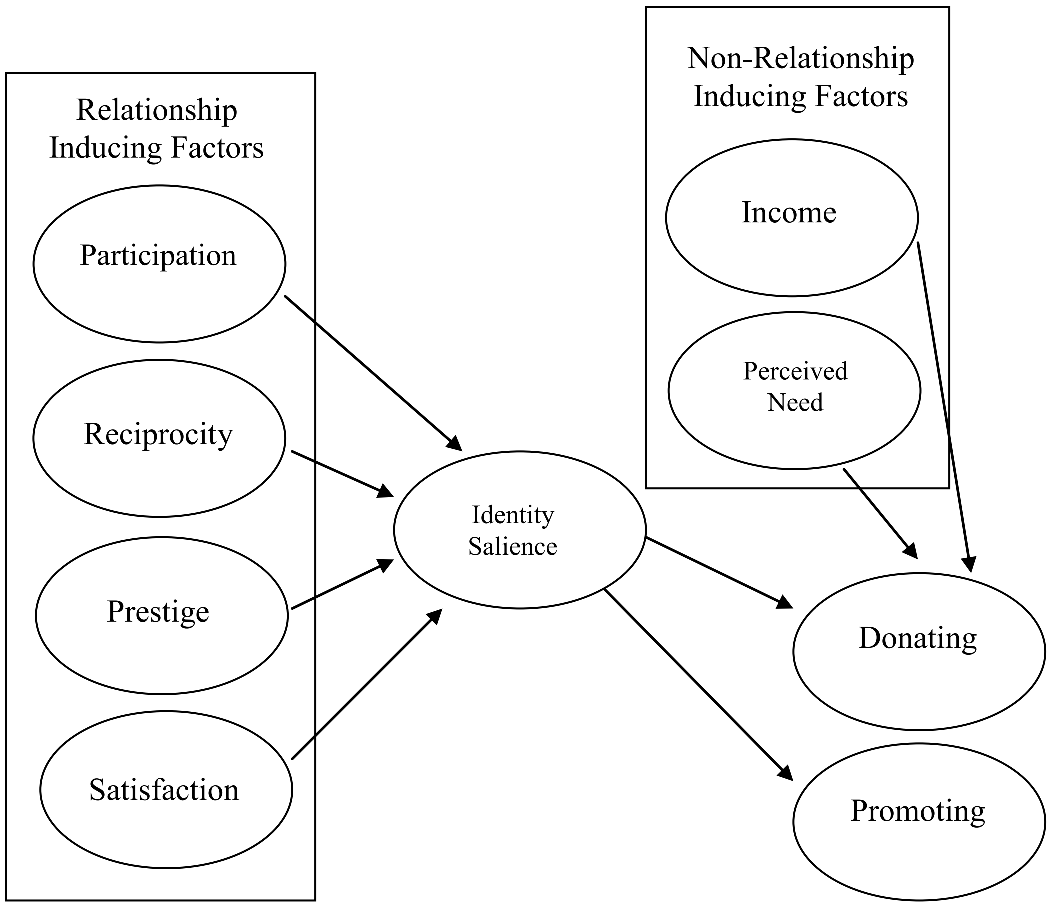
[4] Arnett, German, and Hunt, 89-105.

[5]Blake E. Ashforth and Fred Mael, "Social Identity Theory and the Organization," *The Academy of Management Review* 14, no. 1 (1989): 20.

donations. The scope of the study was limited by including only a single, all-male, religious institution.[6]

FIGURE 2.3

Identity Salience Model of Relationship Marketing Success



Source (adapted from): Arnett, German, and Hunt, "The Identity Salience Model of Relationship Marketing Success: The Case of Nonprofit Marketing," 91.

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[6] Fred Mael and Blake E. Ashforth, "Alumni and their alma mater: A partial test of the reformulated model of organizational identification," *Journal of Organizational Behavior* 13, no. 2 (1992): 103-123.

Social Exchange Theory

Finally, Social Exchange Theory is often used to explain donor behavior including donations to colleges and universities. The theory accounts for how people perceive given relationships, weighing what they put in against what they get out; in essence, it is a cost-benefit analysis. In summary, individuals weigh the amount of resources needed to secure a person's current cost-benefit position, while they simultaneously compare other relationships.[7] Individuals are expected to leave if the costs outweigh the benefits. One example of this theory in research is O'Neil and Schenke's study of giving by former student-athletes. Within the study, they propose that student athletes do not give because they feel that they have already paid tremendous costs. These difficulties come from playing the sport and include isolation, travelling, and juggling school and athletic demands.[8]

Empirical Research

There are also quite a few studies that deviate from the more theoretical models and conduct empirical research on donors at single or multiple universities. These generally build upon the trends earlier researchers have found between giving as a whole and socioeconomic characteristics. For instance, it is generally accepted throughout the literature that giving is associated with higher levels of income[9] and

[7]Richard M. Emerson, "Social Exchange Theory," *Annual Review of Sociology* 2 (1976): 335-362.

[8] Julie O'Neil and Marisa Schenke, "An examination of factors impacting athlete alumni donations to their alma mater: a case study of a U.S. university," *International Journal of Nonprofit & Voluntary Sector Marketing* 12, no. 1 (2007): 59-74.

[9] Russell N. James, "The Nature and Causes of the U-Shaped Charitable Giving Profile," *Nonprofit & Voluntary Sector Quarterly* 36, no. 2 (2007): 218-238.

wealth,[10] while several researchers have found a correlation between education and giving.[11] It is interesting to note that many studies within the educational realm have been fairly limited in scope looking at small segments of individual schools or drawing from a small sample size. For this section of the literature review, those studies which appear to be very narrow in focus have been eliminated.

James's research acts as a good starting point when reviewing some of these works. In his 2008 study, James looks at distinctive characteristics of those who donate to educational organizations in comparison to those who give to non-educational charities. His data from the Consumer Expenditure Survey (CES) includes the second quarter of 1995 through the first quarter of 2005. After narrowing the survey to include only complete fifth quarter interviews, the sample size became 56,663 unique households. Using two regression approaches, Tobit and Probit, the study discovers that education level is the most important factor distinguishing those who give to educational organizations. Moreover, James finds that educational donors are more likely to be married, have children, be of majority racial status, and have greater wealth and income than those who do not donate and those who donate to other charities. Finally, they are more likely to be more broadly generous, donating to a wide variety of organizations.[12]

Clotfelter looks at patterns of alumni giving at 14 private schools for individuals who enrolled in the fall of 1951, 1976, and 1989. With this, he builds off of previous

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[10]Eleanor Brown and Hamilton Lankford, "Gifts of Money and Gifts of Time: Estimating the Effects of Tax Prices and Available Time," *Journal of Public Economics* 47, no. 3 (1992): 321-341.

[11]Brown and Lankford, 321-341.

[12] Russell N. James I.I.I., "Distinctive Characteristics of Educational Donors," *International Journal of Educational Advancement* 8, no. 1 (2008): 3-12.

giving models, confirms earlier findings, and develops some conclusions which have not yet been discussed. Interestingly, Clotfelter discovers that while a large percentage of alumni donate annually, giving is concentrated with over 50 percent of donations coming from one percent of alumni. Clotfelter examines average lifetime giving and finds that the average lifetime giving for the 1976 cohort is only $7,700, while the 1951 cohort is $12,000. Not surprising, he also notes that the two biggest influences of giving were income and satisfaction, again coming back to the SPG model and social exchange theory. He uncovers that having a mentor in college, graduating from the institution they originally enrolled in, and participating in extracurricular activities makes alumni more likely to donate. Still, these were not nearly as important as the other aspects just mentioned.[13]

Harrison, Mitchell, and Peterson take a different approach than Clotfelter to examine what aspects of the actual universities and colleges result in higher giving. In the process they test the reciprocity element of the ISM through their exchange model of donations. Their hypothesis is that the need for recognition motivates donors and therefore the study aims to discover how much spending on alumni relations, fundraising, and other constituent relations by schools is beneficial in soliciting gifts. Moreover, their research ties to the ISM because the authors assume that alumni with fond memories will find more salience in recognition. The group looks at 18 different schools - public and private, research and teaching oriented, big and small. In their first test, they observe that an increase of one percent in spending on recognition of alumni rises giving by approximately .7 percent; they found this to be the largest influence on

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[13] Charles T. Clotfelter, "Who Are the Alumni Donors? Giving by Two Generations from Selective Colleges," *Nonprofit Management & Leadership* 12, no. 2 (2001): 119-138.

the amount of alumni giving. Furthermore, a 10 percent increase in the proportion of Greek life increases giving by .2 percent, while the same increase in part time students decreases giving by .37 percent; however, the type of institution (public/private, research/teaching) and the status of the athletic programs do not affect donations.[14]

Cunningham and Cochi-Ficano use a varied sampling of 415 schools. Unlike the other studies, the research uses a 13 year lag between determinants of giving and the average donation per alumnus. Also unlike other studies, the duo tests whether aspects of student and academic quality affect giving. In doing so, they find statistically significant results that for every 120 point increase in the lagged mean SAT score, the donation per alumnus increases by between $61 and $87 and between $17 and $33 for every .02 increase in lagged faculty-student ratio. This study confirms Harrison's results that indicate that institutions with more full time students generate higher income from alumni donations.[15]

The life cycle hypothesis that donations to educational institutions vary with age proves to be a very popular topic throughout the literature. For instance, Okunade, Wunnava, and Walsh use a covariance regression model to build off of the previous study of alumni at Middlebury College conducted by Olsen, Smith, and Wunnava. This study contends not only that alumni gifts are higher in reunion years by an average of 26.76 percent, but also that contributions converge with the age-income profile of the

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[14] Willian B. Harrison, Shannon K. Mitchell, and Steven P. Peterson, "Alumni Donations and Colleges' Development Expenditures: Does Spending Matter?" *American Journal of Economics & Sociology* 54, no. 4 (1995): 397-412.

[15] Cunningham and Cochi-Ficano, "The Determinants of Donative Revenue Flows from Alumni of Higher Education. An Empirical Inquiry," 540-569.

individual.[16] In the second study, the researchers randomly sample 303 undergraduate, regular, alumni donors who graduated between 1927 and 1976 from a large public university. They discover that donations increase with age until the age of 52, proving that the age-giving profile is not completely dependent on income and marginal tax rate. This notably differs from the original findings at Middlebury. In defiance of Harrison et al., members of non-Greek social organizations gave significantly more than others.[17]

Other authors have created similar models to those mentioned above and have tested them in individual school settings. For instance, Sun, Hoffman, and Grady look at a single mid-size school and test whether student experience, alumni experience, alumni motivation (internal desire of alumni to give), and/or demographic variables affect giving. Although their sample size is small with just under two thousand respondents, the survey and data analysis confirms previous findings. This includes the SPG model argument that satisfaction both as an undergraduate and as an alumni are important determinants of giving. Furthermore, only some of the demographic data is a significant determinant of giving. The variable *graduation year*, a proxy for alumni age, has the greatest effect again confirming previous research. Gender, ethnicity, type of degree, in or out of state, and membership status also serve as distinguishing characteristics, although they are not as important.[18]

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[16] Katherine Olsen, Amy L. Smith, and Phanindra V. Wunnava, "An Empirical Study of the Life-Cycle Hypothesis with Respect to Alumni Donations," *American Economist* 33, no. 2 (1989).

[17] Albert Ade Okunade, Phanindra V. Wunnava, and Raymond Walsh Jr., "Charitable Giving of Alumni: Micro-data Evidence From a Large Public University," *American Journal of Economics & Sociology* 53, no. 1 (1994): 73-84.

[18] Xiaogeng Sun, Sharon C. Hoffman, and Marilyn L. Grady, "A Multivariate Causal Model of Alumni Giving: Implications for Alumni Fundraisers," *International Journal of Educational Advancement* 7, no. 4 (2007): 307-332.

The previous section has reviewed the literature on giving to institutions of higher education has been presented. The following section will narrow in focus and consider studies that test the relationship between giving and athletic success.

Athletic Success as a Determinant of Giving

Over the last century, scholars, researchers, faculty, and coaches have continually debated the impact that intercollegiate athletics has on colleges and universities. The section will first examine those studies which include multiple schools and found some relationship between measures of athletic success and giving. This will be followed by a review of the literature that found no relationship between any measures of athletic success and giving across several schools. Finally, the chapter will conclude with a review of the notable studies that looked at single institutions.

Multiple School Studies- Some Relationship

Although findings about the relationship between giving and athletic success are mixed, several academics have reached conclusions that support the connection. In 1981, Brooker and Klastorin used a combination of longitudinal and cross-sectional analysis to determine that alumni giving is more related to athletic success at private institutions, religious schools, and mid-sized public institutions. This conclusion was uncovered by grouping universities and colleges into homogenous groups varying from religious affiliation to size. The researchers took a sample of 58 institutions with ten years (1962 to 1971) of athletic data and nine years of donation information (1963 to 1971). The institutions were chosen by the researchers to include most major athletic conferences and most major independent schools. Independent variables include football and basketball win percentage lagged by one and two years, participation in a major or minor bowl, ranking in the final United Press International (UPI) Top 20 national poll, and lagged Top 20 information. Dependent variables were average gift size and the per capita gift to the annual fund.[19]

Much later Baade and Sunderberg confirmed some of these findings by studying real gift per alumnus among private and public universities and liberal arts colleges. Specifically, they use a covariance model procedure to test for possible slope and intercept variations over time and include dummy time variables. Unlike previous studies, the duo does not explicitly separate schools by National Collegiate Athletic Association (NCAA) division and they include several institutional characteristics variables (percent women, percent minority, percent on financial aid, acceptance rate, tuition, expenditures per student, age, and enrollment). In all, the study is quite comprehensive, covering 17 years and gathering information for over 300 institutions. They find that football bowl appearances and NCAA basketball tournament appearances are significant influences of giving at the larger universities, while winning proves to be only slightly influential. At the smaller liberal arts schools, winning has the most effect and bowl appearances make a lesser difference.[20]

Rhoads and Gerking also expand early research using ordinary least squares (OLS) and two-way fixed effects regression. Like the two previous pieces, Rhoads & Gerking use data from football and basketball programs (Division I), looking specifically at 87 programs between 1987 and 1996. Rhoads and Gerking in essence

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[19] George Brooker and T. D. Klastorin, "To the Victors Belong the Spoils? College Athletics and Alumni Giving," *Social Science Quarterly (University of Texas Press)* 62, no. 4 (1981): 744-750.

[20] Robert A. Baade and Jeffrey O. Sundberg, "Fourth Down and Gold to Go? Assessing the Link between Athletics and Alumni Giving," *Social Science Quarterly* 77, no. 4 (1996): 789-803.

complete two different studies, one examining year-to-year changes in athletic success and contributions and one examining university-specific effects, such as athletic tradition, student quality, and academic program quality. Unlike Baade and Sunderberg and Brooker and Klastorin, they do not differentiate between public and private institutions, but they do differentiate between alumni giving per enrolled student and total giving per enrolled student. Notably, their OLS model measures athletic tradition as a function of total football bowl and NCAA basketball tournament appearances. In doing so they are able to develop a few very concrete results: alumni contributions increase by 7.3 percent with a football bowl game win, while there is a 13.6 percent decrease in alumni giving with probation. Total contributions do not appear to be influenced in the initial study; however, athletic-tradition is significant. Each additional bowl game prior to 1985 increases mean total support per student by 1.7 percent and basketball tournament appearance increasing it by .7 percent. Alumni donations appear to be more swayed by athletic tradition than giving as a whole.[21]

This model and the use of the Voluntary Support of Education survey have reappeared throughout more recent research. In Stinson and Howard's two research projects they look at Division I-A, Division I-AA, and Division I-AAA programs using linear mixed models and considering post season play, end of season ranking, and the athletic-tradition model. The Division I-A study also looks at winning percentage and only includes football,[22] while the other study includes both basketball and football.[23]

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[21] Thomas A. Rhoads and Shelby Gerking, "Educational Contributions, Academic Quality, and Athletic Success," *Contemporary Economic Policy* 18, no. 2 (2000): 248-258.

[22] Jeffrey L. Stinson and Dennis R. Howard, "Athletic Success and Private Giving to Athletic and Academic Programs at NCAA Institutions," *Journal of Sport Management* 21, no. 2 (2007): 235-264.

They include a wide variety of annual gift variables including, total gift, total academic gift, total athletic gift, average academic and athletic gifts, and athletic allocation percentage, as well as incorporating various baseline variables (many of which were used in Brooker and Klastorin's model). The *US New's and World Report* rankings for academic reputation are also considered within the model. The models for Division I-AA and Division I-AAA find that successful basketball teams lead to an increase in the size of the average total gift, while bowl appearances lead to an increase in number of gifts with I-AA schools. I-AAA institutions see an increase in the number of donors with strong basketball performance and tradition. Interestingly, both academic and athletic gifts are positively influenced by the measures of success within Division I-AA and I-AAA,[24] while within the Division I-A model they discover that increased success (win percentage and tradition) leads to an increased percentage of funds donated towards the athletic programs, but not academic sectors.[25] This study somewhat contradicts Sperber's findings which argue that non-alumni are most interested in supporting athletic programs, while alumni focus on academics.[26] Moreover, it works completely against his other arguments that athletic gifts due to success crowd out academic gifts.[27]

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[23] Jeffrey L. Stinson and Dennis R. Howard, "Winning Does Matter: Patterns in Private Giving to Athletic and Academic Programs at NCAA Division I-AA and I-AAA Institutions," *Sport Management Review (Sport Management Association of Australia & New Zealand)* 11, no. 1 (2008): 1-20.

[24] Ibid.

[25] Stinson and Howard, "Athletic Success and Private Giving to Athletic and Academic Programs at NCAA Institutions," 235-264.

[26] M. Sperber, *College Sports Inc.* (New York: Henry Holt, 1990).

[27] M. Sperber, *Beer and Circus: The impact of big-time college sports on undergraduate education,* (New York: Henry Holt, 2000).

In sum, all of these studies tested the connection between athletic success and giving in different ways and the results are varied. Still, they all found some relationship between athletic success and giving. Other academics disagree, however, finding that athletic success does not impact giving. The following subsection will present some of these studies.

Multiple School Studies- No Relationship

Sigelman and Carter started looking at this relationship early and were one of the first to contend that athletic success does not impact giving. They conducted a cross-sectional study of 135 schools that maintained Division I intercollegiate football programs as of the 1975-1976 academic year. These schools were broken down depending on the dimension of alumni giving which was being examined. Specifically, the researchers examine alumni giving in volume, average dollar value of gifts, and average number of alumni who gave. Using correlation and regression analysis, the authors study the relationship between three measures of alumni giving to a school and athletic success measured by football and basketball records and football bowl appearances. They include school-by-school athletic records and giving information from 1961 to 1977. Their results show that none of the measures of success taken together or alone were closely related to giving.[28]

Other studies support Sigelman and Carter by finding very little relationship between any kind of giving and all measures of athletic success. For instance analyzing College and Beyond statistics, Turner, et al. focuses on 15 academically selective,

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[28] Lee Sigelman and Robert Carter, "Win One for the Giver? Alumni Giving and Big-Time College Sports," *Social Science Quarterly (University of Texas Press)* 60, no. 2 (1979): 284-294.

private schools. Very interestingly, the researchers use individual level data for 15,531 students who entered school in the fall of 1976 and look at these individuals' donations both in general and to athletics for a ten year period. There is no lag time and only the record of the schools' football teams are used in the final regression and fixed effects model. The authors believe the individual level data is helpful because it allows them to get a more similar sample of alumni, avoid corporate gifts, and focus on the difference between athletic and general gifting. All giving rates are unaffected by athletic success at "high profile" Division I schools and Ivy Leagues and general giving is only slightly affected at Division III institutions.[29] Notably, Stinson and Howard suggest that the relationship is negligible because the College and Beyond data set is severely narrow and includes many schools where sports assume a clearly subordinate role to academics.[30] Still, Shulman and Bowen look at a similar sample of 18 varied schools using data for three classes of donors taken from the College and Beyond data set. Their findings confirm Turner's results, showing that athletic and general gifts are not significantly related to win-loss records. The authors go on to assert that athletic expenditures cannot be generally justified as an investment that increases giving.[31]

Next, commissioned by the Knight Foundation on Intercollegiate Athletics, Frank conducted a review of the previous literature on the links between giving and athletic success and prospective student applications and athletic success. After

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[29] Sarah E. Turner, Lauren A. Meserve, and William G. Bowen, "Winning and Giving: Football Results and Alumni Giving at Selective Private Colleges and Universities," *Social Science Quarterly (Blackwell Publishing Limited)* 82, no. 4 (2001): 812-826.

[30] Stinson and Howard, "Winning Does Matter: Patterns in Private Giving to Athletic and Academic Programs at NCAA Division I-AA and I-AAA Institutions," 1-20.

[31] James Lawrence Shulman and William G. Bowen, *The game of life: college sports and educational values,* (Princeton, N.J.: Princeton University Press, 2001), 447.

reviewing several of the pieces described here, as well as others, Frank comes to the conclusion that the effects of athletic success on donations are small if any.[32]

Lastly, Litan, Orszag, and Orszag use data from Equity in Athletics disclosure forms and the NCAA database to examine seven years of data. Notably, they modify previous research in a few ways; they not only control for institutional heterogeneity and provide the most comprehensive study to date, but they test to see if operating expenditures are associated with alumni giving and/or winning as well. They are unable to prove through statistical significance that winning affects alumni giving, nor are they able to prove that changes in operating expenditures on football lead to changes in winning percentages. Furthermore, at these Division I-A schools, the researchers could not prove that increasing expenditures on basketball or football lead to an increase in alumni giving either towards the athletic programs or the general academic fund.[33]

Single Institution Studies

Another trend in the literature is to look at a single university or college in an effort to better study certain characteristics that explain alumni giving in athletic terms. Generally these studies have mixed results depending on the university. Again, a complete review of these pieces is not necessary for this study because they provide limited insight and narrow scope; however, a few studies add significant changes to previous research and are worth reviewing. For instance, Tinsley and McCormick look at alumni giving to Clemson University by county over a five year period. They

[32] Robert H. Frank, "Challenging the Myth: A Review of the Links Among College Athletic Success, Student Quality, and Donations," *Knight Foundation Commission on Intercollegiate Athletics* (2004): 1-17

[33] R. E. Litan, J. M. Orszag, and P. R. Orszag, *The empirical effects of collegiate athletics an iterim report,* (Washington, D.C.; United States: Sebago Associates, 2003)

conclude that a ten percent increase in athletic donations corresponds to a five percent increase to the academic fund and argue again that athletic giving does not crowd out academic donations.[34]

Grimes & Chressanthis use Mississippi State University to examine not only winning percentages and other measures of success, but also to determine if television appearances influence alumni contributions. The pair found, using OLS, that over the 30 year period, basketball, baseball, and football winning percentages and television appearances positively affect giving, while football probations have a negative influence.[35]

Stinson and Howard develop solid conclusions by looking specifically at the University of Oregon. In doing so, they are able to expand the traditional question regarding the relationship between alumni giving and athletics. This allows them to continue to ask: Who gives to educational institutions in support of academic and athletic programs? Does improved athletic performance influence both types of giving? Does increased giving to athletics have a negative impact on charitable giving to educational programs at the same university?

The specific case study is interesting because the University of Oregon experienced huge athletic success and major athletic fundraising during the time period of the study (1994-2002). In the end, they find that winning significantly impacts donor behavior in regards to gifts of $1,000 or more and that increased giving to athletics is

[34] Robert E. McCormick and Maurice Tinsley, "Athletics and Academics: A Model of University Contributions," in *Sportometrics* Texas A&M University Economics Series, no. 11; College Station: Texas A&M University Press, 1990), 193-204.

[35] Paul W. Grimes and George A. Chressanthis, "Alumni contributions to academics: the role of intercollegiate sports and NCAA sanctions," *American Journal of Economics and Sociology* 53 (1994): 27-40.

linked to a decline in academic fundraising. They uncover significant differences in gift allocation patterns between alumni and non-alumni, with alumni giving significantly higher amounts and a greater proportion to academics than non-alumni. Again, however, their findings differ from Sperber who asserts that only two percent of alumni participate in athletic fundraising;[36] Stinson and Howard argue this number is closer to 70 percent.[37]

The most recent single school study came from Meer and Rosen in 2008 who evaluate all athletic teams and alumni donations from 1983 to 2006 at an unidentified, selective, research university. The model includes other information about each alumnus and has a set of indicators which control for the economic environment. This research varies because it examines whether an alumnus played on a varsity team or played on a championship varsity team. From here they determine how that affects giving behavior, as well as whether athlete alumni donations are more influenced by athletic success. Their results are mixed and few patterns emerge with basketball and football records appearing insignificant. Nevertheless, they did discover that successful male athletes are not only more likely to donate if their team won a championship in the athlete's senior year, but also that their donations are more affected by athletic success. If this male won a championship in his senior year, his donations are estimated to

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[36] Sperber, "Beer and circus: The impact of big-time college sports on undergraduate education," (New York: Henry Holt, 2000).

[37] Jeffrey L. Stinson and Dennis R. Howard, "Scoreboards vs. Mortarboards: Major Donor Behavior and Intercollegiate Athletics," *Sport Marketing Quarterly* 13, no. 3 (2004): 129-140.

increase by about seven percent to the general fund and by about eight percent to his program.[38]

Clearly, there has been a significant amount of research conducted in an effort to understand if athletics success impacts donor behavior. This section has reviewed several of these studies and introduced the topic in depth. The following section goes into even greater detail and presents the single study that tests hockey success specifically.

Ice Hockey as a Determinant of Giving

Surprisingly, a great number of studies focus on basketball and football and some include baseball, but very few studies consider the relationship between giving and hockey teams. Holmes touches on the subject, but through the limited scope of only one school and the broad focus of alumni giving as a whole. Examining Middlebury College's alumni giving between 1990 and 2004, she is able to sample 22,641 active alumni. Using this individual level data, the study looks at a wide variety of information about each alumnus as well as athletic and academic prestige each given year. Athletic prestige is measured by the win-loss record of the highest profile sport, ice hockey, while academic prestige is determined by *U.S. News and World Report* rankings. In general, the research aims to look specifically at three factors, charitable tax deductions, athletic prestige, and academic prestige. In the athletic and academic prestige study, donors are tested according to gender, years since graduations, and personal athletic participation. Holmes discovers, using Tobit estimates, that for every

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[38] Jonathan Meer and Harvey S. Rosen, "The Impact of Athletic Performance on Alumni Giving: An Analysis of Microdata," *Economics of Education Review* 28, no. 3 (2009): 287-294.

10 percent point increase in the men's ice hockey winning record, alumni are .45 percent more likely to donate.[39]

Conclusion

By examining an assortment literature pertaining to giving in general and athletics and giving, this review has provided a broad background on the factors that contribute to increased voluntary donations to colleges and universities. It appears that the reasons for giving are mixed, but are generally influenced by a feeling of satisfaction, identity salience, or by receiving an actual gift. Within the realm of the university most researchers agree that perceived need, prestige, and the number of full-time students affect donation levels. Next, while many individual characteristics are still debated, higher levels of wealth, income, and education are generally believed to increase giving on the individual level. Lastly, there appears to be a correlation between age and giving; however, scholars disagree about the exact trend.

Within the literature specific to athletics, a variety of aspects have been tested such as winning percentage, sanctions, tournament and bowl appearances, television appearances, and athletic tradition. Again, there are varied conclusions and contrasting results especially when it comes to the affects of winning percentage. Still, measures of athletic tradition and post season play seem to be somewhat consistent factors affecting charitable contributions to colleges and universities. Throughout the aforementioned literature, giving has been studied intensely, as has the connection between giving and athletics. This being said, the research on athletics focuses almost completely on

[39] Jessica Holmes, "Prestige, Charitable Deductions and Other Determinants of Alumni Giving: Evidence from a Highly Selective Liberal Arts College," *Economics of Education Review* 28, no. 1 (2009): 18-28.

football and basketball. Therefore, the remainder of this study will use existing theory and current research to test the relationship between NCAA Division I men's ice hockey success and voluntary contributions to institutions of higher education.

CHAPTER III

THEORY

The following chapter will review theories regarding giving and athletic success. There are various economic theories that can be applied to the current study. This chapter will begin by providing a maximization model that will examine an individual's decision to give to a university or college along with any other organization. The model will measure giving as a function of giving to institutions of higher education and all other donations. Next, the chapter will include a look at the institution and an exchange model of alumni donations. Within the model, the creators assert that alumni are motivated by recognition and that schools exercise monopsony power over donors. The chapter will examine the types of giving included in the following chapters and the five determinants of athletic success. These measures will be discussed individually. After reviewing the measures of athletic success, theory connecting athletic success and giving will be presented. Finally, this review of theory will examine the inclusion of a measure of income and enrollment information within the model.

Utility Maximization Model

Drawing from Leeds and Von Allmen, Equation 3.1 represents a basic utility function. In the equation, individuals attempt to maximize their utility or U through consumption of either *X* or *Y*.[1] Equation 3.2 accounts for the individual's decision to give to a university or college instead of some other charitable organization. Equation 3.2 states the Lagrangian.

$$U(X,Y) \tag{3.1}$$

$$G(E,O) \tag{3.2}$$

Within the modified equation, giving *G* replaces utility from Equation 3.1. The maximization model assumes that the individual achieves happiness from giving *G*. They can achieve this by giving to an institution of higher education *E* or they can give to another charity *O*.

Within this specific utility maximization model, the budgetary constraint is the cost of donating to an institution of higher education and the cost of donating to a different organization. Equation 3.3 shows the Lagrangian set up for giving options:

$$L = G(e,o) + \lambda[B - ePe - oPo] \tag{3.3}$$

In the equation, total giving *G* is a utility function of giving to universities/colleges *e* and giving to all other charities *o*. *B* denotes the total budget for giving and *Pe* represents the price of donating to institutions of higher education and *Po* denotes the price of donating money someplace else.

The utility function is assumed to take the Cobb-Douglas form used in Equation 3.4:

$$G = e^{\alpha}o^{\beta} \tag{3.4}$$

$$L = e^{\alpha}o^{\beta} + \lambda[B - ePe - oPo] \tag{3.5}$$

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[1]Michael Leeds and Peter Von Allmen, *The Economics of Sports,* 3ed. (Boston: Pearson/Addison Wesley, 2008), 12.

To find the necessary first-order conditions, the partial derivative of the Lagrangian model must be taken with respect to giving to education, giving to other, and the Lagrangian multiplier:

$$\frac{\partial L}{\partial e} = \alpha e^{\alpha-1} o - \lambda Pe = 0 \quad (3.6)$$

$$\frac{\partial L}{\partial o} = \beta e^{\alpha} o^{\beta-1} - \lambda Pe = 0 \quad (3.7)$$

$$\frac{\partial L}{\partial \lambda} = B - ePe - oPo = 0 \quad (3.8)$$

Dividing Equation 3.6 by Equation 3.7 achieves:

$$\frac{\lambda Pe}{\lambda Po} = \frac{\alpha(e^{\alpha}o^{\beta})}{e} \div \frac{\beta(e^{\alpha}o^{\beta})}{o} \quad (3.9)$$

The final equations (3.10 and 3.11) denote the optimal amount of money an individual should give to institutions of higher education and to all other charities. The optimal amount of giving to other organizations is first determined and then substitution is used to obtain the amount for institutions of higher education. Notably, giving to education *e* is independent of price of giving to others *Po.* In other words, for a donor who is giving to education, the price of giving to other charities does not influence the amount given to education.

$$o = \frac{\beta}{Po} \bullet \frac{B}{\alpha + \beta} \quad (3.10)$$

$$e = \frac{B}{Pe} \bullet \frac{\alpha}{\alpha + \beta} \quad (3.11)$$

These two equations model the maximization of giving for individual donors who choose between giving to a college or university and giving to any other organization or charity. In short, utility maximization problems assume that individuals have limited resources and use these to achieve maximum utility. In a perfect world, each individual would pick the optimal mix (determined by Equations 3.10 and 3.11) between types of giving to maximize their utility while working under their specific budget constraint (money allotted to giving).

Taking this into consideration a different model will be presented, an exchange model of alumni donations. In contrast to the previous constrained maximization problem which focuses on individual giving, the following theory will focus on the institution as a monopsony that decides the optimal level of donations.

Exchange Model of Alumni Donations

Harrison, Mitchell, and Peterson develop a theoretical model around the assertion that colleges and universities exercise monopsony power over their alumni.[2] Within a monopsony, the market is limited to only one buyer.[3] As mentioned in Chapter II, the authors believe that alumni donors want and expect recognition for their contributions. Furthermore, although they do not expect recognition that equals the amount of the donation, they do expect that recognition increases with higher amounts of giving.[4]

Within the model, alumni donors are price-takers and face an upward-sloping supply of donations curve. Because theoretically any given school should be willing to

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[2] Willian B. Harrison, Shannon K. Mitchell, and Steven P. Peterson, "Alumni Donations and Colleges' Development Expenditures: Does Spending Matter?" *American Journal of Economics & Sociology* 54, no. 4 (1995): 397-412.

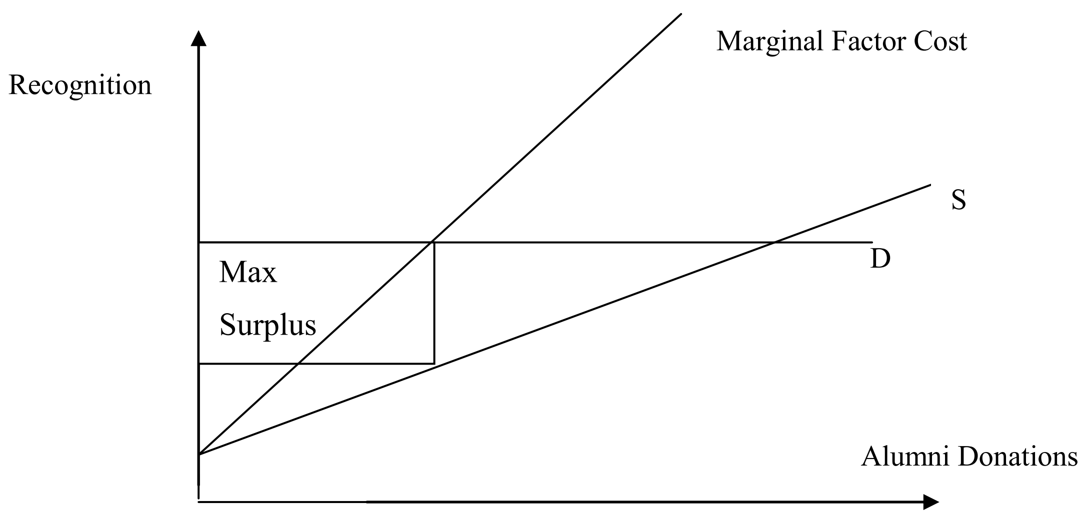
[3] "Monopsony." In *Oxford English Dictionary*. Oxford: Oxford University Press, 2012.

[4] Harrison, Mitchell, and Peterson, 400.

give the same amount of recognition as money they receive (i.e. give one dollar in recognition for one dollar in donations), the demand for donations is completely elastic at one. The theory notes that, "The market supply for donations is derived by the horizontal summation of all of the individual supply curves of said college's alumni."[5] Figure 3.1 shows the monopsony market for alumni donations to a generic college or university. Because of this one for one trade off, the authors set marginal revenue equal to marginal factor cost.

FIGURE 3.1

Market for Alumni Donations



Source (adapted from): Willian B. Harrison, Shannon K. Mitchell, and Steven P. Peterson, "Alumni Donations and Colleges' Development Expenditures: Does Spending Matter?" *American Journal of Economics & Sociology* 54, no. 4 (1995): 401.

The idea that schools exercise monopsony power over alumni within the market is based on two assumptions which are derived through observation:

1. Schools pay much less than a dollar to gain a dollar in donations.
2. An institution's budget is not wholly devoted to fundraising

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[5] Ibid.

Institutions forego some donations in order to maximize the difference between the donations received and the cost of fundraising; therefore, the price of donations never reaches the competitive market price.[6] The maximum surplus is shown in Figure 3.1. The authors also summarize the model within an equation where m'>0, m">0. *Alcost* represents the amount a school spends on its alumni (development costs in this case) and *Alumgiv* represents the amount of alumni giving. The institution has monopsony power over its alumni and therefore chooses the level of giving it would like to receive. The following equation represents this situation:

$$Alcost = m(Alumgiv) \qquad (3.12)$$

From here schools then use Equation 3.13 to maximize giving:

$$Max\ \pi = Alumgiv - Alumcost(Algiv) \qquad (3.13)$$

Next, the first order condition is:

$$1 - (d\ Alcost/\ d\ Alumgiv) = 0 \qquad (3.14)$$

The authors then multiply the first order condition determined above by (*Algiv/Alcost*) and take the inverse to determine the elasticity of alumni giving in relationship to alumni costs.

$$\eta = (d \ln Alumgiv/\ d \ln Alcost) = Alcost/Alumgiv \qquad (3.15)$$

Within this final equation, η represents the elasticity just discussed. As shown in the literature review, this is not the only element, which is tested within their model of alumni giving. Their complete model is stated in Equation 3.16. Using their theory

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[6] Ibid.

on development costs and demographic information about the university, Harrison et al. are able to understand the way institutions attract gifts.[7]

$$\ln(Alumgiv) = \beta_0 + \beta_1 \ln(Alcost) + \beta_2 \ln(Endow) + \beta_3 \ln(Plangiv) + \beta_4\, Greek + \beta_5\, Part + \beta_6\, Athlet + \beta_7\, Rsdoc + \beta_8\, Pub + \mu \quad (3.16)$$

Alcost denotes alumni development costs, as mentioned above. *Endow* measures the school's endowment, *Plangiv* shows planned giving or bequests, and *Athlet* is the status of the institution's athletic programs. *Greek* accounts for the percent of the population involved in social fraternities, while *Part* is percentage of students who are enrolled part-time. Last, *Rsdoc* shows whether the institution was primarily research/doctoral and *Pub* notes public or private.[8]

Although this equation draws more conclusions about the general determinants of alumni giving and less about athletics, it proves fruitful to review within the theory section. It provides an interesting idea that institutions can control the level of donations they receive through the level of recognition that they offer and the development costs that they incur. The model provides a sound theoretical background for the remainder of this study because development money is often used to reward donors through athletic means such as tickets, preferred seating, parking, and pre-game parties. This will be further explored later; however, before discussing these topics, the following section will look specifically at types of giving.

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[7] Ibid.

[8] Ibid.

Types of Giving

In order to review the theory surrounding athletics as a determinant of giving, it is important to first discuss the types of giving. Giving to colleges/universities can be classified into several categories. When deciding to give to an institution, individuals can give to a school's annual fund as well as specific areas including: academic departments, athletic programs, annual funds, and scholarships, to name only a few. As well as classifying gifts by type, donations can be classified by the donor. Schools separate gifts made by alumni and non-alumni. Considering this, previous research and theory suggest that four types of giving are of particular interest for this study. These types will be used as dependent variables in the following chapters.

Total Giving

The most simplistic measure of giving, total giving, encompasses the total amount that a school receives in a single year. This measure includes all kinds of donations from all sources. Notably, pledged gifts are acknowledged in the year that they are received, not the year they are pledged. Any changes in giving that result from changes in athletic success should be included in this type of giving.

Alumni Giving

Alumni giving includes all types of giving, but only those gifts that are donated by alumni. For the purpose of giving records, the alumni category includes all students that have graduated from the institution at any level. It also includes those students that attended the college/university for at least a year, but did not graduate.

Giving to Athletics

Giving to athletics is important to consider when looking at athletic success as a determinant of giving. As mentioned in the previous chapter, several authors suggest that improvements in athletic performance solely influence athletic giving and in some cases crowd out giving to educational purposes. Athletic giving encompasses those donations that are made by alumni and non-alumni to all athletic areas. This includes giving to the athletic department as a whole, as well as specific teams.

Giving to Academics

Giving to academics is important to consider because athletic success may lead to a shift in giving instead of an overall increase, as noted above and in Chapter II. Giving can come from alumni and non-alumni. It includes giving to various academic departments, but does not include financial aid and faculty. Other areas not included in this category include research, public service, and library.

Although simplistic, giving is important to understand before reviewing the measures of athletic success and the theoretical connection between giving and athletics.

Measures of Athletic Success

Like giving, athletic success can be classified and described in a variety of ways. Teams may consider their season successful if they win a rivalry game, participate in an upset, or win a national championship. Still others may view improvement as success. For this reason, it is important to define success and to consider it in a variety of ways. The following subsections will discuss several ways to empirically measure success and compare all teams.

Winning Percentage

The most rudimentary measure of athletic success is winning percentage. Almost every study pertaining to athletics and giving to universities and colleges tests winning percentage as a measure of success. Winning percentage is determined by dividing the number of games won by the number of games played.

Post Season Play

Within college hockey, 16 teams are invited to play in the NCAA tournament. Six bids automatically go to the winners of each conference, while the other ten teams are picked by the NCAA selection committee. The NCAA does not disclose their selection process; however, USHCO.com uses a statistical tool called PairWise Rankings (PWR) to predict which teams will get at large bids. The tool looks at all teams with a Ratings Percentage Index (RPI) of .500 or greater, calling these teams, "teams under consideration (TUC)." The RPI looks at a team's winning percentage multiplied by 25 percent, the average winning percentage of the team's opponents multiplied by 21 percent, and the average winning percentage of the team's opponent's opponents multiplied by 54 percent.[9]

Each TUC is then compared with every other TUC; if the team wins the comparison, they are given one PWR point. Teams are then ranked by PWR points. USCHO.com notes that they use RPI ratings to break ties and although they cannot be certain that the NCAA does the same, there is evidence to support that they do. When comparing teams to give PWR points, the tool looks at RPI, record against TUCs (if

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[9] "Men's Division I Ratings Percentage Index," USCHO.com*,* (November 14, 2011).

both teams have played at least 10 of these games), record against common opponents, and head-to-head competition.[10]

Athletic Tradition

Rhoads and Gerking consider athletic tradition as a function of total football bowl and NCAA basketball tournament appearances to be a measure of success. Baade and Sunderburg present a theoretical background for this measure as a differentiator between the affect of NCAA basketball tournament appearances at private and public schools, arguing that a tradition of excellence (as seen in the public schools) should be considered when measuring the success of a team.

Poll Results

Unlike winning percentage, poll ranking may account for success that may not otherwise become apparent. This is especially relevant in the area of hockey because of the large disparity between conferences. For instance, at the beginning of the 2011-2012 season, seven of the twelve teams in the Western Collegiate Hockey Association (WCHA) were ranked in the USHCO.com top 20 poll, while none of the teams in the Atlantic Hockey conference were ranked.[11] Moreover, in these more successful conferences, donors may be more attuned and responsive to success (like with the post season measures).

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[10] "PairWise Ranking Explanation," USCHO.com, (November 14, 2011).

[11] "USCHO Division I Men’s Poll," USCHO.com, (September 26, 2011).

Athletic Success and Giving

As presented in the previous sections, giving to institutions and success on the ice rink or any other venue can be measured in a variety of ways. No matter which way these are determined, there are a few underlying beliefs which promote the connection between success and giving. The following subsections will present theory that connects the measures of athletic success with giving.

Advertising Effect

To begin, researchers assert that athletic success acts as good publicity for a college or university.[12] Turner, Meserve, and Bowen argue that there is an "advertising effect" in which the publicity from being successful raises the profile of the institution in comparison to other charities. In this case, alumni and other donors become more likely to acknowledge and respond to solicitations for donations.[13]

Quality

Next, success may be taken as a positive reflection of the university or college itself. Alumni and other donors who do not follow changes in faculty, curriculum, and even college overall rankings, may believe that successful teams demonstrate the quality of the institution. Again, this may prompt donors to give or give more. Similarly, problems on the field or other types of athletic probations can often reflect

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[12] Robert E. McCormick and Maurice Tinsley, "Athletics and Academics: A Model of University Contributions," in *Sportometrics* Texas A&M University Economics Series, no. 11; College Station: Texas A&M University Press, 1990), 193-204.

[13] Sarah E. Turner, Lauren A. Meserve, and William G. Bowen, "Winning and Giving: Football Results and Alumni Giving at Selective Private Colleges and Universities," *Social Science Quarterly (Blackwell Publishing Limited)* 82, no. 4 (2001): 815.

poorly on the institution and show that administrators have lost control.[14] This idea ties in directly with the measure of athletic tradition.

Rhoads and Gerking use athletic tradition as an actual variable in their 2000 study. Within the research, they test athletic tradition as a part of their analysis of university-specific effects creating a model which determines that athletic tradition does contribute to alumni giving.[15] Theoretically, the authors believe that tradition leads to greater giving because it demonstrates the quality of the institution. Alumni in turn contribute because they feel proud and want to continue the tradition of excellence. They do note, however, that the athletic measure of quality is less important than faculty and student quality. Still, they argue that for some universities improving athletic tradition may be cheaper and quicker than improving academics; "The payoff from establishing an athletic tradition may come more quickly, particularly if prospective donors have difficulty judging academic improvements and if changes in academic reputation lag behind actual improvements."[16]

Giving as Consuming

Looking back at the connection between giving and recognition, athletic success can have a direct effect on donations. For instance, the University of Minnesota just passed a plan to realign ice hockey season ticket holders based on four factors; one of which is donations to the University of Minnesota athletics and another is donations to the University of Minnesota as a whole. In this case, larger donors would receive better

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[14] Ibid.

[15] Thomas A. Rhoads and Shelby Gerking, "Educational Contributions, Academic Quality, and Athletic Success," *Contemporary Economic Policy* 18, no. 2 (2000): 255.

[16] Ibid, 257.

seat choices.[17] Similarly, other institutions offer preferred seating, upgraded parking, and other benefits based on donation size. In instances like this, success directly affects giving by making tickets and parking more of a commodity. Turner et al. argues that, "In this context giving is really a form of consuming."[18]

Identity Salience

Finally, returning to the idea of identity salience and identity theory proposed in Chapter II, many alumni are staunch supporters and followers of schools' athletic programs. These alumni and fans take great pride and find a remarkable amount of salience in watching "their" teams perform successfully. Many of these fans are important donors and Baade and Sunderburg argue, "But if the football or basketball teams fall on hard times, athletic directors, coaches, and even college presidents become the target of disgruntled alumni groups… alumni are for giving but not for forgiving."[19]

The chapter has presented possible dependent and independent variables as well the theory connecting them. Before moving on to the data and methodology, the chapter will review two other important variables, which will be added for control purposes.

Other Important Independent Variables

Studies on athletic success and donations include a wide variety of non-athletic variables. Some use only controls, while others test alumni involvement during college,

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[17] Russo, John, "U of M Athletics Goes for Big Money Grab," Let's Play Hockey (October 16, 2011).

[18] Turner, Meserve, and Bowen, 815.

[19] Robert A. Baade and Jeffrey O. Sundberg, "Fourth Down and Gold to Go? Assessing the Link between Athletics and Alumni Giving," *Social Science Quarterly* 77, no. 4 (1996): 789-803.

demographic variables, and/or measures of student and school quality. The theory surrounding two of these variables, enrollment and income, will be discussed next.

Enrollment

Enrollment is an important variable to include for two reasons. First, larger institutions obviously graduate more students every year than smaller schools. These graduates are added to the alumni pool. Since alumni are some of the most important donors to an institution, a larger alumni pool equates to more chances to receive funding. In practice larger schools do not always receive more donations; however, logically enrollment could have a huge effect. Second, larger institutions with higher enrollment require additional funding to provide the same services as a smaller school. These colleges and universities need more faculty, space, and other support including donations.

Income

The model presented within the next chapter will also incorporate a measure of income as a control. Theoretically this is needed to account for changes in the economy which may affect the ability of donors to give. Through the existing literature on donations and specifically donations to colleges it is apparent that income and wealth affect giving levels. Several of the pieces reviewed in Chapter II established this. Furthermore, donations can be considered a normal good, opposed to an inferior good. Economics theory explains that normal goods have a positive elasticity of demand, or as income rises, the level of donations should also rise. Thus, if donations are a normal good, changes in the economy should be correlated with changes in donation amounts.[20]

Conclusion

Throughout this chapter several theoretical ideas have been presented in regards to giving and athletic success. The chapter first began with more economic based models looking at the donor side through a constrained maximization model. This was followed by a look at development costs, considering colleges and universities as monopsonies. The chapter then examined the dependent and independent variables and the connection between the two. Giving was broken down into total giving, alumni giving, giving to athletics, and giving to academics. Success was defined through winning percentage, post season play, poll rankings, and athletic tradition. The non-athletic variables presented as controls were enrollment and income. Table 3.1 summarizes these theoretical independent variables, giving descriptions and predicted signs. The following chapter will discuss these variables further and the models used for this specific study.

[20] Leeds and Von Allmen,19.

TABLE 3.1

Theoretical Variables, Descriptions, and Predicted Signs

Variable	**Description**	**Predicted Sign**
WINPCT	Number of games won in a season divided by the number of games played	Positive
POST	Whether a team makes it to the NCAA tournament	Positive
POSTWIN	Whether a team wins the NCAA tournament	Positive
TRAD	Whether a team has a history of hockey success	Positive
POLL	Whether a team appears in national poll rankings	Positive
ENROLL	School enrollment	Positive
INCOME	Measure of national wealth	Positive

CHAPTER IV

DATA AND METHODOLOGY

The purpose of this chapter is to discuss and describe the data set that has been collected to test the theories presented previously in Chapter III. First, the data will be explained briefly including summary statistics. Giving data, athletic data, and other information will be reviewed including a broad discussion of sources. This will be followed by a discussion of ordinary least squares (OLS) regression which will lead into the two specific OLS models used in this study. The independent and dependent variables that will be included in the models will be examined in depth. After discussing the OLS models, fixed effects regressions will be explained and four specific fixed effects models will be presented. Because many of the variables are also in the OLS models, there will only be a brief discussion of the independent and dependent variables. The results of this empirical model will be presented in the Chapter V.

Data

The regression models will be tested using annual data from colleges and universities with NCAA Division 1 men's ice hockey teams. All data spans a ten year period with giving information from fiscal year 2001 to fiscal year 2010 and athletic data from the 1999-2000 season to the 2008-2009 season. Although there were 58 schools with Division I men's ice hockey teams in the United States as of the 2011-

2012 season,[1] the data only includes the 56 schools that were considered Division I during the entire period. Schools were also eliminated from the study based on the availability of data. Table 4.1 summarizes the dependent variables giving descriptions of each and key statistics. Notably, the final column indicates how many schools will be included in each variation of the model. Table 4.2 includes definitions and summary statistics for each of the independent variables.

TABLE 4.1

Summary Statistics and Definitions for Giving Variables

Variable	**Description**	**Mean**	**St. Dev.**	**Min**	**Max**	**Schools**
GIVING	Total donated	$70,993,017.14	$113,976,235.41	568,661.27	683,172,781.00	48
ALGIV	Total donated by alumni	$19,088,713.44	$32,364,033.43	$43,840.80	$231,357,674.87	41
ATHGIV	Amount to athletics	$1,976,946.27	$4,584,034.58	$4,317.17	$ 30,371,597.94	45
ACGIV	Amount to academics	$6,495,985.73	$11,534,345.53	$4,222.50	$98,382,214.65	40

[1] "KRACH: Division I Men's," USCHO.com, January 3, 2012.

TABLE 4.2

Summary Statistics and Definitions for Independent Variables

Variable	Description	Mean	St. Dev.
WINPCT	Winning percentage	.4578	.1517
POST	Dummy variable for post season appearance	.2938	.4560
POSTWIN	Whether a team wins the NCAA tournament	.0210	.1430
TRADPOST	Number of appearance prior to 2000	6.5	4.40
TRADWIN	Number of wins prior to 2000	1.04	1.92
POLL	Percent of possible appearances in USCHO poll	.3309	.4055
ENROLL	Total number of full-time students	14204	13156

Giving Data

The number of schools included in the study was also narrowed by the availability of giving data. Although most institutions report this type of information annually to the Council for Aid to Education (CAE) Voluntary Support of Education (VSE) survey, several do not report anything or do not report certain figures. The CAE VSE survey is the most commonly used source of information on giving to private K-12 schools and post-secondary institutions. The survey has been in existence for over 50 years and captures 85 percent of gifts.[2] Initially, there were 25 schools within the study that had missing information in the VSE data miner. After contacting the development

[2]"Data and Trends on Private Giving to Education," in Council for Aid to Education [database online]. [cited 2012].

offices of each of these institutions only eight schools had to be excluded completely based on a lack of giving information. A few schools are excluded from parts of the study because of missing data, but are included for others models because they had some information every year. Schools that were missing more than one year of data for a certain type of giving were excluded from the model for that dependent variable. Table 4.1 summarizes the number of schools included in each variation of the model. The smallest data set is for academic giving with only 40 schools.

Giving data is lagged one year because giving is measured over the academic, fiscal year which runs from July 1 to June 30. Without lagging the giving data one year, the study would not be able to account for the donations that are made after the season.

Athletic Data

Athletic data on the 56 teams came from a variety of sources including the NCAA record history books as well as USHCO.com and hockeydb.com. During the study period, these teams were split into six conferences with a few independent teams. The regular hockey season generally runs from the beginning of October to the end of February with a maximum of 38 games. The season is followed by a playoff within each conference. The top 16 teams including the conference winners advance to the NCAA playoffs. Interestingly the tournament has expanded since the first 1948 tournament of four teams, increasing tournament attendance more that 50 fold.[3]

[3] "Men's Ice Hockey, Division I," *NCAA Record Book* (2009): 1.

Other Data

Other data was also collected on each of the schools within the study. Within the literature, Brooker and Klastorin suggest certain types of schools are more sensitive to athletic success than others. For instance, they find that private schools, mid-sized universities, and institutions with a religious affiliation are most sensitive to athletic success.[4] Information on size, type (public, private, religious, liberal arts, research), region, and age was collected for each institution. Table 4.3 shows the breakdown of the schools into these groups. Table 4.3 notes the classifications that can be used to divide the schools. The table includes sources and the number of schools in each category.

Information on enrollment was used from the final year of the study, 2010, as provided by the VSE survey. The median size was then found from all of the schools. The mean was initially used; however, the existence of a few very, very large schools skewed the distribution. Other information about the age, region, public, private, religious affiliation, and liberal arts schools was pulled from US News and World Report college database.[5] Finally, the categorization of “research institution” came from the Carnegie Foundation Classifications of Institutions of Higher Education. The size categories and method were also doubled checked against the Carnegie classifications. Those schools which were classified as small and medium by the Carnegie Foundation were placed in the small category. Notably, when comparing this approach to classification to the median technique only two schools were classified

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[4] George Brooker and T. D. Klastorin, "To the Victors Belong the Spoils? College Athletics and Alumni Giving," *Social Science Quarterly (University of Texas Press)* 62, no. 4 (1981): 744-750.

[5] "Education: Colleges," in US News and World Report [database online]. [cited 2012].

differently. After explaining OLS and its role within the study, the variables and models will be described further.

TABLE 4.3

Sources for Various Classifications and Number of Schools Included

Characteristic	**Source**	**Number in Category**
Size	Carnegie classification	23 large schools, 25 small and medium
Public and Private	US News and World Report college database	26 public, 22 private
Liberal Arts	US News and World Report college database	5 liberal arts, 43 non-liberal arts
Research	Carnegie classification	30 research, 18 non-research
Religious Affiliation	US News and World Report college database	6 religious, 42 non-religious
Region	US News and World Report college database	18 midwest, 25 northeast, 5 other
Age	US News and World Report college database	14 old, 10 young, 23 middle

OLS Empirical Models

Because there are various independent variables which measure success, this study is using a multiple regression model. Specifically, OLS, a common estimator in multiple regressions, will be used to evaluate the relationship between hockey success and giving. OLS evaluates relationships by minimizing the sum of the squared distances between scattered points and the regression line. OLS then emphasizes the large misses by squaring the error terms to better describe the fit. Leeds and Von Allmen describe this well saying, “OLS thus fits our intuitive notion that a line with several small misses fits the data better than a line with a few very large ones."[6] This theoretical framework is essential to understand before moving on to describe the specific model.

Models

The study includes two variations of a basic OLS model. The models are somewhat similar in that they use the same measures of athletic success and test whether variations in athletic success across universities contribute to different levels of giving on an annual basis. The different variables aim to capture the sensitivity of both total giving and alumni giving to athletic success. The model below holds for both of the dependent variables with the variable $DEPEND_i$ substituting in for $GIVING_i$ and $ALGIV_i$.

$$DEPEND_i = \beta_0 + \beta_1 * WINPCT_i + \beta_2 * POLL_i + \beta_3 * POST_i + \beta_4 * POSTWIN_i + \beta_5 * TRADWIN_i + \beta_6 * TRADPOST_i + \varepsilon_i \qquad (4.1)$$

Dependent Variables

As seen in Chapter II, giving to institutions is multi-faceted and can be measured in a variety of ways. For this reason, the study looks at several models using different measures of giving. Notably, all of the measures which look at the dollar value of gifts were somewhat skewed because of economic changes. In order to generate real prices, the contributions were deflated using the Consumer Price Index (CPI). Values were plugged into the CPI calculator and then deflated to values in terms of 2000 dollars.

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[6] Michael Leeds and Peter Von Allmen, *The Economics of Sports,* 3ed. (Boston: Pearson/Addison Wesley, 2008), 461.

This information was available from the United States Department of Labor, Bureau of Labor Statistics.[7]

The first dependent variable, $GIVING_i$, measures the total amount of money that is donated to an institution within a given year. The total includes not only athletic and academic gifts, but also gifts to the general fund, research, and faculty, among many other things. This variable will be used to test whether changes in an individual team's success affect overall giving to an institution. This model includes data from 48 schools over the ten year period.

The second OLS model will examine the responsiveness of alumni alone to athletic success as measured by the total dollar amount of alumni gifts in a given year. This is represented by the variable $ALGIV_i$. Only 45 schools were included in this portion of the study due to missing data from Harvard University, Cornell University, and Boston University.

Independent Variables

For each of the teams certain athletic data was collected on an annual basis: winning percentage, tournament appearance, tournament win, and number of times the team appeared in the USCHO.com poll. Data was also collected on athletic tradition as measured by the total number of tournament appearances and total number of championships over the history of Division I hockey prior to the first year of the study, 2000.

The first and most commonly used measure of athletic success is winning percentage, $WINPCT_i$. Data on annual winning percentage for each team over the ten

[7] "CPI Inflation Calculator," in Bureau of Labor Statistics [database online]. [cited 2012].

year span was calculated by dividing the number of games won by the number of games played yearly. This information is available from hockeydb.com.[8] There should be a positive correlation between winning percentage and all measures of giving.

$POLL_i$ is used to measure the number of times within a season that a team appeared in the USCHO.com poll rankings. The poll rankings are published every Monday during the season. Notably, the poll evolved during the study period from including only 10 teams to including 20 teams. The poll also releases the names of all of the teams that receive votes but are not ranked; however these were not counted as appearances. The number of possible appearances ranges from 23 in the shortest season to 25 in the longest season. Because the number varies by season, the $POLL_i$ data was adjusted to be a fraction of the number of possible appearances. For instance, if a team appeared in every poll in a given year, $POLL_i$ carries a value of one no matter how many possible appearances there were. $POLL_i$ is confined to the parameters demonstrated in equation 4.2.

$$0 \leq POLL_i \leq 1 \tag{4.2}$$

Several polls could have been used to measure success in this way including the PairWise, Ken's Rankings for American College Hockey (KRACH), Rankings Percentage Index (RPI), Inside College Hockey Power Rankings (INCH Power Rankings) or the USA Today rankings. USCHO.com was chosen because it is widely accepted and incorporates an interesting voting element. Unlike the KRACH, PairWise, and RPI which use statistical modeling to rank teams, the USCHO.com poll asks 50

[8] "Team Search," in hockeydb.com [database online]. [cited 2012].

coaches and industry experts to rank teams weekly.[9] Unfortunately, USCHO.com does not disclose who is voting or how they are chosen. As described in Chapter III, the PairWise is a very useful tool in measuring the success of college ice hockey teams; however, it is designed to predict the rankings that the NCAA selection committee will use to determine post season play.[10] In this respect, it is already represented in $POST_{i,}$ a variable that will be discussed in the next section. Again, $POLL_i$ should carry a positive sign in the model.

The other major classification is athletic tradition as discussed throughout Chapter II and Chapter III. Baade and Sunderburg suggest that a tradition of excellence makes donors more attune to post season play in their discussion of public school sensitivity to basketball success. This study will aim to test this hypothesis in the realm of hockey by testing whether a strong tradition of hockey success results in higher giving levels across universities. This was determined by looking at the number of NCAA tournament appearances and NCAA tournament wins a team has had since the inception of their NCAA Division I men's ice hockey program but prior to 2000. Again, this information came from the NCAA Division I men's ice hockey record books.[11]

More specifically, $TRADPOST_i$ measures athletic tradition through post season play. It measures the number of times prior to 2000 that a team was invited to the NCAA tournament at the end of the season. $TRADWIN_i$ measures the number of total

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[9] "USCHO.com Division I Men's Poll," USCHO.com, January 3, 2012.

[10] "Pairwise Rankings Explained," USCHO.com, January 3, 2012.

[11] "Men's Ice Hockey, Division I," *NCAA Record Book* (2009): 6-8.

number of times a team won the NCAA tournament prior to 2000. Both of these variables are expected to have a positive relationship with both total giving and alumni giving.

Dummy Variables

$POST_i$ is a measure of post season play or, more specifically, a dummy variable used to measure whether a team is invited to the NCAA tournament at the end of a season. A value of one was used if a team was invited to the tournament, while a value of zero was given if they were not invited in said year. This is depicted in Equation 4.3. Again, if athletic success positively affects giving, there should be a correlation between $POST_i$ and all measures of giving. Throughout the literature, post season play appears to be one of the more consistent variables that affect giving.

$$POST = \begin{cases} 1 \; if \; NCAA \; tournament \\ 0 \; if \; otherwise \end{cases} \quad (4.3)$$

Similarly, a dummy variable will be used to test whether winning the NCAA hockey tournament affects all types of giving to an institution. This variable is represented by $POSTWIN_i$. Equation 4.4 shows that a value of one was assigned for winning the NCAA tournament and a value of zero was given otherwise. Both $POST_i$ and $POSTWIN_i$ should have a positive correlation with the measures of giving. Information on tournament appearances and wins was easily accessible from the NCAA Division I ice hockey record book.[12]

$$POSTWIN = \begin{cases} 1 \; if \; win \; NCAA \; tournament \\ 0 \; if \; otherwise \end{cases} \quad (4.4)$$

[12] Ibid.

Fixed Effects Models

While OLS regressions are very helpful when comparing differences between schools, fixed effects models will be used to look at year-to-year differences on an individual school basis. By definition, fixed effects models allow the unobserved effects to be arbitrarily correlated with the explanatory variables in each time period. The unobserved effect is an unobserved variable in the error term that does not change over time.[13] Moreover, Rhoads and Gerking noted in their 2000 study, "OLS results easily can be challenged because some schools simply receive more contributions and participate more frequently in postseason games. Because of this possible source of heterogeneity bias, these results may not show what happens to a particular school's contributions when its athletic teams perform well."[14] In light of this, the fixed effects approach was chosen for a few reasons. First, it controls for unique elements of institutions and heterogeneity over time. Second, unconditional estimates of the effects of athletic success on giving that would be obtained from a random effects model are of less interest for this study than the conditional estimates that can be obtained from fixed effects models. Rhoads and Gerking suggest that these conditional estimates are of greater interest because they hold constant net effects of university- and time-specific factors.[15] The following section will present the actual fixed effects models used within this study.

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[13] Jeffrey Wooldridge, *Introductory Econometrics: A Modern Approach,* 4th ed. (Cincinnati, OH: South Western College Publishing, 2009), 839.

[14] Thomas A. Rhoads and Shelby Gerking, "Educational Contributions, Academic Quality, and Athletic Success," *Contemporary Economic Policy* 18, no. 2 (2000): 253.

[15] Ibid, 252.

Models

The study includes four variations of a basic fixed effects model. Like with the OLS models, the four models differ in their dependent variables, but use the same measures of athletic success. They test whether variations in athletic success within a single university affect giving on an annual basis. The model below holds for all of the dependent variables with the variable $DEPEND_i$ substituting in for $GIVING_i$, $ATHGIV_i$, $ACGIV_i$, and $ALGIV_i$.

$$DEPEND_i = \beta_0 + \beta_1 * WINPCT_i + \beta_2 * POLL_i + \beta_3 * POST_i + \beta_4 * POSTWIN_i + \beta_5 * ENROLL_i + \varepsilon_i \quad (4.5)$$

Dependent Variables

Like with the OLS model, the contributions were deflated to account for economic change using the Consumer Price Index (CPI). All dollar amounts for the fixed effects models are values in terms of year 2000 dollars.[16]

The first two dependent variables are taken from the OLS models. $GIVING_i$ measures the total amount of money that is donated to an institution within a given year and tests whether changes in an individual team's success affect overall giving to an institution. Again, the model includes data from 48 schools. The second fixed effects model will examine the responsiveness of alumni alone to athletic success as measured by the total dollar amount of alumni gifts in a given year, $ALGIV_i$.

The next two models break down giving to look specifically at gifts to athletics and academics. The first considers $ATHGIV_i$ as a measure of the amount of money contributed specifically to athletics at a given school over one year. This is interesting

[16] "CPI Inflation Calculator," in Bureau of Labor Statistics [database online]. [cited 2012].

because it continues previous research. As described in Chapter II, Stinson and Howard looked at the University of Oregon and asked, "Does improved athletic performance influence both types of giving?"[17] In contrast, $ACGIV_i$ measures the total amount donated strictly to academics within a certain year. This again ties into previous research which argues that increased athletic success actually negatively impacts giving to academic sectors by shifting funding from academics to athletics.[18]

Independent Variables

As depicted in the equation (4.5) above, the independent variables are very similar to those used in the OLS models. $TRADWIN_i$ and $TRADPOST_i$, the measures of athletic success, are excluded from the fixed effects models because they do not change within an institution over the study period.

$WINPCT_i$ is still included in the fixed effects model and there should a positive correlation between winning percentage and all measures of giving. $POLL_i$, a percentage measure of the number of times within a season that a team appeared in USCHO.com poll rankings, is also used. The range from 23 to 25 still holds as does the expected positive correlation. $POLL_i$ is again confined to the parameters demonstrated in Equation 4.6.

$$0 \leq POLL \leq 1 \qquad (4.6)$$

Finally, $ENROLL_i$, the enrollment of an institution is included as an independent variable in the fixed effects models. Like giving information, enrollment data was provided by the VSE. Enrollment can be calculated several ways including "total head

[17] Jeffrey L. Stinson and Dennis R. Howard, "Scoreboards vs. Mortarboards: Major Donor Behavior and Intercollegiate Athletics," *Sport Marketing Quarterly* 13, no. 3 (2004): 129-140.

[18] M. Sperber, *Beer and circus: The impact of big-time college sports on undergraduate education,* (New York: Henry Holt, 2000).

count," "administrative site enrollment," and "delivery site enrollment." The total head count method counts full-time and part-time students, while delivery and administrative site enrollment account for where students physically take classes and receive their degree in state school systems. This study uses "Full Time Equivalence" (FTE) numbers. This figure only accounts for students that are enrolled full-time.[19]

Although $ENROLL_i$ is not a measure of athletic success, it is important to include for control reasons as noted by Grimes and Chressanthis.[20] As presented in Chapter III, higher enrollment results in more alumni and an increased funding need. Both of these should lead to a positive correlation between giving and enrollment. Moreover, while many schools within the study did not change in size drastically over the ten years, a few grew between 30 and 120 percent. Because of these growing institutions, enrollment must at least be considered. This subsection discussed those independent variables which will carry a numerical value noting their expected sign and sources for information. Next, the dummy variables within the equation will be discussed.

Dummy Variables

The dummy variables from the OLS models are also continued in the fixed effects models. Once again, $POST_i$ is a dummy variable used to measure whether a team is invited to the NCAA tournament at the end of a season. Equation 4.7 depicts the possible values.

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[19] "Data and Trends on Private Giving to Education," in Council for Aid to Education [database online]. [cited 2012].

[20] Paul W Grimes and George Chressanthis, "Alumni Contributions to Athletics: The Role of Intercollegiate Sports and NCAA Sanctions," American Journal of Economics and Sociology, Volume 53, 1994: 27-40.

$$POST = \begin{cases} 1 \; if \; NCAA \; tournament \\ 0 \; if \; otherwise \end{cases} \quad (4.7)$$

$POSTWIN_i$ is shown below in Equation 4.8 and is used to test whether winning the NCAA hockey tournament affects all types of giving to an institution. Both $POST_i$ and $POSTWIN_i$ should have a positive correlation with the measures of giving.

$$POSTWIN = \begin{cases} 1 \; if \; win \; NCAA \; tournament \\ 0 \; if \; otherwise \end{cases} \quad (4.8)$$

Conclusion

The previous sections and chapter have reviewed the data that will be included in the theoretical models. The chapter explained the OLS and fixed effects framework, as well as the variables that will be included in depth. The following chapter, Chapter V, will examine the results of the OLS regression and develop conclusions based on these results.

Once more, the basic OLS model is presented in Equation 4.9. The variables $GIVING_i$ and $ALGIV_i$ can be substituted in for the variable $DEPEND_i$. The basic fixed effects model is presented in Equation 4.10. $DEPEND_i$ again acts as a place holder for the dependent variables, $GIVING_i$, $ALGIV_i$, $ATHGIV_i$, and $ACGIV_i$.

$$DEPEND_i = \beta_0 + \beta_1 * WINPCT_i + \beta_2 * POLL_i + \beta_3 * POST_i + \beta_4 * POSTWIN_i + \beta_5 * TRADWIN_i + \beta_6 * TRADPOST_i + \varepsilon_i \quad (4.9)$$

$$DEPEND_i = \beta_0 + \beta_1 * WINPCT_i + \beta_2 * POLL_i + \beta_3 * POST_i + \beta_4 * POSTWIN_i + \beta_5 * ENROLL_i + \varepsilon_i \quad (4.10)$$

CHAPTER V

RESULTS AND CONCLUSIONS

The purpose of this chapter is to discuss and describe the regression results based on the data set and models set forth in Chapter IV. Various models were constructed with data from institutions with Division I men's ice hockey teams. Both OLS regressions and fixed effects models were used to determine whether hockey success affects giving to colleges and universities in various situations.

The first part of this chapter will present the OLS models that compared overall giving and giving from alumni across universities and colleges. The regression results will be examined. This will be followed by a review of the findings from the various fixed effects models. These four models examined the affects of success on overall giving, alumni giving, giving to academics, and giving to athletics on a school-by-school basis. The final sections of the chapter and paper will present conclusions derived from the regression results, as well as discuss the limitations of this study and possibilities for future research.

Ordinary Least Squares Regression Result

Two OLS models were used to test whether athletic success affects the amount of money that is donated to colleges and universities across institutions. In other words, did college XYZ receive more money in a given year than university ABC because their hockey team was more successful?

Model I Results: Overall Giving

Table 5.1 is a summary of the OLS regression for athletic success and total giving. The name of the variable is presented with a brief definition as well as the value of the coefficient. The t-statistics are given in parentheses. The number of stars next to the coefficient indicates the significance level with three stars representing the 99 percent confidence interval, two stars representing the 95 percent confidence interval, and one star representing the 90 percent confidence interval.

TABLE 5.1

Model I: Ordinary Least Square for Overall Giving

Variable	Description	Model I
C	Constant Term	15.98396*** (52.08764)
POST	Dummy variable for post season appearance	0.325005** (2.098717)
POSTWIN	Dummy variable for NCAA tournament win	-0.127950 (-0.277305)
TRADWIN	Number of NCAA tournament wins prior to 2000	0.094986 (1.312686)
RESEARCH	Dummy variable for schools classified as research institutions	2.240481*** (9.504839)
NORTHEAST	Dummy variable for schools located in the northeast	-0.119317 (-0.449530)
PUBLIC	Dummy variable for public schools	-1.171640*** (-4.105797)
RELIGIOUS	Dummy variable for religious schools	-0.333729 (-1.330796)
LIBERAL	Dummy variable for liberal arts schools	0.696138*** (2.591648)

R-Squared	Adjusted R-Squared	F-Statistic
0.586835	0.579773	83.08998

Fit of Model I

The f-test is one of the most important tests in determining the validity of an econometric model. The f-statistic in a regression answers the question: “Does the movement of the independent variables actually explain the movement of the dependent variables?" The f-statistic within this model greatly surpasses the required value to achieve the 99 percent confidence level at 83.09.

Another common measure of the overall fit of a regression model is the coefficient of determination (r-squared), which gives the percentage of the variation in the dependent variable from its mean that is explained by the independent variables.[1] An r-squared of zero indicates that the model explains none of the variation, while an r-squared of one suggests that the model explains all of the variation in the dependent variable. The r-squared for the model is 0.5868, meaning that the independent variables account for 58.68 percent of the difference in overall giving from the mean. An r-squared of .5868 also suggests that the model is missing key variables which impact giving; however, the model does not aim to look at all of the determinants of giving to schools, it only attempts to account for athletic success measures that may affect giving. The adjusted r-squared of 0.5798 accounts for degrees of freedom. The following sections will look deeper at the econometric issues and the results and implications of Model I.

Econometric Issues for Model I

Several econometric issues were tested for in all of the study models. First, the independent variables were tested for multicollinearity. Multicollinearity occurs when there is high correlation between two or more independent variables.[2] Table 5.2 shows the correlation matrix for all of the independent variables that measure athletic success. The values within the correlation matrix show how two independent variables move

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[1] Jeffrey M. Wooldridge, *Introductory Econometrics: A Modern Approach.* ed. 4, (Mason, OH: South Western Cengage Learning: 2009), 96.

[2] Ibid, 96.

together and values greater than 0.50 were deemed to represent a multicollinearity problem. None of the dummy variables used to control for school specific classifications are included in the table because they did not show any sign of multicollinearity.

TABLE 5.2

Correlation Matrix for Athletic Variables

	POST	POSTWIN	WINPCT	POLL	TRADWIN	TRADPOST
POST	1.000000	0.227035	0.384615	0.754120	0.425321	0.491972
POSTWIN	0.227035	1.000000	0.112731	0.229876	0.202251	0.258130
WINPCT	0.384615	0.112731	1.000000	0.488676	0.340386	0.393183
POLL	0.754120	0.229876	0.488676	1.000000	0.537913	0.625435
TRADWIN	0.425321	0.202251	0.340386	0.537913	1.000000	0.786764
TRADPOST	0.491972	0.258130	0.393183	0.625435	0.786764	1.000000

Looking at the above table, it is evident that multicollinearity existed between some of the variables discussed in Chapter IV. For this reason, *POLL* and *TRADPOST* were excluded from all of the models in the study. *POLL* was highly correlated with *POST, TRADWIN, TRADPOST* and *WINPCT,* while *TRADPOST* was correlated with *POST, POLL,* and *TRADWIN.*

The USCHO.com poll was chosen in an effort to avoid problems of multicollinearity. Unlike the PairWise, it does not rank teams using a statistical model; however, teams that spend most of their season in the top 20 ranking are often invited to the post season tournament. The correlation between the measures of athletic tradition can be attributed to the slow change in the overall success of teams. The correlation between *POLL* and *WINPCT* is most likely because changes in the poll rankings are largely due to teams' wins and losses. *TRADPOST* was excluded opposed to *TRADWIN* because *TRADPOST* was more highly correlated with *POST* than *TRADWIN* was. Although removing these two variables could result in omitted variable bias, they were left out to ensure that two or more independent variables were not correlated. Readers should keep in mind that if omitted variable bias exists in the model, coefficients could be misestimated.

Next, normality of the error terms was examined. For the normality assumption to hold, the population error must be normally distributed with zero mean and variance σ^2.[3] The initial model presented in Chapter IV resulted in non-normal distribution of error as shown by the Jarque-Bera (JB) test. In order for normality to exist, the JB statistic must be below 5.99 or within the 95 percent confidence interval. Without normal distribution of errors, the t-statistics, r-squared, and f-statistic cannot be accepted as valid. The common fix for a non-normality problem is changing the functional form of the regression equation. For this reason, the log of total giving was used instead of simply total giving. This still did not lower the JB into the 95 percent confidence interval. For this reason, the control dummy variables of *RELIGIOUS, LIBERAL, PUBLIC, NORTHEAST*, and *RESEARCH* were added to the model. These helped account for the large differences in giving between schools that were leading to normality issues. Finally, the statistically insignificant variable *WINPCT* was dropped from Model I to help account for non-normality.

[3] Ibid, 118.

The third econometric problem that can arise within a time-series model is serial or autocorrelation. The assumption is that serial correlation does not exist. In other words, correlation between the error terms across time does not exist.[4] The standard test for serial correlation is a Durbin-Watson test which compares the Durbin-Watson value to the upper and lower values of the statistic. Unfortunately, the Durbin-Watson test only looks for first-degree autocorrelation.[5] For this reason, a more robust test was performed on the model. A regression model was created in which the lagged residuals were regressed with a constant against the residuals (*RESID*). If the t-statistic was significant at the 95 percent confidence level, autocorrelation existed. The regression was then performed again, lagging the residuals two years. This continued until the t-statistic was no longer significant. Equation 5.1 shows the regression model used to test for autocorrelation.

$$RESID_i = \beta_0 + \beta_1 * RESID_{i-1} + \beta_2 * RESID_{i-2} + \ldots + \beta_x * RESID_{i-x} + \varepsilon_i \qquad (5.1)$$

Using residuals for Model I, Equation 5.1 resulted in significant t-statistics for lags one through eight indicating that eight degrees of autocorrelation existed within the model. For this reason, the Newey-West HAC estimation method was employed. Because the general assumption is that the residuals are serially uncorrelated, Newey and West proposed a more general estimator that assumes both serial correlation and heteroskedasticity and corrects for the effects of serial correlation and heteroskedasticity.[6] Notably, before this correction was made, *TRADWIN* was

[4] Ibid, 350.

[5] Ibid, 415.

[6] *Eviews 7: User Manual II,* 7th ed. (Irvine, CA: Qualitative Micro Software, 2011), 32.

positively correlated with giving and significant at the 99 percent level and *RELIGIOUS* was negatively correlated and significant at the 95 percent level.

Finally, the model was tested for constant variance, or homoskedasticity. Homoskedasticity is important because it ensures that the ordinary least squares estimators for each variable have a minimum variance. Without this minimum variance, it cannot be assumed that the estimated values of the coefficient lie close to the true values. Using the White test, homoskedasticity was confirmed in the Model I before using the Newey-West method. The White test regresses the squared OLS residuals on the OLS fitted values and on the squares of the fitted values.[7]

Equation 5.2 shows the final version of Model I, which was used to generate the statistics in Table I. The following subsection will consider the results and implications of the model.

$$Log(GIVING_i) = \beta_0 + \beta_1 * POST_i + \beta_2 * POSTWIN_i + \beta_3 * TRADWIN_i + \beta_4 * RESEARCH_i + \beta_5 * NORTHEAST_i + \beta_6 * PUBLIC_i + \beta_7 * RELIGIOUS_i + \beta_8 * LIBERAL_i + \varepsilon_i \quad (5.2)$$

Results and Implications of Model I

The goal of Model I was to determine if and to what degree the disparity in total annual giving between schools and years can be attributed to changes in different measures of ice hockey success. Looking at the measures of athletic success, *POST* was the only statistically significant measure. Because giving was logged in the regression equation, the coefficient does not give the marginal effects of a one-unit increase in the

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[7] Ibid, 848.

independent variables on the dependent variables. Equation 5.3 represents the first step to finding the marginal effect of attending the post season tournament.

$$\frac{y}{x_1} \times \frac{1}{y} = \beta_1 \tag{5.3}$$

Equation 5.4 modifies Equation 5.3 to show the formula for deriving the marginal effect:

$$\frac{y}{x_1} = \beta_1 \times \bar{y} \tag{5.4}$$

As demonstrated in Equation 5.4, the marginal effect of a one-unit increase in the dependent variable equals the coefficient as a percentage multiplied by the mean giving amount for all of the schools. This being mentioned, attending the NCAA tournament leads to an increase in giving of $230,730.85 using the average giving amount. This must be kept in perspective because school giving ranges over the period and schools from about 500 thousand dollars to over 680 million dollars.

Many of the dummy variables used to account for differences between universities and colleges also appeared statistically significant within the model. Although being located in the northeastern part of the country or being a school with a religious affiliation had low t-statistics, the variables *PUBLIC, RESEARCH*, and *LIBERAL* were all significant at the 99 percent level. All three of these variables also had a greater effect on giving than the variable that accounted for post season appearances.

Equation 5.5 shows the possible values for *RESEARCH*. Equation 5.6 shows that a value of one was assigned if a school was a public school and a value of zero was given if it was private. Equation 5.7 shows that a value of one was given if the school was located in the northeast. Finally, Equation 5.8 shows the possible values for *RELIGIOUS* and Equation 5.9 shows *LIBERAL*.

$$RESEARCH = \begin{cases} 1\ if\ research \\ 0\ if\ otherwise \end{cases} \tag{5.5}$$

$$PUBLIC = \begin{cases} 1\ if\ public \\ 0\ if\ otherwise \end{cases} \tag{5.6}$$

$$NORTHEAST = \begin{cases} 1\ if\ northeast \\ 0\ if\ otherwise \end{cases} \tag{5.7}$$

$$RELIGIOUS = \begin{cases} 1\ if\ religious \\ 0\ if\ otherwise \end{cases} \tag{5.8}$$

$$LIBERAL = \begin{cases} 1\ if\ liberal \\ 0\ if\ otherwise \end{cases} \tag{5.9}$$

The following section will review Model II, which aims to determine whether measures of athletic success explain variations in the level of giving to colleges and universities from alumni alone.

Model II Results: Alumni Giving

Table 5.3 is a summary of the OLS regression for athletic success and alumni giving. Again, the variable names and definitions are presented in the table, as well as the value of the coefficients and t-statistics.

TABLE 5.3

Model II: Ordinary Least Square for Alumni Giving

Variable	**Description**	**Model II**
C	Constant Term	15.08792*** (34.15563)
POST	Dummy variable for post season appearance	0.348135 (1.576785)
POSTWIN	Dummy variable for NCAA tournament win	0.249403 (0.675963)
TRADWIN	Number of NCAA tournament wins prior to 2000	0.253678*** (3.983086)
WINPCT	Winning percentage	0.136234 (0.160936)

R-Squared	**Adjusted R-Squared**	**F-Statistic**
0.111754	0.103697	13.87099

Fit of Model II

As discussed earlier, the r-squared and f-statistic are important measures when examining the validity and fit of a model. Looking at Model II, the dummy variables for school types were not included as in Model I greatly reducing the r-squared. Model II has an r-squared of only .1118 and an adjusted r-squared of .1037. Although these numbers indicate that the model explains 11.18 percent of the variation in alumni donations between the schools, this is still very interesting. While Model I accounts for almost 60 percent of the variation, it includes several non-athletic elements. Model II is noteworthy because it suggests that variations in athletic success account for around 11 percent of the differences in alumni donations. Moreover, the f-statistic was once again far above the minimum value for the 99 percent confidence interval at 13.87. The next subsection will delve deeper into the econometric issues of this specific model.

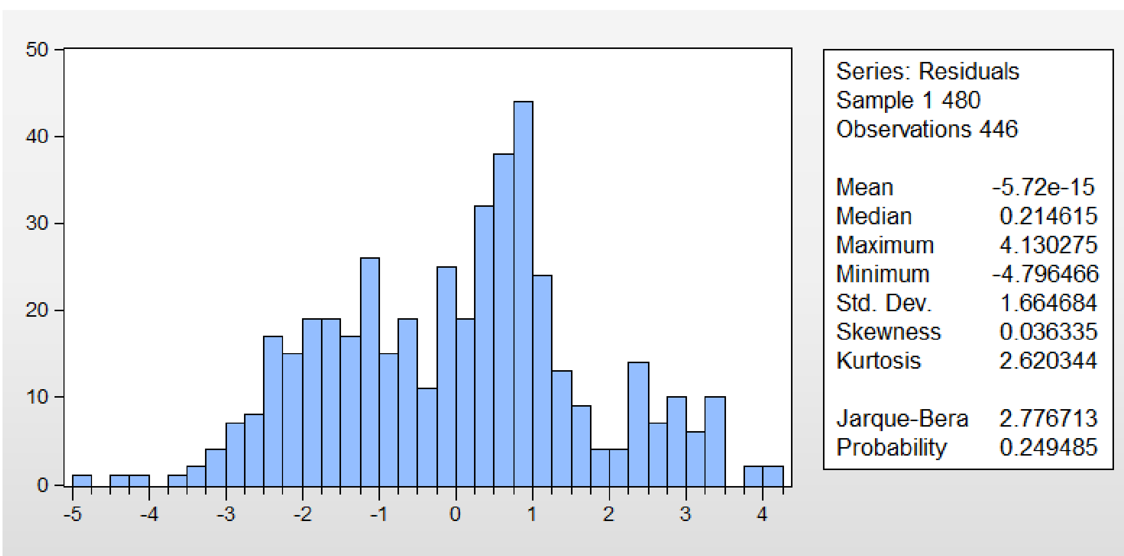
Econometric Issues for Model II

In order to ensure the validity of the results, econometric tests and fixes had to be applied to the model. The correlation matrix shown in Table 5.3 holds for all of the OLS and fixed effects models. Therefore, *POLL* and *TRADPOST* were excluded from the final regression equation because it led to multicollinearity.

Normality was again a problem; however, it was easily corrected using the logged measure of alumni giving. After employing this adjusted functional form of the first regression equation, the JB statistic in the model became 2.77. Assuming two degrees of freedom, this statistic is well below the maximum of 5.99. Figure 5.1 shows a histogram of the distribution of the residuals.

FIGURE 5.1

Model II: Histogram of Residuals



Similarly, serial correlation was tested for using the regression equation presented in Equation 5.1. The t-statistics for the lagged residuals were significant through the eighth lag. Therefore, eight degrees of autocorrelation also existed in this model. As in Model I, the Newey-West HAC method was used in an effort to correct the serial correlation problem. The correction resulted in lost significance. Before employing the correction, POST was significant at the 90% confidence level. This would have indicated that not only is overall giving sensitive to post season appearances, but alumni giving is also.

Finally, the model was tested for constant variance, or homoskedasticity. Homoskedasticity was detected using the White test ensuring that the estimated values of the coefficients lie close to the true values. The test was conducted before the Newey-West method was used. Equation 5.10 shows the final model that was created after accounting for the above tests and issues. The results and implications will be discussed in the next subsection.

$$Log(ALGIV_i) = \beta_0 + \beta_1 * POST_i + \beta_2 * POSTWIN_i + \beta_3 * TRADWIN_i + \beta_4 * WINPCT_i + \varepsilon_i \quad (5.10)$$

Results and Implications of Model II

Unlike Model I, Model II did not need to include dummy variables to account for generally stable university specific factors and to ensure the normal distribution of residuals. Looking at the t-statistics presented in the table above, only *TRADWIN* was statistically significant. The t-statistic of 3.98 puts *TRADWIN* in the 99 percent confidence interval, while the coefficient of .25 suggests that for every NCAA Division I men's ice hockey championship a school has before 2000 their alumni donations increase .25 percent or, using the average amounts, by $48,423.87. Again this figure needs to be considered carefully because it was derived using the average total of alumni donations over all years and all schools. Like with total giving, alumni donation totals vary greatly by school. This suggests that a tradition of hockey success impacts alumni donations; however, all measures of current success do not seem to have significance.

The previous sections have examined the OLS models used to determine whether differences in athletic success result in differences in overall and alumni giving levels across schools. The models found that overall giving is sensitive to post season appearances among other institutional factors, while alumni giving is more sensitive to a history of hockey success as measured by NCAA championships. The following sections will review the four fixed effects models presented in Chapter IV. For each model summary statistics will be provided and a discussion of results, implications, and econometric problems will be included.

Fixed Effects Regression Results

The four fixed effects models were used to test whether athletic success affects the amount of money that is donated to colleges and universities on a year-by-year, individual school level. For instance, does college XYZ receive more money in year A than year B because their hockey team was more successful in year A?

Model III Results: Overall Giving

While the OLS model for overall giving included various dummy variables to account for the differences between schools that initially led to normality problems, this could not be done in the fixed effects models. This being said, to test the affects of athletic success on overall giving on an individual school level, the schools had to be divided into three categories: large, public schools, small, public schools, and private schools. The private school category did not need to be divided into large and small because the range of sizes was not as drastic as within the public school category; public school enrollment ranged from 1,961 to 61,116, while private school enrollment only ranged from 1,876 to 25,124.

Table 5.4 is a summary of the fixed effects regression for athletic success and total giving at large, public schools. Table 5.5 is a summary of the fixed effects regression for athletic success and total giving at small, public schools. Table 5.6 is a summary of the fixed effects regression for athletic success and total giving at private schools. The name of the variable is presented with a brief definition as well as the value of the coefficient. The t-statistics are given in parentheses.

TABLE 5.4

Model III: Fixed Effects for Overall Giving At Large, Public Schools

Variable	**Description**	**Model III**
C	Constant Term	16.65763*** (53.65886)
POST	Dummy variable for post season appearance	0.124290** (2.142325)
POSTWIN	Dummy variable for NCAA tournament win	-0.094941 (-1.177689)
ENROLL	Total full-time enrollment	0.00000936 (0.892593)
WINPCT	Winning percentage	0.474710** (2.338899)

R-Squared	**Adjusted R-Squared**	**F-Statistic**
0.975696	.970397	184.1154

TABLE 5.5

Model III: Fixed Effects for Overall Giving At Small, Public Schools

Variable	**Description**	**Model III**
C	Constant Term	14.75147*** (15.72930)
POST	Dummy variable for post season appearance	-0.027786 (-0.181646)
ENROLL	Total full-time enrollment	0.0000761 (0.792734)
WINPCT	Winning percentage	0.413314 (0.538967)

R-Squared	**Adjusted R-Squared**	**F-Statistic**
0.731019	0.651906	9.240279

TABLE 5.6

Model III: Fixed Effects for Overall Giving At Private Schools

Variable	Description	Model III
C	Constant Term	17.30430*** (40.17504)
POST	Dummy variable for post season appearance	0.026033 (0.825471)
POSTWIN	Dummy variable for NCAA tournament win	-0.118125*** (-3.348664)
ENROLL	Total full-time enrollment	-0.00000775 (-0.157999)
WINPCT	Winning percentage	0.257063** (2.101570)

R-Squared	Adjusted R-Squared	F-Statistic
0.983087	0.979927	311.1366

Fit of Model III

Notably, the r-squared for each of the three models were very high at 0.9757 (large, public schools), 0.7310 (small, public schools), and 0.9831 (private schools). It is important to note that these figures are not very telling of the individual models. Specifically, a large amount of the variation in the dependent variables can be attributed school specific elements rather than actual changes in the independent variables. Rhoads and Gerking had similar findings in their fixed effects model and noted, “The much large coefficients of determination in the fixed effects estimates, compared with those for OLS, indicate the importance of controlling both university- and time-specific heterogeneity."[8]

Still, the f-statistics for all three models were good at 184.12 (large, public schools), 9.24 (small, public schools), and 311.14 (private schools). This suggests that university-specific variation in overall contributions is significantly different from zero.[9] Once again, the econometric issues of the model will be discussed in the next subsection.

Econometric Issues for Model III

Once again, the four assumptions had to be tested in Model III in order to ensure its validity. The four assumptions are: no multicollinearity, normal distribution of error terms, no serial correlation, and homoskedasticity.

Multicollinearity did not exist after the variable *POLL* was removed. Non-normal distribution of the error terms was found and therefore the log form of total giving in all three of the regressions was used. Still, non-normality existed and the data was divided into the three categories seen above. After testing several divisional variations (public and private, large and small, region, and age), the divisions shown above were chosen because they resulted in the most normally distributed residuals. Still, the large, public school and private school categories had problems with non-normality of error terms. As mentioned in the discussion of Model I, normality needs to be achieved in order to assure that the f-statistic, r-squared, and t-statistics are valid. Because of this, unusually large and unusually small giving amounts were removed

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[8] Thomas A. Rhoads and Shelby Gerking, "Educational Contributions, Academic Quality, and Athletic Success," *Contemporary Economic Policy* 18, no. 2 (2000): 254.

[9] Ibid, 254.

from the two models. Six data points were removed from the large, public school data set lowering the JB statistic from 136.32 to 5.69. Only two data points needed to be removed from the private school category. The original JB statistic was 26.62; however, after removing the two data points, the JB statistic fell below the maximum value to 4.21. The JB statistic for the small, public schools was 4.77 without removing any data points.

Serial correlation was tested in all three of the regressions using the method presented in Equation 5.1. The large, public school and private school regression equations had first-degree autocorrelation, while the small, public school model showed no signs of autocorrelation. In order to correct for autocorrelation within the model, an alternate coefficient covariance method was chosen in Eviews 7. The white period method was chosen because it assumes that the errors for a cross-section are serially correlated and therefore corrects for the effects of this correlation.[10]

The White test could not be used in Eviews 7 to account for heteroskedasticity within the three regressions; however, the white period method used to correct for serial correlation in the large, public school and private school models also assumes heteroskedasticity.[11] Therefore, the white period method corrected for any heteroskedasticity they may have been present in these two models. Because serial correlation was not detected in the small, public school version of the model, the white diagonal method was used opposed to the white period method. Unlike the white

[10] *Eviews 7: User Manual II,* 611.

[11] Ibid, 611.

period method, the white diagonal method does not assume that the errors are serially correlated. It does, however, fix for heteroskedasticity.[12]

Once again, the significance levels changed slightly after adding the corrections for autocorrelation and heteroskedasticity. Most notably, within the private school category, *POSTWIN* had a t-statistic of -1.07 and was not significant before employing the corrections. Equation 5.12 shows the final fixed effects model for total giving. Notably, the small, public school model did not include the *POSTWIN* variable.

$$Log(GIVING_i) = \beta_0 + \beta_1 * POST_i + \beta_2 * POSTWIN_i + \beta_3 * ENROLL_i + \beta_4 * WINPCT_i + \varepsilon_i \quad (5.12)$$

Results and Implications of Model III

Like several other studies, this portion of the study divided schools into categories. For the large, public school category, two of the measures of athletic success proved to be statistically significant at the 95 percent confidence level and positively correlated. The dummy variable *POST* has a coefficient of .12 indicating that when a given school's men's ice hockey team attends the post season tournament, the total giving increases by $90,473.46 the following fiscal year. The model also indicates that a team's winning percentage affects giving at large, public schools, although less than the *POST* measure. The coefficient value of .47 suggests that if a team were to increase its win percentage from zero percent to 100 percent, the total giving to the university would increase almost one half percent or, in monetary terms, by $345,551.97. Obviously improving from a winless season to an undefeated season is not feasible especially in college hockey. The data set included no instances of a win

[12] Ibid, 612.

percentage of zero or 100. Because of this it is interesting to consider that increasing win percentage by five percent would increase giving on average by $17,277.60. To put this in perspective, a team playing the only the maximum number of regular season games would increase their win percentage by five percent if they were able to win two more games a year.

Unlike with large, public schools, measures of athletic success had no significant impact on overall giving to small, public schools. Moreover, the variable *POSTWIN* had to be removed from this segment of the model because no small, public school won the NCAA tournament during the study period. In general, these schools had low hockey success rates that could have resulted in the insignificant variables. For instance, the championship has only been won by a small, public school six times since the tournament started in 1942 and only 14 of the 142 tournament appearances throughout the study period were attributed to the group as a whole. The average giving rate, eight million dollars, for the subset was also much lower than the rate, 72 million dollars, for all 48 schools.

Lastly, when looking at only private schools, two variables were significant. *POSTWIN* carried a negative sign and was significant at the 99 percent confidence level. Like with the large, public schools, *WINPCT* was significant and positively correlated with total giving. As shown in Table 5.6, *POSTWIN* carries a coefficient of -0.12 meaning that if a team wins a championship in a given year, the total donations for the next fiscal year will drop by $109,837.58, holding all else constant. *WINPCT* carries a coefficient of .26 indicating that a five percent increase in win percentage increases giving by $11,951.40 on average.

The following section will continue reviewing the fixed effects models used within this study. Specifically, the models are designed to look at a subsection of giving: alumni giving. The fit of the model, econometric problems, and implications and results will be explained.

Model IV Results: Alumni Giving

Schools were again divided into two categories to allow for normally distributed residuals. In the case of alumni giving, schools were divided into small and large schools. Unlike overall giving, they did not need to be broken down further into public and private categories. Table 5.7 is a summary of the fixed effects regression for athletic success and alumni giving at large schools. Table 5.8 is a summary of the fixed effects regression for athletic success and alumni giving at small schools. The name of the variable is presented with a brief definition as well as the value of the coefficient. The t-statistics are given in parentheses.

TABLE 5.7

Model IV: Fixed Effects for Alumni Giving At Large Schools

Variable	**Description**	**Model IV**
C	Constant Term	16.13704*** (45.13625)
POST	Dummy variable for post season appearance	0.065024 (1.166582)
POSTWIN	Dummy variable for NCAA tournament win	0.021055 (0.176616)
ENROLL	Total full-time enrollment	-0.0000219* (-1.716083)
WINPCT	Winning percentage	0.603478*** (3.185225)

R-Squared	**Adjusted R-Squared**	**F-Statistic**
.966150	.959585	147.1711

TABLE 5.8

Model IV: Fixed Effects for Alumni Giving At Small Schools

Variable	Description	Model IV
C	Constant Term	14.74768*** (35.40572)
POST	Dummy variable for post season appearance	-0.032299 (-0.463135)
POSTWIN	Dummy variable for NCAA tournament win	-0.433901** (-2.3788634)
ENROLL	Total full-time enrollment	0.0000451 (0.631060)
WINPCT	Winning percentage	0.405208* (1.776724)

R-Squared	Adjusted R-Squared	F-Statistic
.963428	.956891	147.3819

Fit of Model IV

As expected, the r-squared for each of the two models was very high. Shown in the tables above, the large school category had an r-squared of 0.9662 and for the small school category it was 0.9634. As in the previous models, the f-statistics were far greater than the required minimum for the 99 percent confidence interval. The small school f-statistic was 147.17 and the large school f-statistic was 147.38. The following subsection will continue to look at the two models focusing on the econometric issues and on the results and implications.

Econometric Issues for Model IV

As in the previous three models, *POLL* was removed from the equation in order to control for multicollinearity. Non-normal distribution of the residuals was also present. Taking the log of the dependent variable was the first correction employed in an effort to correct this problem. Although the errors terms were more normally distributed after using this technique, non-normality still existed and therefore, the data was split into the two categories, large and small, shown above. After using this fix, the JB statistic dropped to 26.76 for large schools and 11.58 for small schools. Outliers were removed from the data set. In the large school category, Ferris State had abnormally high alumni giving in the first year of the study. In the small school category, data from University of Alaska, Anchorage in year three and data from University of Minnesota, Duluth in year two was removed because the figures were unusually low. After making these final corrections, the JB statistic for the large school data set became 4.16 and 3.78 for small school data set.

First-degree autocorrelation was detected in large school regression using the method presented in Equation 5.1. The white period method described earlier was used to correct for the presence of serial correlation in this model and the possibility of heteroskedasticity. Because homoskedasticity could not be ensured using the White test, it was ensured the in the white diagonal method was used in the small school model. The final equation that was used to generate the statistics shown in the tables is presented in Equation 5.13.

$$Log(ALGIV_i) = \beta_0 + \beta_1 * POST_i + \beta_2 * POSTWIN_i + \beta_3 * ENROLL_i + \beta_4 * WINPCT_i + \varepsilon_i \quad (5.13)$$

The results and implications of Model IV will now be discussed. Significance levels changed after the use of the corrections for autocorrelation and heteroskedasticity. Before, *POSTWIN* had a t-statistic of -1.3, while *WINPCT* was significant with a t-statistic of 1.82.

Results and Implications of Model IV

To look at alumni giving, schools were classified as either large or small using the Carnegie Institution classifications. *WINPCT* was significant at the 99 percent confidence level for large schools and at the 90 percent level for small schools. For large schools, the coefficient of 0.60 indicates, using the average total alumni giving amounts, that a five percent increase in win percentage correlates to a $6,134.03 increase in total alumni giving. For small schools, the coefficient of .40 corresponds with an increase of $375.80 in alumni giving per five percentage point increase in win percentage.

Looking just at the large school category, enrollment or *ENROLL* was significant at the 90 percent confidence level and surprisingly had a negative correlation with the dependent variable, total alumni giving. When interpreted the model suggests that for every additional student enrolled full-time at a large school, alumni donations decrease by $4.45. Also surprisingly, *POSTWIN* was negatively correlated with alumni giving at the five percent significance level for small schools. The coefficient of -0.43 indicates that in years when a team wins the NCAA tournament, the following fiscal year total alumni donations fall by .43 percent or $77,650.94. Again this number was found using the mean alumni gift as a base. This number varies drastically by school. All other variables were found to be insignificant.

The next subsection will look at a different area of giving, giving specifically to athletics. The model aims to determine whether various measures of athletic success affect giving to athletics on an annual school-by-school basis.

Model V Results: Giving To Athletics

Data on giving to athletics was broken down into the three categories: large, small, public, and small, private. Table 5.9 is a summary of the fixed effects regression for athletic success and giving to athletics at large schools. Table 5.10 is a summary of the fixed effects regression for athletic success and giving to athletics at small, public schools. Table 5.11 is a summary of the fixed effects regression for athletic success and giving to athletics at small, private schools. The name of the variable is presented with a brief definition as well as the value of the coefficient. The t-statistics are given in parentheses.

TABLE 5.9

Model V: Fixed Effects for Athletic Giving At Large Schools

Variable	**Description**	**Model V**
C	Constant Term	13.66568*** (50.36555)
POST	Dummy variable for post season appearance	0.163019 (1.549013)
POSTWIN	Dummy variable for NCAA tournament win	0.187922* (1.782052)
ENROLL	Total full-time enrollment	0.00000186 (0.144214)
WINPCT	Winning percentage	0.469911* (1.738433)

R-Squared	**Adjusted R-Squared**	**F-Statistic**
0.929471	0.915455	66.31772

TABLE 5.10

Model V: Fixed Effects for Athletic Giving At Small, Public Schools

Variable	Description	Model V
C	Constant Term	12.39496*** (20.00187)
POST	Dummy variable for post season appearance	-0.044159 (-0.226218)
ENROLL	Total full-time enrollment	-0.0000825 (-0.910623)
WINPCT	Winning percentage	0.376736 (0.950092)

R-Squared	Adjusted R-Squared	F-Statistic
.858062	.809905	17.81783

TABLE 5.11

Model V: Fixed Effects for Athletic Giving At Small, Private Schools

Variable	**Description**	**Model V**
C	Constant Term	15.89501*** (6.956326)
POST	Dummy variable for post season appearance	0.274115 (1.051362)
ENROLL	Total full-time enrollment	-0.000728 (-1.493745)
WINPCT	Winning percentage	-0.114028 (0.254914)

R-Squared	**R-Squared**	**F-Statistic**
0.915697	0.897046	49.09596

Fit of Model V

Once again, the three models had high r-squared figures and need to be viewed skeptically. The f-statistics were also very high and significantly greater than the 99 percent confidence interval minimum. The f-statistics imply that changes in the dependent variable are caused by changes in the independent variables. Keeping these things in mind, it is helpful to more closely examine the econometric issues that had to be corrected in the model.

Econometric Issues for Model V

Very similar econometric issues existed in Model V as the previous four models. The fixes were generally the same as well. Multicollinearity did not exist between the independent variables after *POLL* was removed from the equation. Non-normality was again a major issue that needed to be resolved. Schools were split into the categories of large, small, private, and small, public after the logged form of athletic giving was added to the equation. It seems somewhat intuitive that these divisions helped account the most for the non-normality problem. Large schools generally have more Division I programs than small schools and thus would need more voluntary support in order to operate and compete at a high level. Similarly, small, private schools would also need more voluntary support than small, public schools because of the lack of government funding. These small, private schools also generally have much better hockey programs than the small, public schools again increasing the amount of funding need that is expected.

After dividing the schools into these three categories, the JB statistic for large schools was 4.51 indicating that the residuals were normally distributed. The JB statistic for small, private schools also fell below the minimum value of 5.99 to 2.96; however, the JB statistic for small, public schools remained at 10.27. Because of this, three data points were removed from the study. After this adjustment was made the JB statistic became 1.93.

First-degree autocorrelation was again a problem in the small, private school category and the large school category. In other words, correlation existed between the error terms across time. No serial correlation existed in the fixed effects regression model for the small, public schools. Homoskedasticity once again could not be tested for. The first degrees serial correlation was corrected for and homoskedasticity was insured by using the white period method, while the white diagonal method was used for small, public school regression. Equation 5.13 represents the final version of the model for athletic success and athletic giving. Notably, *POSTWIN* was only included in the regression for large schools.

$$Log(ATHGIV_i) = \beta_0 + \beta_1 * POST_i + \beta_2 * POSTWIN_i + \beta_3 * ENROLL_i + \beta_4 * WINPCT_i + \varepsilon_i \qquad (5.13)$$

After employing the corrections, all significance within the small, private school category was lost. Furthermore, *POST* was initially significant at the 90 percent confidence interval and *ENROLL* was significant at the 99 percent confidence level.

Results and Implications of Model V

Looking specifically at giving to athletics, *WINPCT* was significant at the 90 percent confidence level for large schools. The coefficient indicates, using the average total alumni giving, that a five percent increase in win percentage correlates to a $792.48 increase in giving to athletics directly.

POSTWIN was also significant at the 90 percent confidence interval for large schools. Notably, while it has been negatively correlated with all other measures of giving, it carried a positive sign in this model. The model suggests that when a team wins the national championship, giving to athletics increases by $5,498.48 on average and holding all else constant. Unfortunately, *POSTWIN* was not included in the small, public or small, private school models. None of the schools classified as small, public won the national championship during the study period and the only small, private school that won during the period was the University of Denver. Figures for athletic giving could not be obtained for the years following their two wins. The next subsection aims to determine whether various measures of athletic success affect giving to academics.

Model Six Results: Giving To Academics

When looking at giving to academics, schools were divided into categories by age. Schools that were founded before 1850 were put into the “old” category, those founded between 1850 and 1900 were placed in the “middle-aged” category, and those schools that were founded after 1900 were placed in the “young” category. Table 5.12 is a summary of the fixed effects regression for athletic success and giving to academics at old schools. Table 5.13 is a summary of the fixed effects regression for athletic success and giving to academics at middle-aged schools. Finally, Table 5.14 is a summary of the fixed effects regression for young schools. The name of the variable is presented with a brief definition as well as the value of the coefficient and the t-statistics.

TABLE 5.12

Model VI: Fixed Effects for Academic Giving At Old Schools

Variable	Description	Model VI
C	Constant Term	13.53723*** (8.784478)
POST	Dummy variable for post season appearance	-0.076885 (-0.674898)
POSTWIN	Dummy variable for NCAA tournament win	-0.582014*** (-3.371635)
ENROLL	Total full-time enrollment	0.000110 1.047723
WINPCT	Winning percentage	0.046493 (0.151055)

R-Squared	Adjusted R-Squared	F-Statistic
0.938145	0.922519	60.03549

TABLE 5.13

Model VI: Fixed Effects for Academic Giving At Middle-Aged Schools

Variable	Description	Model VI
C	Constant Term	13.33863*** (33.28074)
POST	Dummy variable for post season appearance	0.028698 (0.206513)
POSTWIN	Dummy variable for NCAA tournament win	0.164315 (1.211584)
ENROLL	Total full-time enrollment	0.0000480*** (2.865024)
WINPCT	Winning percentage	0.608289 (1.589880)

R-Squared	Adjusted R-Squared	F-Statistic
0.939525	0.927505	78.16374

TABLE 5.14

Model VI: Fixed Effects for Academic Giving At Young Schools

Variable	Description	Model VI
C	Constant Term	12.88992*** (12.17210)
POST	Dummy variable for post season appearance	-0.509090*** (-2.829258)
ENROLL	Total full-time enrollment	0.0000232 (0.221163)
WINPCT	Winning percentage	0.795134 (1.194921)

R-Squared	Adjusted R-Squared	F-Statistic
0.915059	0.886745	32.31847

Fit of Model VI

Looking at giving to academics within colleges and universities, similar r-squared and f-statistic results were found. Data from old schools resulted in an r-squared 0.9381 and an f-statistic of 60.04. The regression for schools founded between 1850 and 1900 had an r-squared of 0.9395 and an f-statistic of 78.16, while the regression for young schools had an r-squared of 0.9150 and an f-statistic of 32.32. All of these f-statistics are above the minimum value for the 99 percent confidence interval. Econometric issues will be discussed next.

Econometric Issues for Model VI

Multicollinearity, non-normal distribution of the error terms, and autocorrelation were found to be problems in the initial fixed effects model for academic giving presented in Chapter IV. Heteroskedasticity could not be tested for. Non-normal distribution of the error terms was adjusted by taking a different functional form of the equation: the log of giving to academics. As in the other fixed effects models, this did not completely solve the problem. The schools were again divided. In regards to academics, giving appeared to be most sensitive to the age of the university. Placing schools founded before 1850 into the category of old made the JB statistic fall to .77, while the regression models for the middle-aged and young categories still had issues with normality. In the young category, two data points were removed. After employing this fix, the JB statistic became 1.84. After removing four data points from the middle-aged category, the JB statistic became 3.84.

First-degree autocorrelation was detected in the old and young categories using the same method employed throughout the study. Second-degree autocorrelation was found in the regression model for the middle-aged schools. Because of this, the white period method was again chosen as the coefficient covariance calculation method for all three equations. This method also corrected any instances of heteroskedasticity that may have existed. The significance of certain variables changed after the corrections were used on the equations. For instance, *POSTWIN* was not significant in the original model for old schools and *WINPCT* had a t-statistic of 2.04 in the first model for middle-aged schools. In order to more completely discuss the results and implications next, Model V in its final form is presented below in Equation 5.14.

$$Log(ACGIV_i) = \beta_0 + \beta_1 * POST_i + \beta_2 * POSTWIN_i + \beta_3 * TRADWIN_i + \beta_4 * WINPCT_i + \varepsilon_i \quad (5.14)$$

Results and Implications of Model VI

Within the old category, only the measure for post season wins was significant. Notably, it again carried a negative sign. The coefficient was also relatively large at .58. In other words, if a team wins the NCAA championship, giving to academics will decrease the following fiscal year by $51,293.59, on the average and holding all else constant.

For young schools, *POST* was the only significant measure of athletic success and was negatively correlated with giving to academics. The t-statistic for this variable was -2.83. The models says that if a team from a school founded after 1900 attends the NCAA post season tournament, giving to academics will fall by $13,071.03 the following fiscal year. *POSTWIN* was excluded from this model because no school founded after 1900 won the NCAA tournament during the ten year study period.

Lastly, looking at schools founded between 1850 and 1900, none of the measures of athletic success were significant; however, *ENROLL* was significant at the 99 percent confidence interval. For schools founded between 1850 and 1900, every additional full-time student results in an increase in giving to academics by $3.18.

All six of the models have been thoroughly reviewed and explained including implications and econometrics problems. The final sections of this chapter will review limitations of the study including areas for further research and final conclusions.

Limitations of this Study

In order to completely understand the findings presented throughout this chapter it is important to discuss the limitations of the study. The first limitation was the availability of data. Chapter IV mentioned that although most schools report most data to the VSE on a yearly basis, data was certainly missing. Contacting the development offices of schools with missing data helped fill in missing pieces; still, several schools did not respond or would not disclose information. The length of data was also a limitation. While ten years of information and a total of 480 observations is an acceptable data set, the study would be more robust with more years. Given the time restraints and availability of data, collecting information over a longer time span was not feasible for this project. Problems with multicollinearity may have also been solved by adding more data, ensuring that omitted variable bias did not exist. Next, certain data points were removed in order to correct for the non-normal distribution of the error terms. A perfect study would include a model that was able to account for the outliers. Finally, it would have been beneficial if the same divisions in the data could have been used for every model. For instance, the study divided the fixed effects model for total giving into three categories, small schools, large, public schools, and large, private schools, and the alumni giving model was just divided into small and large school categories. By dividing all the data sets into the same categories the regressions would be more comparable. Unfortunately this was not possible because of the non-normal distribution of the error terms.

The aforementioned problems have hindered the study and its ability to grasp the full affects of Division I ice hockey success on giving. Therefore, they act as suggestions for future research. The topic can be improved by expanding the data set to include a greater time period and all programs. Furthermore, with a larger amount of data, the likelihood of the coming across the normality problems that plagued this project will decrease. Decreased normality problems will increase the robustness of future studies because data points will not need to be excluded and researchers can have more freedom in dividing schools. With this, future studies may consider dividing schools further to test the affects of athletic success on various types of schools. Many of the studies considered in Chapter II used this technique with basketball and football; however it was not feasible in this study. Finally, future studies may include a variable to account for television appearances or wins on television.

Final Conclusions

As schools are becoming more and more reliant on voluntary contributions, the cost of college sports in many instances is becoming more and more taxing on already constricted university budgets. With this being said, many argue that sports should not have such a focus within an institutional setting, while others contend that they bring about important externalities. One of the proposed benefits of having sports programs, and specifically successful ones, is that they generate increased donations. As presented in Chapter II, a great deal of research has been conducted on this topic; however, it has focused almost exclusively on the effects of successful football and basketball programs. These various studies have also generated a mix of findings, but generally measures of athletic tradition and post season play seem to be somewhat consistent factors affecting charitable contributions to colleges and universities.

Therefore, this study has aimed to test the relationship between NCAA Division I men's ice hockey and voluntary contributions to institutions of higher education, specifically asking, "Do various measures of athletic success impact donor behavior?" Using data from ten years and 48 institutions with NCAA Division I men's ice hockey teams, the study built OLS and fixed effects regression models. The OLS models examined whether win percentage, a tradition of hockey success, post season play, and post season wins affect total giving and alumni giving across universities. The models concluded that total giving is sensitive to a tradition of hockey success measured by the number of championships won prior to 2000 and that alumni giving is positively correlated with post season appearances.

The fixed effects models used the same data set, but aimed to test whether athletic success leads to changes in overall giving, alumni giving, giving to athletics, and giving to academics within a single institution. The data was split into categories in order to ensure normality. In general, the effects of different measures of success impacted schools differently. In the overall giving model, win percentage led to an increase in giving for large, public schools and private institutions. Post season play was also positively correlated with giving for large, public schools and championships negatively impacted giving to private schools. Alumni giving was sensitive to all of the measures depending on the classification. Notably, post season wins was significant for small schools but had a negative sign, while enrollment was significant and negative for large schools. This is in contrast to what theory suggests and other studies have found. Looking at giving to athletics, win percentage appears to be significant for some schools, while post season wins positively affected giving to athletics at large schools.

Lastly, the model for giving to academics shows that none of the measures of athletic success affect this type of giving except for championships which was significant and negatively correlated in both of the models that included it as a variable.

In sum, this study has aimed to expand the research around athletic success and giving into the realm of hockey. It appears that in general giving is affected by hockey success; however, the affect is dependent on the type of giving, the measure of success, and the type of school. Furthermore, this study contradicts previous research on football and basketball, by suggesting that when post season wins are significant, they actually negatively affect giving (except in the case of giving to athletics).

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