ABSTRACT

Title of Document: EXAMINING THE INFLUENCE OF
                          SELECTIVITY ON ALUMNI GIVING AT
                          PUBLIC UNIVERSITIES: A DYNAMIC PANEL
                          MODELING APPROACH

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This study examines the influence of institutional selectivity on alumni giving among public research universities, using a conceptual framework based on the economics of nonprofit organizations.   This study introduces a dynamic panel modeling technique, which addresses many limitations that more traditional statistical models have when applied to panel data with lagged or "dynamic" variables. Using panel data from 147 public universities over 11 years, the analysis for this study compares the results from ordinary least squares (OLS), fixed effects, and instrumental variable (2SLS) regression with a dynamic fixed effects panel model using a procedure proposed by Blundell and Bond (1998). This dynamic panel modeling technique allows researchers to simultaneously discern the relationship between variables and take into account the possible endogeneity and omitted

variable biases, as well as determine conditional convergence or divergence of the values of key observed variables over time.

The results indicate that ordinary least squares, fixed effects, and instrumental variable regression models yield different coefficients, standard errors, and probability values for hypothesis tests. Results from the most robust technique, a dynamic panel fixed effects model using system generalized method of moments, did not indicate that a statistically significant relationship exists between student selectivity and alumni giving. However, the presence of a law or medical program and institutional wealth were statistically significant. Additionally, there is no evidence of convergence or divergence of alumni giving rates.

The results from this analysis have a number of implications. First, the statistically insignificant relationship between selectivity and alumni giving challenges a major paradigm in the literature regarding the influence of this measure of prestige on alumni giving. Future studies should test the influence of other conceptions of prestige and donative support, using dynamic panel modeling, to see if the results are similar. Second, this analysis shows that statistical models prominent in the literature can yield misleading results when applied to panel data. Researchers, therefore, must take great care in using the most appropriate technique when examining dynamic panel data. Finally, this analysis indicates that more complex modeling techniques are required to study alumni giving over time.

EXAMINING THE INFLUENCE OF

SELECTIVITY ON ALUMNI GIVING AT PUBLIC UNIVERSITIES:

A DYNAMIC PANEL MODELING APPROACH

By

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CHAPTER 1

INTRODUCTION

This study examines the influence of an institution's selectivity on the amount of alumni giving among public research universities. Defining prestige as student selectivity and using a conceptual framework based on the economics of nonprofit organizations, this study addresses the following research questions:

1. After taking into account predictors of student selectivity, to what extent does an institution's selectivity influence alumni giving at public research universities?

2. Taking into account student selectivity, is there evidence of convergence or divergence among public research universities over time in alumni giving?

In the second research question, convergence occurs when alumni giving rates approach the average rate over time. Divergence, on the other hand, occurs when alumni giving rates move away from the average rate over time.

The research questions in this study are pertinent because of the increasing importance of donative revenue in higher education. Over time, public colleges and universities have experienced declining revenues, resulting from reductions in state appropriations (Heller, 2006; Mortenson, 2004) and increasing costs (Winston, 1999; Zemsky, Wegner, & Massy, 2005). Public colleges and universities are forced to offset declining revenues by seeking private support (Conley & Tempel, 2006). Revenues from non-tuition-based sources, such as alumni giving, are required to offset reductions in state

appropriations and increased administrative costs. The practice of raising funds from alumni and other private sources has implications for tuition, which in turn affects college access and the services higher education institutions can offer for the public good. The research questions for this study are designed to contribute to the higher education literature by using panel data (also known as time series cross-sectional (TSCS) data) and the most appropriate and robust statistical technique to discern if selectivity influences alumni giving over time.

The research questions for this study are relevant for four reasons. First, many public research universities have sought to increase their prestige within the higher education industry at great expense, in part to increase their magazine rankings (especially the *U.S. News and World Report* rankings) and financial resources (including alumni giving) (Geiger, 2004; Hoxby, 1997; O'Meara, 2007; Volkwein & Sweitzer, 2006; Winston, 2000; Zemsky, Shaman, & Shapiro, 2001). Second, aside from a few of studies on alumni giving (Gottfried & Johnson, 2006; Harrison, 1995; Harrison, Mitchell, & Peterson, 1995; Monks, 2003; Yoo & Harrison, 1989), most research focuses on only one institution or does not use panel data. Third, most of the literature that addresses selectivity or alumni giving is disproportionately focused on private nonprofit four-year colleges and universities, without as much attention to public four-year higher education institutions. Fourth, few studies use an organizational perspective of colleges and universities to examine alumni giving, nor does the alumni giving literature examine how changes in alumni support may be influenced by changes in institutional selectivity. Instead, prior studies focused on the relationship between alumni giving and individual characteristics. This study attempts to address these limitations in the literature. This

chapter will describe the purpose of the study, provide a background for the problem, present a conceptual framework, and briefly describe the methodology used in this research.

Purpose of the Study

The purpose of this study is to examine whether selectivity influences the amount of alumni giving among public research universities. Using a conceptual framework based on the economics of nonprofit organizations (Garvin, 1980; Winston, 1999), this study proposes an approach that allows one to explain the influence of selectivity on alumni giving, taking into account predictors of selectivity and unobservable institutional level variables. Additionally, the second research question explores the extent to which, over time, there is a divergence or convergence in alumni giving among public research institutions, given the predictors of alumni giving.

This study demonstrates the use of an appropriate approach to examine alumni giving in higher education using panel data. This study uses dynamic fixed effects panel (DFEP) modeling to examine if selectivity influences alumni giving. This approach can provide a basis for examining other research questions on alumni giving at higher education institutions, using panel data and appropriate statistical techniques.

Background of the Problem

According to the Council for Aid to Education, 59% of individual donations to higher education institutions in fiscal 2007 came from alumni (Kaplan, 2008). Because donative support of higher education is developing into a significant source of revenue

(Conley & Tempel, 2006), research on alumni giving is becoming more important. This section illustrates two basic problems in higher education research when studying alumni giving and private support: theoretical justifications for donor behavior and increasing costs in higher education.

Andreoni (2006) observes that philanthropy and donor behavior are puzzling concepts for economists. It is not easy to incorporate an unselfish act into a field based on the study of self-interested behavior. Neoclassical economic theories cannot adequately explain philanthropy and donative support. These theories typically presume that donors make rational decisions with perfect information so that any contributions benefit the well-being of the donor. Under this perspective, the act of philanthropy benefits the donor. This perspective, however, does not reflect actual behaviors observed in the philanthropic environment (Andreoni, 2006). Alternative explanations are required to explain donor behavior.

In higher education, understanding donor behavior is becoming more important because non-tuition revenues are used to address the problem of higher college costs. Reducing costs and enhancing efficiency have been longstanding problems in higher education. Colleges and universities have long been criticized for experiencing cost and tuition increases beyond the rates of inflation (Ehrenberg, 2002b; Johnstone, 2001). Critics of higher education who claim that colleges and universities are not cost efficient implicitly assume that the majority of colleges and universities should behave as businesses adhering to the economic model of a "firm" or a for-profit organization. The neoclassical economic theory of the firm posits that cost minimization is a characteristic of profit maximizing behaviors. This theory, however, is not appropriate when examining

not-for-profit higher education institutions (Garvin, 1980; Hansmann, 1981; Weisbrod, 1988). Instead of maximizing profits or increasing efficiency by cutting unprofitable services, many public colleges and universities increase their prestige to increase college rankings and financial resources (O'Meara, 2007). Although this strategy appears to be successful for wealthy institutions, colleges and universities that strive to increase prestige also increase costs (O'Meara, 2007; Winston, 1999). Higher education institutions attempt to cover these increased costs with revenue generated from grants (mostly from research) and donative support such as alumni giving.

Although prestige has been identified by a number of scholars (O'Meara, 2007; Winston, 2009) as a mechanism for increasing costs, the concept has many definitions. For the purposes of this study, prestige is defined as student quality measured by student selectivity (Brewer, Gates, & Goldman, 2002; Geiger, 2004; Hoxby, 1997; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b). Although there is much evidence that student selectivity is a poor predictor of outcomes and of student quality (Pascarella, 2001; Pascarella et al., 2006; Pascarella & Terenzini, 2005; Pike, 2004), scholars (Brewer, Gates, & Goldman, 2002; Geiger, 2004; Hoxby, 1997; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) still view selectivity as a measure of an institution's prestige in conjunction with faculty research productivity (Brewer, Gates, & Goldman, 2002), success in intercollegiate athletics (Tucker & Amato, 1993), and college rankings (O'Meara, 2007).   Several studies (Ehrenberg, 2002a; Geiger, 2004; Hoxby, 1997; Machung, 1998; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b; O'Meara, 2007; Winston, 1999) provide evidence that higher education administrators increase the student selectivity of their institutions in

an effort to enhance the prestige of their colleges or universities. As a result, this study focuses on the influence of prestige, measured by student selectivity, on alumni giving at public research universities.

Increasing the selectivity of a college or university has both positive and negative consequences. Although higher education institutions with high prestige appear to have more resources and higher graduation rates (Geiger, 2004; Meredith, 2004; Winston, 1999), there may be several unintended consequences. Some scholars claim that investing in prestige increases tuition prices (Winston, 1999) and consequently limits access to college for minority and low income students (Bernal, Cabrera, & Terenzini, 2002; Meredith, 2004), reduces the emphasis on classroom engagement and student learning (Pascarella & Terenzini, 1991; Pike, 2004; Winston, 1999), increases faculty workload, and reduces institutional diversity (O'Meara, 2007).

In spite of efforts to learn more about the effects of prestige on colleges and universities, little is known about how prestige impacts donative support and alumni giving over time. Using a theoretical framework grounded in the economic model of nonprofit organizations and extended to public higher education institutions, this study examines how one definition of prestige (student selectivity) influences alumni giving at public research universities.

Conceptual Framework

The conceptual framework for this study is based on economic concepts that describe how nonprofit organizations, such as research universities, strive to increase their prestige or status rather than maximize profits (Garvin, 1980; Newhouse, 1970).

This framework departs from the traditional economic model of profit maximization to describe the behavior of nonprofit organizations and provides an alternative framework using the concept of utility (Garvin, 1980; Lee, 1971; Newhouse, 1970; Valentinov, 2006). According to Lee (1971) utility is used in economics to describe all the factors that affect the well-being of individuals, including administrators within nonprofit organizations. These factors include salary, prestige, security, power, recognition, and professional standing. Given Lee's (1971) conceptualization of utility as applied to nonprofit higher education institutions, the underlying assumption of this framework suggests that college administrators and faculty at nonprofit colleges and universities engage in utility-maximizing behavior by seeking to increase the prestige of their institutions.

Drawing on the broader economic literature on nonprofit organizations, this dissertation will discuss why these organizations seek to maximize prestige (under the auspices of quality) instead of profits. The discussion of the economics of nonprofit organizations will focus on public research universities and describe how these institutions increase utility by maximizing prestige. The study utilizes a theoretical framework that includes concepts reflecting institutional prestige of and alumni giving to public research universities.

The reasons that public research universities maximize prestige originated within the broader economics literature on nonprofit organizations. When describing nonprofit organizations, scholars (Hansmann, 1981; Lee, 1971; Newhouse, 1970; Raines & Leathers, 2003; Weisbrod, 1988) note that the lack of incentives to maximize profits allow administrators of nonprofit organizations to focus on other outcomes, such as

prestige. Because nonprofit organizations aren't legally permitted to distribute any surplus revenues to owners, administrators in nonprofit organizations seek to maximize utility in other ways (Lee, 1971; Newhouse, 1970; Valentinov, 2006). At most nonprofit organizations, an administrator's values are aligned with the values of the organization. Any enhancement to the organization itself or to its prestige enhances the administrator's well-being and utility (James & Rose-Ackerman, 1986; Newhouse, 1970). In an effort to increase the prestige of the organization, administrators of nonprofit organizations seek to increase the quality of the product or services produced by the organization (Lee, 1971; Newhouse, 1970).

These observations of nonprofit organizations are also applicable to nonprofit higher education institutions, including public research universities. Many nonprofit colleges and universities also increase utility via prestige maximization. Like the broader nonprofit sector, nonprofit colleges and universities do not seek to minimize costs in order to maximize profits (Winston, 1999). Instead, many nonprofit colleges and universities divert excess revenues to subsidize activities that may be associated with prestige-maximizing behaviors, such as increasing the student selectivity of the institution (Geiger, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) or recruiting talented faculty (Ehrenberg, 2002b; Garvin, 1980). These activities require extra revenues from external sources, such as alumni donations, to cover increased costs.

Applying the nonprofit economic framework advanced by several scholars (e.g., Garvin, 1980; Winston, 1999) to higher education, alumni giving and other non-tuition-based revenue provides college and university administrators the resources to maximize utility via increases in prestige. This theoretical framework posits that alumni giving

would increase as prestige is maximized at a college or university. Although some level of altruism may be present in alumni who give to a college or university, several scholars (Leslie & Ramey, 1988; Rose-Ackerman, 1996) suggest that alumni seek to maximize utility in their relationships with the college or university as well. Alumni gain satisfaction through the success or prestige of their institution because of the close relationship they have with the university as former students (Rose-Ackerman, 1996). While alumni may be motivated to make a donation by other factors in addition to the prestige of an institution, this study examines prestige as a primary motivator. Other motivations of alumni giving are explored in more detail in chapter 2.

As stated above, this study defines prestige in terms of an institution's student selectivity (Geiger, 2004; Hoxby, 1997; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b). While recognizing that prestige may also be viewed in terms of faculty research productivity (Brewer et al., 2002; Dey, Milem, & Berger, 1997; Melguizo & Strober, 2007; Milem, Berger, & Dey, 2000), success in intercollegiate athletics (Brewer et al., 2002; Tucker & Amato, 1993), or college rankings (O'Meara, 2007), this study utilizes a narrow definition of prestige to simplify the model. Using the student selectivity definition of prestige, Figure 1.1 presents this study's conceptual framework, which illustrates the hypothesis that prestige influences alumni giving. As shown in Figure 1.1, current alumni giving is a function of previous alumni giving, prestige, and other institutional characteristics. Prestige is a function of an institution's wealth and level of expenditures. The model includes only constructs at the institutional level of analysis.

Previous Alumni
Giving

Wealth
(Endowment)

Expenditures

Prestige

Institutional
Characteristics
& Controls

Current Alumni
Giving
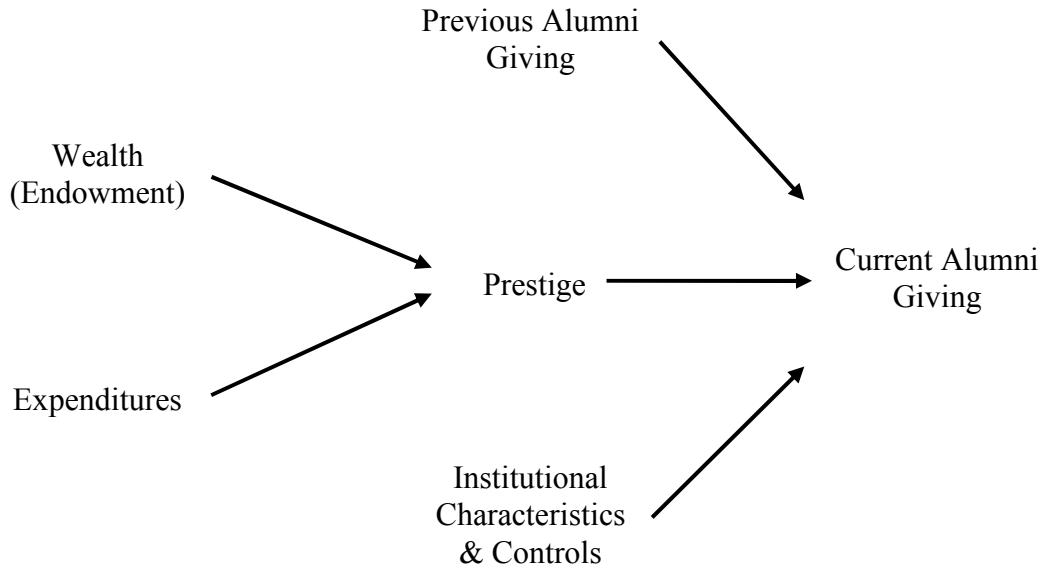
Figure 1.1. Conceptual framework: A dynamic model of alumni giving

The conceptual framework for this study is represented by a system of equations. Given

the above conceptual framework, alumni giving (AG_{it}) in the current period is a function

of alumni giving (AG_{ir-1}) in a previous period, prestige (P_{it}), and other institutional

characteristics (IC_{it}) known from the literature to influence alumni giving. This dynamic

conceptual framework is reflected in the equation presented below:

$$AG_{it} = f(AG_{it-1}, P_{it}, IC_{it}) \qquad (1.1),$$

where *i* denotes the institution and *t* denotes the year. Within this conceptual framework,

prestige is presumed to be an endogenous variable with its own predictors, such as

institutional wealth (W_{it}) and institutional expenditures (E_{it}), as reflected in the second equation presented below:

$$P_{it,} = f(W_{it}, E_{it}) \qquad (1.2).$$

This conceptual framework is grounded in the economic theory of the nonprofit organization and extended to higher education institutions to help explain the influence of selectivity on alumni giving among public research universities.

Methodology

Because the above conceptual framework is dynamic in nature, this study employs an advanced econometric technique known as dynamic fixed effects panel (DFEP) modeling to examine the influence of selectivity on alumni giving among public research universities. Using panel data, DFEP modeling allows researchers to simultaneously discern the relationship between variables and take into account the possible non-stationary data as well as endogeneity and omitted variable biases. Additionally, DFEP modeling enables analysts to determine conditional convergence or divergence of the values of key observed variables over time. In this study, DFEP modeling techniques are used to address the research questions. This section briefly describes the research design, the data used for the analysis, the statistical method, and the limitations of this study.

Research Design

The research design involves the use of panel data, also known as time series-cross sectional (TSCS) data covering 147 public research universities across 11 years,

from fiscal 1997 through fiscal 2007. The panel data are based on surveys of colleges and universities that contain institutional information such as endowment income, expenditures, alumni giving, student selectivity, faculty research, and other related variables.

<center>*Data*</center>

This study utilizes secondary data drawn from three distinct sources. The first data source is the Integrated Postsecondary Education Data System (IPEDS), sponsored by the National Center for Education Statistics (NCES). The data collected in these surveys provide aggregate measures of an institution's yearly financial, enrollment, and institutional characteristics (e.g., institutional mission, degree offerings, sector of institution). NCES conducts regular technical quality control studies of the data to ensure the surveys are standardized across institutions and the integrity of the data is maintained (Jackson, Peecksen, Jang, & Sukasih, 2005). IPEDS data are based on the collection of information from eight surveys. For this study, IPEDS data are drawn from the Institutional Characteristics, the Completions, the Fall Enrollment, and the Finance surveys. These surveys provide enrollment, institutional expenditures, institutional type, and the presence of professional degree programs as variables in this study.

The second data source draws from an annual survey on voluntary support from the Council for Aid to Education (CAE). Beginning in 1957, the CAE has conducted the Voluntary Support of Education (VSE) yearly surveys in all sectors of education, from colleges and universities to secondary schools. The survey collects data in such areas as grants, gifts, endowments, real estate, deferred gifts, cash payments, number of

alumni/individuals solicited, number of alumni/individuals that gave, and other forms of support from various sources (alumni, individuals, and organizations). The VSE survey provides standard measures across institutions for every year the survey has been offered. This study draws on alumni giving and endowment data in the VSE survey.

The third data source comes from the *U. S. News and World Report* indicators that are used to develop the magazine's ranking scheme. Although prior to 1990 there were concerns about the integrity of the data that *U. S. News* used (Mallette, 1995), the definitions for the *U.S. News* data are consistent across institutions for the years of interest in this study. The *U. S. News* rankings provide institutional student selectivity data as measured by the midpoint of SAT/ACT test scores of the institution's incoming freshmen class. Together, these data sources result in 147 public research universities that have participated in all three surveys between fiscal 1997 and fiscal 2007, potentially yielding 1,364 cases.

Statistical Method

This study employs DFEP modeling techniques to address the research questions. This statistical technique is appropriate for this study for at least three reasons. First, due to the panel data and the dynamic nature of the equations in the model (Equations 1.1 and 1.2) that will be used in this study, several researchers (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998) recommend a DFEP modeling technique as the most appropriate statistical method. Second, DFEP modeling techniques allow researchers to take into account the possible endogeneity of key predictor variables. In

this study, selectivity is posited to be a key predictor of alumni giving and addressed in the following research question:

1. After taking into account predictors of student selectivity, to what extent does an institution's selectivity influence alumni giving at public research universities?

Third, while taking into account the possible endogeneity of variables and unobserved effects or omitted variable bias, DFEP modeling techniques allow researchers to determine whether, among units of analysis (e.g., colleges and universities), convergence or divergence in the value of a variable of interest (e.g., alumni giving) is occurring over time. In this study, the coefficient of the lagged dependent variable is used to address the following research question:

2. Taking into account student selectivity, is there evidence of convergence or divergence among public research universities over time in alumni giving?

The sign of the lagged dependent variable coefficient indicates whether there is convergence or divergence in alumni giving among public research universities. The results generated from the DFEP modeling technique are compared with the results derived from ordinary least squares (OLS), fixed-effect, and instrumental variable (2SLS) regression analyses in chapter 4.

Limitations

This study has at least four limitations. First, data used in this research are based on secondary sources. Second, this study examines the influence of selectivity on

alumni giving only at public research universities. Caution should be used when interpreting any potential findings from this study to other sectors or institution types. Third, this study employs a statistical technique (DFEP modeling) that does not infer causation between alumni giving and institutional prestige. Fourth, this study uses a rational perspective drawn from the field of economics to understand the conceptual framework used in this study. In future studies, other perspectives and frameworks should be used to examine the influence of prestige on alumni giving to higher education institutions. Despite these limitations, this study generates results that will have implications in several areas.

Implications

This study has potential implications for methods and theory. First, because it uses a panel as opposed to a cross-sectional dataset, this study addresses the methodological limitations of prior research. The use of cross-sectional data does not allow for the examination of the relationship between alumni giving and selectivity over time nor can it account for possible unobservable variables.

Second, because previous studies of alumni giving are typically based on individual and not organizational behavior, the findings in this study may further contribute to theory. This study uses an economic perspective for examining the influence of selectivity on alumni giving. Because researchers who examine alumni giving rarely use economic perspectives of nonprofit organizations, this study contributes to the literature by introducing a new conceptual framework.

Third, this study demonstrates the use of DFEP modeling techniques. These statistics enable researchers to investigate the dynamic nature of the relationship inherent in many financial and economic variables. Future studies may employ this technique to address other research questions in higher education finance. The following chapter presents a review of the broader literature on the economic theory of nonprofit organizations, prestige in higher education, and alumni giving among nonprofit colleges and universities, including public research universities.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter reviews the literature used to develop the conceptual framework for this study. This chapter applies concepts from the literature on the economics of nonprofit organizations to higher education institutions and discusses the hypothesized relationship between selectivity and alumni giving at public research universities.

The chapter is divided into four sections. The first section of this chapter reviews the literature on the economics of philanthropic giving as it relates to higher education institutions. The second section of this chapter reviews the literature on the economics of nonprofit organizations as it relates to the scholarship on nonprofit public higher education. The third section of the chapter discusses the literature on prestige in higher education within the context of various frameworks. The fourth section of this chapter presents the conceptual framework that is used in this study.

I. Alumni Giving

According to the Council for Aid to Education, 59% of individual donations to higher education institutions in fiscal 2007 came from alumni (Kaplan, 2008). Because alumni represent a significant source of private funding for higher education institutions, one would expect that as investments in prestige increases, so would activities to encourage alumni giving. Most studies on alumni giving in higher education, however, do not examine how organizational behaviors, such as enhancing selectivity, influence

the level of alumni donations. Instead, prior research focuses on individual aspects of giving (Brittingham & Pezzullo, 1990; Monks, 2003; Taylor & Martin, 1995; Weerts & Ronca, 2006) or the structural characteristics of colleges and universities that are associated with alumni giving (Bristol, 1990; Harris, 1990; Harrison, 1995; Monks, 2003; Smith & Ehrenberg, 2003). Although past studies are valuable in developing an understanding of individual giving behavior, they do not contribute to an understanding of how organizational behaviors, such as enhancing selectivity, influence alumni giving. This section will first present the literature on alumni giving in higher education to provide a context for this study. The section then discusses the literature on donative support as it relates to the pursuit of prestige at higher education institutions.

Context: Alumni Giving in the Higher Education Literature

Although this study uses an economic/rational approach to examine the influence of selectivity on alumni giving, other theoretical perspectives are discussed in the literature on giving behaviors. Research on the donative support of organizations and charitable causes comes mostly from the fields of economics, sociology, and psychology. The purpose of this section is to review the theoretical perspectives and research on alumni giving to provide a context for how the conceptual framework used in this dissertation may contribute to an understanding of the influence of selectivity on alumni giving at public research universities.

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Theories of Alumni Giving

Prior studies on alumni giving utilize several broad theoretical perspectives, including: (1) public good theory, (2) social exchange theory, (3) expectancy theory, (4) the life cycle hypothesis, (5) the investment model, (6) organization theory, and (7) neoclassical economics. Most contemporary studies integrate multiple theories to provide a comprehensive perspective on alumni giving. This section describes each of these theoretical perspectives.

Public Good Theory and Altruism

Public good theory assumes that donations serve the collective interest. Donors gain utility from the total charitable output and not from their own well being (Andreoni, 2006; Halfpenny, 1999; Rose-Ackerman, 1996; Sun, Hoffman, & Grady, 2007). Although altruism may be one factor in a donor's motivation, research (Andreoni, 1990; Rose-Ackerman, 1996) has shown that it is rare that pure altruism can accurately describe donors in a market. Rose-Ackerman (1996) argues that pure altruism is not the only mechanism that motivates donors because of "free-rider" problems (i.e., an individual lacks the motivation to donate because he or she benefits from the collective donations from others). She asserts that a low percentage of the population actually makes donations, especially in relation to government social welfare spending. Andreoni (1990) further observes that as a population increases, altruistic motives diminish and average donations decrease toward zero, leaving only the wealthiest donors making donations. Therefore, other factors beyond pure altruism motivate donor philanthropy.

Andreoni (1990) proposes a public good theory based on "impure altruism."
Summarizing other research, Andreoni (1990) claims that "pure altruism," (a theory that
donors contribute for the sake of public good without recognition to the individual) lacks
predictive power. Andreoni (1990) states that the alternative model of "warm glow" is
consistent with observed patterns of giving. Warm glow incorporates feelings of social
pressure, guilt, or sympathy as well as positive feelings that benefit the individual. When
donors give, they not only gain utility through increasing the total supply of public goods,
they also gain utility through the act of giving itself.

Building on the work of Andreoni's (1990) warm glow theory, other economists
have augmented altruism theories with other factors to better explain donor behavior in
the environment. Harbaugh (1998a; 1998b) presents a model of impure altruism where
alumni donors maximize utility through personal prestige. Harbaugh (1998a; 1998b)
asserts that donors are motivated by personal prestige in the form of recognition,
publicized donations, and rewards, in addition to internal satisfaction. Harbaugh (1998a)
found general support for this model using panel data from one prestigious law school,
but has yet to expand these findings to other professional programs or universities.

Given that Andreoni (1990) and Rose-Ackerman (1996) advocate for a theory that
focuses on impure altruism, the theory can easily be integrated with other theories. This
flexibility allows scholars to account for altruistic motives as well as other factors not
directly related to altruism.

Social Exchange Theory

Social exchange theory, from the field of sociology, provides another perspective on donor behavior. Halfpenny (1989) and Holländer (1990) assert that cooperative behavior is motivated by the expectation of social approval. The likelihood of a donation, therefore, is dependent on the strength of the social approval incentive. Halfpenny (1989) believes that strict rational/economic assumptions of the charity market are unsustainable in the absence of these norms of social reciprocity. Holländer (1990) further contends that a donor is likely to make a donation when he or she subjectively perceives a social benefit in the relationship. An alumna/us donor, for example, will need to perceive a social benefit in the relationship with the college or university in order to make a donation. When the donor perceives there will be little benefit in the relationship, then he or she will not make the donation.

Investment Model

Another theory adapted to describe donor behavior and alumni giving is the investment model. Based on a study by Rusbult (1980), Weerts and Ronca (2006) posit that attraction and satisfaction in a relationship is a function of the costs and rewards of an outcome in relation to an individual's expectations. As rewards increase, so does an individual's commitment. Looking at alumni giving, Weerts and Ronca (2006) propose that development officers cultivate donors at an early stage to demonstrate the benefits of the relationship. This cultivation increases the likelihood of a committed relationship and increases the likelihood of donations as a donor ages.

Expectancy Theory

Expectancy theory, from the field of industrial/organizational psychology, describes employee motivation in the workplace but has been adapted to describe alumni giving. Vroom (1964), who developed and tested the theory, asserts that employee behavior results from conscious decisions designed to maximize pleasure and minimize pain. Decisions are the result of valance (the value of a perceived outcome), instrumentality (the belief that performance will yield a desirable outcome), and expectancy (the likelihood or strength of the desired outcome). Although expectancy theory focuses on employee motivation, the theory is easily adapted to describe donor behavior.

Weerts and Ronca (2006) assert that alumni donors are motivated in ways similar to employees. Weerts and Ronca (2006) hypothesize that alumni make donations because they believe that increased giving will allow a university to achieve a certain outcome, the alumni donor values this outcome, and the alumni donor is capable of making the commitment. Expectancy theory is typically combined in a conceptual framework with other theoretical approaches, including the theories described above.

Life Cycle Hypothesis

Another framework commonly combined with other theoretical perspectives is the life cycle hypothesis. The life cycle hypothesis describes how the wealth of a donor can predict the likelihood of making a donation. The hypothesis indicates that as a person's age increases, so does his or her consumer spending (Olsen, Smith, & Wunnava, 1989). Olsen and her colleagues (1989) suggest that the life cycle hypothesis can also

describe donor spending on philanthropic causes. When examining alumni gifts to a small liberal arts college using an OLS regression model, Olsen and her colleagues (1989) found that the growth rate of donations coincided with the age-income profile and became negative at retirement. That study's finding is nearly identical to the pattern of consumer spending over a life time.

Organization Theory

Unlike the theories of alumni giving presented above, organization theories focus on institutional behaviors that influence donor behavior. Although there are many organization theories in the broader literature, two organization theories are most used to describe alumni giving or donor behavior: systems theory and resource dependence theory.

Theories that describe the relationship between organizations and the environment are known as systems theories. Scott (2003) defines "open systems" as organizations that are embedded and interact with complexity and ambiguity in an environment. Systems theories describe how organizations respond to environmental demands by processing information through the organization's operating procedures and policies, yielding an output (Scott, 2003). Kelly (1998) posits one systems theory that proposes that organizations are embedded in an environment that is part of a larger social, economic, and political system that impacts organizational behavior. In terms of donative support, organizations are required to respond to these systems in order to be successful in recruiting donations. Studies that use systems theories typically integrate them with other theories of donative support in higher education.

Consistent with an open systems perspective, resource dependence theory describes how organizations interact in an environment. Resource dependence theorists approach the study of organizations by viewing organizations as coalitions that need to leverage power to obtain or maintain resources. The need to acquire resources creates dependencies between organizations and these dependencies constrain organizational choice. Because multiple actors control achievement of a desired outcome (Pfeffer & Salancik, 1978), organizations are therefore interdependent. A basic assumption of resource dependence theory is that one organization's actions or consumption of a resource affects other organizations. Therefore, an organization cannot survive if it is not responsive to the demand of the other organizations on which it depends or with which it competes in its environment (Pfeffer & Salancik, 1978). When applied to alumni giving, resource dependence theory presumes that colleges and universities will change their behaviors in order to compete with other universities to enhance donative revenues.

Integrated Approaches

Alumni giving behavior is best characterized by integrating multiple theories into one comprehensive framework. Although most studies draw on integrated theories, two integrated approaches capture most of the perspectives presented in the alumni giving literature and are presented in this section.

Volkwein and Parmley (1999) developed a comprehensive model of alumni giving, covering most of the perspectives presented in the alumni giving literature. Volkwein and Parmley's (1999) *Theoretical Model of Alumni Gift Giving Behavior* combines concepts from microeconomic principles and the market of higher education, as

well as from the individual college outcomes literature. The model posits that alumni

giving is determined by demographic characteristics (socioeconomic status, age, gender,

race), college experiences (undergraduate GPA, major, academic experiences, faculty

relations, peer relations, intellectual growth), capacity to give (occupation, income assets,

dependents, highest degree earned), and motivation to give (number of degrees from the

institution, proximity, appreciation and career values, alumni involvement, satisfaction

with occupation, perceived institutional need). Although Volkwein and Parmley (1999)

did not empirically test their model, other scholars have developed similar integrated

frameworks to describe alumni giving behaviors.

Patouillet (2001) introduces a comprehensive theory of alumni giving based upon

Kelly's (1998) integrated theory of fundraising for nonprofit organizations. Patouillet

(1998) proposes integrating four theories to describe philanthropic fundraising in higher

education. In addition to systems theory and social exchange theory described above,

Patouillet (2001) proposes integrating magic buttons theory and coorientation theory to

describe alumni giving behavior. In magic buttons theory, donors are presumed to be

passive participants in the philanthropic exchange. Kelly (1998) posits that there is a link

between giving behavior and a donor's demographics, cognitions, and attitudes. The

optimal combination of these characteristics, or "magic buttons," would increase the

probability of a donation. Coorientation theory presupposes that donors are more likely

to give when an organization aligns its program or goals to match the donor's needs.

Kelly (1998) suggests that fundraising is optimized when the needs of the donor match

the needs of the organization. Patouillet (2001) notes that by combining systems, social

exchange, magic buttons, and coorientation theories, scholars can develop a more comprehensive understanding of alumni giving.

Patouillet (2001) tests these integrated theories of alumni giving in a study that sought to understand the difference between alumni association donors and alumni association non-donors. Using a survey of 1,200 University of Pittsburgh alumni, Patouillet (2001) found that the survey responses were consistent with all but magic buttons theory. Although his study provides some support of the theories advanced by Kelly (1998), Patouillet (2001) focused on only one institution and did not use appropriate statistical techniques, such as factor analysis, to verify that the constructs measured were valid measures. Additional studies are required to validate the theories that Patouillet (2001) proposes.

Empirical Studies on Alumni Giving

The alumni giving literature utilizes a diversity of theoretical frameworks and methods to describe donor behavior. Some studies are strictly empirical and use descriptive statistics to assist development staff in courting donors. Other studies use sophisticated theoretical models and statistical techniques to better understand donative support in higher education. This section presents studies that focus on the most popular topics in the alumni giving literature to provide context for this dissertation study. These topics include how donor capacity, tax policy, intercollegiate athletics, individual/donor characteristics, development expenditures, and alumni engagement/involvement impact alumni giving.

Alumni Giving and Donor Capacity

Many scholars (Belfield & Beney, 2000; Bruggink & Siddiqui, 1995; Clotfelter, 2003; Grimes & Chressanthis, 1994; Holmes, 2009; Okunade, 1993; Okunade, 1996; Weerts & Ronca, 2006; Weerts & Ronca, 2007) have conduced studies to understand the impact of a donor's wealth on the likelihood of making a donation. Overall, these scholars found that a donor's wealth significantly predicts alumni giving up to retirement age.

In two studies, Okunade (1996) and Okunade and his colleagues (1994) tested the life cycle hypothesis among other theories. In a study of graduate school alumni donations using generalized least squares regression, Okunade (1996) found that donations of new graduates decrease at first, but increase as the graduates' wealth increases. Income effects from higher-level professional and doctoral degrees also predicted higher levels of giving. In a second study, Okunade and his colleagues (1994) studied the "age-donation" profile of donor alumni at a large public research university. Using a pooled random sample survey and regression, Okunade and his colleagues (1994) found that growth rates increase throughout a life span but begin to decline at age 52, which falls short of the typical retirement age. Although these two studies provide evidence supporting the life cycle hypothesis, the findings may not be generalizable to other institutions because they draw data from only one institution.

Bristol (1990) found slightly different results in an atheoretical study using another institution to examine the collective giving of a cohort of graduates over time. Using descriptive statistics, Bristol (1990) demonstrates that a spike in giving levels occurs at regular intervals following the graduation year of a cohort of students. Bristol

(1990) surmises that these increases in collective giving correspond with campus events put on by the development or alumni affairs office of an institution. Typically, the spikes in alumni giving correspond with the 25th or 50th class reunions of the graduating class, with higher donations for higher-numbered reunions. Bristol found that the class year predicted increased giving: The longer the student was out of school, the higher the giving.

Bruggink and Siddiqui (1995) also found support for the life cycle hypothesis when examining another research question. In their economic model of giving, Bruggink and Siddiqui (1995) included alumni age as a variable when modeling alumni giving. They found a 5% increase in giving for every one-year increase in age, even after controlling for a donor's income. Bruggink and Siddiqui (1995) conclude that as donors get older they become more generous, adding to the evidence that donor capacity should be included in integrated models for alumni giving.

Alumni Giving and Tax Policy

Donor capacity and wealth can also be influenced by federal and state tax policy. Changes in tax law, therefore, can increase or decrease the likelihood of donations. A number of studies have tested the notion of how tax policies impact philanthropic giving. Drezner (2006), for example, demonstrated that tax cuts in 2001 for the wealthiest population had the effect of reducing philanthropic giving. Using descriptive statistics, Drezner (2006) demonstrates that reducing taxes for the wealthy increases the costs of making a donation for these donors. Wealthy donors are therefore less likely to make donation when taxes are reduced.

Several other scholars (Holmes, 2009; Sargeant, Hilton, & Wymer, 2006; Smith & Ehrenberg, 2003) provide evidence to support the relationship between tax policy and donation levels. Utilizing concepts from economics, social exchange, and public good theories, Holmes (2009), for example, sought to understand if prestige or charitable tax deductions impacted alumni giving at a selective private liberal arts institution. Holmes (2009) utilized probit and tobit regression models to examine 15 years of data on alumni donations, controlling for other determinates of alumni giving in his model. Holmes (2009) found that wealthy alumni who live in states that allow charitable tax deductions were more likely to give, as were alumni who were more proximate to the institution.

Holmes' (2009) study also included findings on the relationship between prestige and alumni giving. While it focused on individual instead of institutional characteristics, Holmes' (2009) study also found that as athletic and academic prestige increases, so do alumni donations and younger alumni are more likely to be responsive to prestige than older alumni. That study, however did not examine the relationship between alumni giving and prestige at public universities or across time periods.

Alumni Giving and Intercollegiate Athletics

Similar to Holmes' (2009) study, a large portion of the literature on alumni giving focuses on the effects of intercollegiate athletics on alumni giving. Although these studies are atheoretical, they hypothesize that success in athletics increases alumni giving. Brewer, Gates, and Goldman (2002) define success in intercollegiate athletics in terms of national ranking polls such as AP and USA Today/ESPN; and appearances in bowl games. The findings in the literature on the relationship between success in athletics

and alumni giving, however, are mixed. Some studies (Grimes & Chressanthis, 1994; Holmes, Meditz, & Sommers, 2008; Rhoads & Gerking, 2000; Tucker, 2004) have shown that the success of an institution's athletic program increases giving, while other studies (Gaski & Etzel, 1984; Harrison, Mitchell, & Peterson, 1995; Meer & Rosen, 2008; Meer & Rosen, In Press; Sigelman & Carter, 1979; Turner, Meserve, & Bowen, 2001) have found little predictive value.

Alumni Giving and Individual Characteristics

Some studies on donative support of higher education seek to understand what factors contribute to predict higher levels of giving without the use of theory. Monks (2003), for example, sought to identify individual characteristics, observable on campus, that are correlated with alumni giving, to assist development administrators in increasing donative revenues. Using survey data from 28 private nonprofit higher education institutions and tobit and logit regression models, Monks (2003) identified multiple individual characteristics that predicted alumni giving. These include individual and household income, gender, race, marriage status, type and amount of financial aid, and citizen status. The largest predictor of alumni giving in that study was an individual's satisfaction with his or her undergraduate experience.

Without using a clear theoretical framework, Marr and her colleagues (2005) found similar results in their study on the relationship between student financial aid and alumni giving. Using an alumni survey at Vanderbilt University and tobit and logit regression models, Marr and her colleagues (2005) found that the type of financial aid received increases the probability of alumni giving. Receiving need-based loans as an

undergraduate predicts lower probabilities of giving but receiving need-based and merit

scholarships increases the likelihood of giving. The amount of the aid explains less about

the probability of a donation than the type of financial aid does. Additional predictors

increasing the probability of a donation include parental income, an alumna/us'

experience while an undergraduate, affiliation with a Greek organization, affiliation with

athletics, academic performance, and academic major. Although Marr and her colleagues

(2005) used the appropriate method to answer the research questions, they transformed

all of their continuous variables to dummy variables because of measurement error, so the

results of this study should be interpreted with caution.

Clotfelter (2003) utilized concepts from economics, life cycle, and social

exchange theories to describe the factors that increase alumni donations at elite private

higher education institutions. Using four logistic regression models and data from 34

private colleges and universities, Clotfelter (2003) demonstrated that level of income,

institutional selectivity, and positive experiences as an undergraduate all positively

predicted alumni giving. Although it is one of the few multi-institutional studies in the

literature, the study is limited in that it only focuses on private institutions and four time

periods.

Using concepts from economic, life cycle, and public good theories, Bruggink and

Siddiqui (1995) propose a model where alumni are motivated by a social sense of

obligation (altruism), a payback from services previously provided (reciprocity), and

improved recognition for the donation or special privileges (direct benefit). Using a

multiple regression model with cross-sectional survey data from a liberal arts institution,

Bruggink and Siddiqui (1995) found that income, age, affiliation with a Greek

organization, and engineering majors positively predicted giving.

Overall, the studies that seek to define individual characteristics that predict

giving are useful for practitioners and development officers in identifying donors. For

researchers, more institution-level models and panel studies are required to understand

the influence of selectivity on alumni giving at public research universities.

Alumni Giving and Development Spending/Solicitations

Beyond individual characteristics, institutional characteristics or behaviors have

also been found to influence alumni giving. Using social exchange theory, Harrison and

his colleagues (1995) used a two-stage least squares regression model to determine if

institutional expenditures on activities designed to recognize donors influence alumni

giving. Harrison and his colleagues (1995) found that development costs related to

recognition did predict levels of alumni giving. Additionally, Harrison and his colleagues

(1995) found that other factors also predict higher alumni giving including an alumna/us'

positive experiences as an undergraduate, Greek participation as a student, and full-time

student status. Although that study was one of the few with many institutions

represented, the study did not examine changes over time.

In one organizational study, Gottfried and Johnson (2006) sought to understand if

devoting resources toward solicitations increased alumni giving. Using a panel dataset

between 1994 and 2005 and 2,986 public and private universities, Gottfried and Johnson

(2006) sought to resolve the debate in economics regarding the effects of solicitation on

alumni giving. Using fixed effects regression, Gottfried and Johnson (2006) provide

evidence that colleges and universities that increase solicitation efforts will increase alumni giving, with elite institutions having the most success. Although that study has a higher representation of institutions than other studies on alumni giving do, it combined private and public institutions.

One study proposed an economic-based model consistent with resource dependence theory. Harrison (1995) proposes an economic model where colleges seek to maximize success through increased fundraising. Analyzing data at 18 public and private universities over three years, Harrison (1995) finds that institutions that allocate scarce resources to fundraising, alumni relations, and other activities increase participation rates. In another study, Harrison and his colleagues (1995) found similar results. Using two-stage least squares regression and data from 13 private and 5 public colleges and universities, Harrison et al. (1995) found that increased expenses on development activities also increased alumni giving. These two studies show that colleges and universities devote resources toward development activities in order to increase revenues from donative support (Harrison, 1995; Harrison et al., 1995).

Results from a similar study provide support for the relationship between development spending and alumni giving. In his study of 81 public research universities, Harris (1990) also found that development activities predict fundraising success. Funding of development activities was more important than the structure of the development office in increasing donations. More current research, however, has focused on an alumna/us' relationship or involvement with the institution as a predictor for giving.

Alumni Giving and Engagement/Involvement

An emerging trend in the alumni giving literature focuses on the donor's relationship with the college or university. Weerts and Ronca (2006) sought to design a conceptual model that would identify the characteristics that would encourage current donors to increase their levels of giving. Using social exchange, investment, and expectancy theories to describe a public research institution, Weerts and Ronca (2006) used an ordinal logistic regression in their model. Weerts and Ronca (2006) found support for the model, with higher age, being male, capacity to give, and social engagement as an undergraduate student being positive predictors of increased giving. The study is limited in that it only focuses on one institution.

In another study, Weerts and Ronca (2007) designed a conceptual model using concepts from social exchange, expectancy, life cycle, and investment theories to describe the characteristics that encourage alumni to volunteer for, donate to, or otherwise support (such as through political advocacy) a public research institution. Using logistic regression, Weerts and Ronca (2007) found that alumni who have some current involvement with the institution in some way are more likely to give. Additionally, alumni who are older and more established in their careers are the most likely to get involved with their previous institution through volunteering, donations, or support.

Sun and his colleagues (2007) also provide evidence that donor involvement in the institution influences alumni giving. Sun and his colleagues (2007) developed a conceptual framework using concepts from economic, public good, social exchange, equity, and organizational theories to identify the factors that triggered alumni donation

behavior at a Midwestern public university. Utilizing a multivariate regression model, Sun et al. (2007) found current alumni experiences with the institution, alumni motivation, student involvement in extracurricular activities, and student relationships all significantly predicted alumni giving, controlling for other factors. Although Sun and his colleagues (2007) utilized regression to analyze alumni giving, their study is limited by the nature of data drawn from one institution and does not address change over time.

Gaier (2005) utilized concepts from economics and impact models in order to understand if alumni satisfaction increased the probability of a donation at a large state university. According to Gaier (2005), impact models describe two social systems that shape an undergraduate student's experience: relationships in the academic system and the social system. Using logistic regression analysis and data from 1,608 alumni, Gaier (2005) found that alumni satisfaction with their undergraduate experiences and their current involvement significantly increase the probability of making a donation.

Although an emerging trend in alumni giving studies focuses on the donor's experience and relationship with the college or university, few studies focus on institutional behaviors (such as prestige maximization) and relationships among variables over time. This dissertation study attempts to address some of these limitations by using an economic framework to understand the relationship between selectivity and alumni giving.

Economic Theories

Andreoni (2006) notes that philanthropy is a puzzling concept for economists. It is not easy to accommodate an unselfish act in a field based on the study of self-interested

behavior. Neoclassical and other economic theories cannot adequately explain philanthropy and voluntary support. Neoclassical economic theories of giving presume that donors make rational decisions with perfect information, so that any charitable contributions benefit the well-being of the donor (Andreoni, 2006). Halfpenny (1999) presents three assumptions of neoclassical economic theories. First, donors have a set of unchanging preferences used to improve their well-being, and their goal is to expend resources to fulfill these preferences. Second, donors selfishly seek to maximize their well-being; they act rationally with full information to maximize benefits for minimum costs. Third, markets control the transactions among donors and markets tend to reach equilibrium to meet the demands of the goods and services available. Andreoni (2006) and Halfpenny (1999), however, state that neoclassical economic perspectives do not accurately describe actual donor behavior in the market.

Although scholars (Andreoni, 1990; Andreoni, 2006; Halfpenny, 1999) indicate that neoclassical economic theories do not accurately describe donor behavior, some studies show that some donors have self-interested motivations. For example, some studies note that donors that receive naming rights (Harbaugh, 1998b), recognition for a donation (Bruggink & Siddiqui, 1995; Harbaugh, 1998b; Yoo & Harrison, 1989), or other special privilege (Bruggink & Siddiqui, 1995) are more likely to make a donation. These studies, however, do not exclusively adhere to assumptions of neoclassical economics. Economists have modified neoclassical economic theories by introducing other assumptions that more accurately describe market behavior and the environment.

When summarizing the development of donor behavior in economic theory, Halfpenny (1999) states that neoclassical theories have been recast to combine altruistic

motives with some level of self-interested donor behavior. Early neoclassical theories are

inconsistent with most of the theories of alumni giving presented above. Halfpenny

(1999) states that alumni giving theories, such as those from sociology, can be easily

assimilated into economic analysis. When incorporated into an economic framework,

theories such as public good theory, social exchange theory, life cycle hypothesis, and

others may help to explain deviations from expected economic behavior.

Summary

This section presented the theoretical perspectives used to describe alumni donor

behavior and motivation. Many theories are available in the literature to describe alumni

giving, including public good theory, social exchange theory, expectancy theory, the life

cycle hypothesis, the investment model, and organization theory. Most of these theories

are consistent with modern economic perspectives and are typically integrated to develop

a comprehensive understanding of donor behavior. Although much research has been

conducted, especially focusing on the impact of donor capacity, tax policy, athletics,

individual characteristics, development spending, and alumni involvement on donor

behavior, few studies have been conducted at the organizational level or have focused on

changes in institutional selectivity and alumni giving at public universities over time.

The next section presents another economic framework describing the influence of

selectivity on alumni giving.

Economics of Prestige and Alumni Giving in Higher Education

Several researchers (Cheslock & Gianneschi, 2008; Ehrenberg & Smith, 2003; Leslie & Ramey, 1988; Rose-Ackerman, 1996) use economic perspectives to examine the influence of prestige or institutional selectivity on philanthropic contributions such as alumni giving. Rose-Ackerman (1996) provides an economic framework that explains why individuals give to charitable causes. One aspect of this framework provides a rationale for the relationship between philanthropic giving and prestige. Rose-Ackerman (1996) maintains that, when compared to other organizations, educational organizations yield much higher rates of philanthropic giving in relation to governmental spending. She speculates that educational organizations (including higher education institutions) receive higher levels of giving because donors have closer personal ties to such organizations (Rose-Ackerman, 1996). In higher education, alumni who were once students enrolled in a higher education institution may be more invested in the success or failure of the college or university.

In addition to a donor's close personal ties to an organization, Rose-Ackerman (1996) notes that prestige, among other factors, can motivate donors to make contributions to a philanthropic cause. When describing donative support in higher education, James (1990) contends that, because of the close relationship between an alumni donor and the college or university, the donor's own prestige is enhanced as a college or university enhances its prestige. This section reviews the literature that discusses the connection between prestige or selectivity and alumni giving.

Extending Rose-Ackerman's (1996) work, Martin (2005) proposed an economic framework to help explain donor intent and the philanthropic market as applied to higher

education. Martin's (2005) model proposes that donative revenues increase the institution's quality reputation (defined as student selectivity) and decreases the institution's solicitation costs. High educational quality, therefore, is a concern of wealthy donors. If high quality students are admitted to an institution, it signals that the institution is of high quality and it increases the likelihood of a donation from a wealthy donor. Likewise, if a donor who contributes is an alumna/us, it signals to prospective students that the institution is of high quality and increases the likelihood that high quality students would enroll (Martin, 2005). As a result, Martin (2005) proposes that high quality institutions fundraise, regardless of whether it maximizes revenues, in order to increase quality. This economic model, however, has yet to be tested.

Utilizing economic utility concepts, Leslie and Ramey (1988) provide evidence that alumni donors are motivated by the prestige of a college or university when making philanthropic contributions as well. Leslie and Ramey (1988) used an economic utility model to explain how donors gain satisfaction as a result of prestige, power, or recognition. Using a pooled sample of public and private Research I universities and covering two years (1977 and 1980) through an OLS regression analysis, Leslie and Ramey (1988) found that alumni, non-alumni, and organizational donors maximize relative satisfaction, otherwise known in economics as utility, in different ways. Alumni are largely motivated by the prestige of an institution with regard to their giving behaviors, whereas other donors had other reasons for their gifts. Alumni from prestigious institutions also appear to give more because of the higher income of graduates from those institutions. One limitation of this analysis is that it covers only two

years of data and thus does not take into account changes over time in the relationship between prestige and alumni giving.

Using concepts from the economics of nonprofit organizations, Cunningham and Cochi-Ficano (2002) also found a relationship between prestige, measured by student selectivity, and alumni giving. Cunningham and Cochi-Ficano (2002) examined determinates of alumni giving to private four- and two-year institutions. To provide evidence of causation between prestige and alumni giving, Cunningham and Cochi-Ficano (2002) lagged the prestige variable by 13 years. Their results indicate that measures of selectivity predict future levels of giving. Although the study appears to confirm a cause and effect relationship between prestige and alumni giving, the study has a number of limitations. It is not clear, for example, why a 13-year lag was ideal for determining the relationship, nor is there any theoretical justification for the development of the composite measures. Additionally, the study does not examine what occurred among the predictors of alumni giving during the intervening years.

Another study extends the work of Cunningham and Cochi-Fiano (2002) and Leslie and Ramey (1988) by examining prestige (student selectivity) and the influence of state appropriations on donative support (including alumni giving) at all public four-year colleges and universities. Utilizing concepts from economics, sociology, and political science, Cheslock and Gianneschi (2008) examine the impact of declining state appropriations on alumni giving. Cheslock and Gianneschi's (2008) model asserts that the amount of philanthropic giving is not evenly distributed across institutions due to an institution's selectivity. Using a fixed effects regression model and 11 years of panel data, they show that donors are most likely to give to selective institutions that already

possess significant resources. These selective institutions have a competitive advantage over other institutions in securing alumni donations. Cheslock and Gianneschi's (2008) statistical model, however, does not account for lagged effects of alumni giving.

In their study of the sources and uses of alumni giving at 60 private selective colleges and universities, Ehrenberg and Smith (2003) also examined prestige as measured by *U.S. News and World Report* ranking and alumni giving. Ehrenberg and Smith (2003) developed an economic utility-maximizing model to describe differences by type of institution in the types of support received, and how the philanthropic support is used by private selective colleges and universities. Using 31 years of annual data in a fixed effects regression model, Ehrenberg and Smith (2003) found that wealthier and more prestigious universities (as measured by *U.S. News* tier rank) are able to focus more of their efforts on fundraising for enhancing their endowments rather than for current expenditures. Additionally, higher levels of wealth are associated with higher levels of giving from all sources, including alumni. Ehrenberg and Smith (2003) contend that these factors increase the concentration of wealth among the wealthiest private colleges and universities. That study did not address the relationship between alumni giving and prestige at public research universities.

Additionally, although prior research (Ehrenberg & Smith, 2003; Leslie & Ramey, 1988; Martin, 2005; Cheslock & Gianneschi, 2008) is valuable in illustrating a possible relationship between alumni giving and selectivity, these studies do not examine how changes in a higher education institution, over time, influence changes in alumni giving. An alternative model is required to address this limitation in the literature. The next section reviews the literature on prestige and alumni giving as it relates to economics

of nonprofit organizations. This literature is used to build a conceptual framework to examine the relationship between alumni giving and selectivity over time at public research universities.

II. Economics of Nonprofit Organizations and Higher Education

This section reviews the economics literature on nonprofit organizations as it relates to public higher education. Higher education is an industry dominated by nonprofit organizations. According to the American Council on Education (2007), nonprofit colleges and universities accounted for nearly 80% of all degree-granting institutions and 95% of the enrollment in American higher education in 2004. Industries dominated by nonprofit organizations operate under different market dynamics than industries dominated by for-profit organizations (Weisbrod, 1988). As a result, economists have noted that the economic behavior of colleges and universities is difficult to characterize, calling it "awkward" (Winston, 1999) or "curious" (Clotfelter, 1999) economics. The literature on the economics of nonprofit organizations provides explanations for why nonprofit higher education institutions behave differently than their for-profit counterparts. Primarily, nonprofit organizations, including not-for-profit higher education institutions, do not maximize profits. This section describes the economics of nonprofit organizations and why these organizations are different than for-profit organizations. This section then defines the economic concept of utility to illustrate the differences in administrator behaviors at nonprofit and for-profit organizations. Finally, this section will introduce a utility-maximizing theory to describe why nonprofit universities seek to enhance prestige.

Economics of Nonprofit Organizations and Utility

The broader literature on the economics of nonprofit organizations provides explanations for why nonprofit organizations exhibit behaviors that differ from for-profit organizations. Many scholars (Hansmann, 1981; James & Rose-Ackerman, 1986; Lee, 1971; Newhouse, 1970; Raines & Leathers, 2003) introduce the economic concept of utility to illustrate differences between nonprofit and for-profit organizations. The concept of utility is used in economics to explain the relative satisfaction derived from the consumption of goods and services by society, an organization, or an individual, such as an administrator in an organization. With regard to the administrators, relative satisfaction may be derived from a combination of salary, prestige, power, job security, job satisfaction, recognition, and professional standing (Lee, 1971; Lee, Stevens, & Wallace, 1975). Lee (1971) notes that this economic concept allows for the possibility that an administrator's goals can be in misalignment with goals of the organization. The starkest difference between nonprofit and for-profit organizations is the different reward structures in place that allow administrators to maximize utility.

Scholars (James & Rose-Ackerman, 1986; Newhouse, 1970) that develop theoretical models to describe utility-maximizing behaviors posit that utility can be increased by improving the quality or the quantity of goods or services produced (James & Rose-Ackerman, 1986; Newhouse, 1970). If an administrator of a revenue-generating organization chooses to maximize utility by increasing production, she may increase the organization's revenues. Consistent with this model, many for-profit organizations choose to maximize utility by increasing profits brought about by increasing revenue

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and/or minimizing costs. Maximizing utility by increasing the quantity of products at the expense of quality, however, is atypical in nonprofit organizations (Hansmann, 1981; James & Rose-Ackerman, 1986; Lee, 1971; Newhouse, 1970; Parente & Van Horn 2006; Valentinov, 2006; Weisbrod, 1988).

According to many economists (Hansmann, 1981; James & Rose-Ackerman, 1986; Lee, 1971; Newhouse, 1970; Parente & Van Horn 2006; Valentinov, 2006; Weisbrod, 1988), most nonprofit organizations choose to maximize utility by increasing the quality of the organization's products or services. To summarize the economic literature (see Hansmann, 1981, James & Rose-Ackerman, 1985; Valentinov, 2006; Weisbrod, 1988), there are three reasons why nonprofit organizations choose to increase quality rather than quantity. First, nonprofit organizations typically operate in markets where the consumer cannot accurately evaluate the quality of a product or service. Because administrators have no incentive to maximize profits, nonprofit organizations operate in markets where consumers trust that nonprofit organizations will produce high quality goods or services (Hansmann, 1981; James & Rose-Ackerman, 1986; Weisbrod, 1988). Second, administrators at nonprofit organizations tend to have values aligned with the goals of the organization. James and Rose-Ackerman (1986) contend that whereas administrators of for-profit organizations maximize utility with higher salaries through increasing profits, administrators of nonprofit organizations typically earn lower salaries and gain utility by maximizing the values and goals they share with the organization. Any enhancement to the organization itself, via increasing the quality of its products or organizational prestige, enhances the administrator's utility (James & Rose-Ackerman, 1986; Newhouse, 1970). Third, Hansmann (1981) contends that nonprofit organizations

are bound by a "non-distribution constraint," where surplus revenues cannot be distributed to owners, including shareholders. As a result of this restriction, several scholars (Lee, 1971; Newhouse, 1970; Valentinov, 2006) contend that administrators of nonprofit organizations have more discretion as to how to maximize utility beyond enhancing revenues. Because administrators of nonprofit organizations cannot be evaluated for profit-maximizing behaviors, quality becomes a key criterion for good performance. As a result of these three factors, nonprofit organization administrators have an inherent preference for increasing quality to maximize utility.

James and Rose-Ackerman (1986) assert that although administrators of nonprofit organizations choose to maximize utility through quality, there are limits to realizing this goal. James and Rose-Ackerman (1986) note that nonprofit organizations are constrained by capital, making it difficult for administrators to focus on quality alone. Nonprofit organizations, therefore, use charitable donations or revenue-generating sub-units to both increase quality and become more competitive in the market (James & Rose-Ackerman, 1986). Some nonprofit organizations without any capital aren't able to maximize utility through quality and need to increase quantity for survival.

Hansmann (1981) and Weisbrod (1988) observe another challenge to maximizing quality in nonprofit organizations. Hansmann (1981) and Weisbrod (1988) observe that many nonprofit organizations produce products and services for which quality cannot be measured. In the absence of quality measures, several researchers (Horwitz & Nichols, 2007; Lee, 1971; Newhouse, 1970; Parente & Van Horn, 2006) state that nonprofit organizations prefer to enhance status or prestige.

The absence of quality measures has been observed in the higher education literature. Birnbaum (1988) and Cohen and March (1986) note that quality is difficult to measure in higher education. Other scholars (Lee, 1971; Parente & Van Horn, 2006) contend that some nonprofit organizations increase the variety and complexity of the inputs available to enhance the organization rather than the actual quality of the product or service. Using economic perspectives on the nonprofit organization and building on the work of Garvin (1980) and Winston (1999), the next section describes a conceptual model of nonprofit public research universities that maximize utility by enhancing prestige.

Economics of Nonprofit Colleges and Universities

Utilizing a theoretical framework described in the broader economics literature on nonprofit organizations, one may be able to examine how nonprofit colleges and universities maximize prestige instead of profits. In summary, administrators in public universities maximize utility by increasing institutional prestige, depending on the financial resources available. Many public colleges and universities make an effort to increase revenue from sources such as alumni to subsidize investments in prestige. This section reviews the literature that discusses a possible relationship between alumni giving and prestige.

Garvin (1980) proposes an economic model of prestige in higher education that can be utilized to understand the relationship between alumni giving and prestige. Building on the work of Thorsten Veblen (1957/1918), Garvin's (1980) economic model of university behavior posits that college faculty and administrators seek to maximize

utility through increasing prestige. Garvin (1980) proposes a utility-maximizing model similar to the economic models of nonprofit organizations to explain college and university behavior. Garvin (1980) states that goals that are shared by both administrators and faculty are the ones likely to be pursued, as long as the goals also ensure the university's future survival. According to Garvin's (1980) model, utility is maximized in three ways: prestige through research productivity (in terms of the number and/or quality of faculty in each academic department), student quality, and number of students. By developing a reputation that focuses on quality, colleges and universities widen their markets to better compete for both students and funds (Garvin, 1980).

Garvin's (1980) model suggests higher education institutions are faced with a quality/quantity tradeoff. Similar to models of nonprofit organizations described by other scholars (Horwitz & Nichols, 2007; Lee, 1971; Newhouse, 1970; Parente & Van Horn, 2006), Garvin's (1980) model posits that colleges and universities prefer to maximize utility through enhancing prestige. In Garvin's (1980) model, the concept of prestige dominates, with an emphasis on faculty research productivity. Higher education institutions that make an effort to increase prestige, but are capital constrained, may need to generate additional revenues by increasing enrollment. However, according to Garvin (1980), increasing enrollment may lower the proportion of talented students and reduce the likelihood that talented faculty will be attracted to the institution.

Garvin (1980) also maintains that some universities operate under a "service tradition" and maximize utility by increasing aggregate enrollments. Institutions that operate under a service tradition are guided by a mission to increase access to higher education. Consequently, other institutions may prefer to maximize utility through

prestige, but are forced to maximize utility by increasing enrollments because these universities do not have enough resources.

Garvin's (1980) model differs from other utility models of nonprofit organizations. Most scholars (Horwitz & Nichols, 2007; James & Rose-Ackerman, 1986; Lee, 1971; Newhouse, 1970; Parente & Van Horn, 2006) suggest that only administrators in leadership positions maximize utility. Compared to others, in Garvin's (1980) model, faculty play a prominent role, primarily because no simple hierarchy exists in higher education institutions. The role of faculty is enhanced so that the institution pursues goals in line with both faculty and administrative leaders.

Although Garvin's (1980) utility-maximizing model is the most appropriate for describing prestige in higher education institutions, it does have a disadvantage. Garvin's (1980) model fails to recognize complex decision-making processes at colleges and universities. James (1990) argues that the utility-maximizing process is complicated by complex decision making, imperfect information, and goal ambiguity. Complex decision making is even more acute in four-year colleges and universities (Birnbaum, 1988; Cohen, March, & Olsen, 1972). Cohen, March, and Olsen (1972) describe higher education institutions as "organized anarchies" because they decentralize operations allowing for conflicting goals to coexist. As a result of this decentralization, utility maximization is specific to the goals and managers of each unit of the college or university. However, James (1990) contends that when utility is maximized in one unit, it contributes to collectively maximize utility for all units.

Despite this disadvantage, Garvin's (1980) model captures concepts from the nonprofit economic literature in his theory. His model is consistent with other models

(Geiger, 2004; Hansmann, 1981; Horwitz & Nichols, 2007; Hoxby, 1997; Lee, 1971; Newhouse, 1970; Raines & Leathers, 2003; Rose-Ackerman, 1996; Slaughter & Rhoades, 2004; Weisbrod, 1988; Winston, 1999; Zemsky et al., 2005) of nonprofit organizations. First, several scholars (Hansmann, 1981; James & Rose-Ackerman, 1986; Valentinov, 2006) have noted that the "non-distribution constraint" in nonprofit organizations does not provide incentives to maximize profits. In Garvin's (1980) model, the non-distribution constraint changes the motivation of faculty and administrators to focus on goals that don't include minimizing costs or increasing profits. The non-distribution constraint changes the goals of faculty and administrators to maximize prestige instead of profits (Hansmann, 1981; James & Rose-Ackerman, 1986; Lee, 1971; Raines & Leathers, 2003; Weisbrod, 1988).

Second, other scholars (Geiger, 2004; Hoxby, 1997; Slaughter & Rhoades, 2004; Winston, 1999) note that, for many nonprofit selective higher education institutions, there are more applicants than there are slots available in the admissions process. This "excess demand" in certain segments of the higher education market gives faculty and administrators discretion to make decisions that focus on prestige rather than consumer preferences (Hoxby, 1997; Slaughter & Rhoades, 2004; Winston, 1999). Excess demand in segments of the higher education market is also consistent with concepts that characterize Garvin's (1980) model.

Third, Winston (1999) notes that higher education institutions do not rely on a single source of funding. Higher education organizations are subsidized from a number of external sources, including state and federal governments, charitable donations, and

commercial enterprises, in addition to tuition. In Garvin's (1980) model, these external subsidies fund goals that may enhance prestige but may not be profitable.

In summary, Garvin (1980) proposes a utility-maximizing model of university behavior to explain the motivations of faculty and administrators who maximize utility by pursuing goals that increase prestige. Scholars writing about nonprofit organizations (Hansmann, 1981; Horwitz & Nichols, 2007; Lee, 1971; Newhouse, 1970; Rose-Ackerman, 1996; Weisbrod, 1988) and nonprofit higher education institutions (Geiger, 2004; Hoxby, 1997; Raines & Leathers, 2003; Slaughter & Rhoades, 2004; Winston, 1999; Zemsky et al., 2005) provide concurrent validity that Garvin's (1980) economic model is useful when examining college and university behavior. The next section of this chapter will discuss Garvin's (1980) utility-maximizing model within the context of the literature on prestige in higher education.

III. Prestige in Nonprofit Higher Education Institutions

Some aspects of the literature on prestige in higher education institutions are consistent with Garvin's (1980) utility-maximizing model. The studies on prestige in higher education fall into five broad sets of theories: (1) utility theories, (2) market theories, (3) input-output theories, (4) resource dependence theories, and (5) theories on institutional isomorphism. This section discusses the definition of prestige in higher education, summarizes each of these bodies of literature, and describes how they intersect with the concept of prestige in Garvin's (1980) model.

Context: Definitions of Prestige in the Higher Education Literature

A review of the higher education literature reveals that prestige is discussed from the perspective of perceived student quality (Brewer, Gates, & Goldman, 2002; Cyrenne & Grant, 2009; Geiger, 2004; Hoxby, 1997; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b), faculty research productivity (Brewer et al., 2002; Cyrenne & Grant, 2009; Dey et al., 1997; Dolan & Schmidt, 1994; Melguizo & Strober, 2007; Milem et al., 2000; Morphew & Baker, 2004; Porter & Toutkoushian, 2006), success in intercollegiate athletics (Brewer et al., 2002; Tucker & Amato, 1993), and college and university magazine rankings (Ehrenberg, 2002a; Monks & Ehrenberg, 1999; O'Meara, 2007). Scholars have discussed prestige-seeking behaviors among higher education institutions using many concepts, such as academic drift (Berdahl, 1985), upper drift (Aldersley, 1995), academic ratcheting (Zemsky et al., 2005), institutional isomorphism (Dey et al., 1997; DiMaggio & Powell, 1983; Milem et al., 2000; Morphew, 2002), and striving (O'Meara, 2007). This section presents these concepts and how they are discussed along with prestige in the higher education literature.

The first conception of prestige used by many scholars (Brewer et al., 2002; Cyrenne & Grant, 2009; Dey et al., 1997; Dolan & Schmidt, 1994; Melguizo & Strober, 2007; Milem et al., 2000; Morphew & Baker, 2004; Porter & Toutkoushian, 2006) is faculty research productivity. Faculty research productivity has been measured using faculty quality (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006), faculty salary level (Melguizo & Strober, 2007), research and development expenditures (Brewer et al., 2002; Dolan & Schmidt, 1994), and the number of research publications produced (Dey et al., 1997; Milem et al., 2000; Porter & Toutkoushian, 2006). Several researchers (Dey

et al., 1997; Milem et al., 2000) justify the use of research productivity as a measure of prestige by showing that comprehensive master's and liberal arts institutions are gradually changing to emulate doctoral research institutions. In the higher education literature, some scholars utilize the research definition of prestige when defining their conceptual models (Dolan & Schmidt, 1994; Garvin, 1980; Porter & Toutkoushian, 2006). Faculty research productivity is used as a primary measure of prestige in Garvin's (1980) model for university behavior.

A second conception of prestige used by researchers (Geiger, 2004; Hoxby, 1997; McDonough, Antonio, Walpole, & Pérez, 1998; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) is student quality. Geiger (2004), for example, defines student quality in terms of student selectivity when describing competition among private selective institutions. Selectivity has been defined using standardized test scores in the admissions process and admissions yield rates (Hoxby, 1997; McDonough et al., 1998; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b). Scholars (Hoxby, 1997; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) justify the use of student quality as a measure of prestige by demonstrating that many colleges and universities are competing in a national market to attract talented students. According to several scholars (Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b), institutions appear to be increasing admissions standards in order to increase student quality by increasing the number of high ability students. Geiger (2004) calls the competition for high ability students the "selectivity sweepstakes," while Zemsky, Wegner, and Massy (2005) call it the "admissions arms race." Based on student selectivity, prestige is mostly examined in

studies that focus on the higher education admissions market (Geiger, 2004; Hoxby, 1997), the college admissions process (McDonough, 2003; McDonough et al., 1998), or college and university rankings (Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b). Garvin (1980) also recognizes student selectivity as a measure of prestige in his study, positing that high quality faculty wish to surround themselves with high ability students.

The third conception of prestige that scholars (Ehrenberg, 2002a; Meredith, 2004; Monks & Ehrenberg, 1999; O'Meara, 2007) use prominently in the literature is college and university rankings publications such as *U.S. News and World Report*. The magazine rankings use a combination of factors to determine an institution's rank relative to other colleges and universities. The *U.S. News* rankings, for example, include student selectivity, faculty resources, graduation and retention rates, financial resources, alumni giving, graduation rate performance, and a survey of academic reputation in their methodology for ranking colleges and universities (Ehrenberg, 2002a). Monks and Ehrenberg (1999a) and Meredith (2004) demonstrate that there are negative consequences to admissions outcomes and finances if an institution's *U.S. News* ranking falls. As a result, college administrators are very sensitive and responsive to changes in these rankings publications (Machung, 1998). Although the *U.S. News* rankings account for seven measures of institutional performance, several scholars (Grunig, 1997; Pascarella et al., 2006; Webster, 2001) have shown that the highest correlate of an institution's *U.S. News* ranking is SAT/ACT score. Despite the fact that some scholars (Meredith, 2004; Monks and Ehrenberg, 1999) have conducted studies using this definition of prestige, most studies examine the individual components that are used in

developing these rankings. Garvin's (1980) model does not incorporate university rankings into his model, but the component measures used to develop the rankings (selectivity and research productivity) are consistent with the rankings definition of prestige.

For the purposes of this study, prestige is defined as student quality measured by student selectivity (Brewer, Gates, & Goldman, 2002; Geiger, 2004; Hoxby, 1997; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b). Although there is much evidence that student selectivity is a poor predictor of outcomes and future student performance (Pascarella, 2001; Pascarella et al., 2006; Pascarella & Terenzini, 2005; Pike, 2004), it is still viewed as a measure of an institution's prestige in conjunction with faculty research productivity. Several studies (Ehrenberg, 2002a; Geiger, 2004; Hoxby, 1997; Machung, 1998; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b; O'Meara, 2007; Winston, 1999) provide evidence that higher education administrators increase the selectivity of their institutions in an effort to enhance the prestige of their colleges or universities. Given the high correlation between student selectivity and *U.S. News* ranking (Grunig, 1997; Pascarella et al., 2006; Webster, 2001), it is plausible that alumni have access to this information and may be responsive to institutional performance based on selectivity. As a result, this study focuses on prestige using student selectivity as a measure and future studies will be needed to examine alumni giving using other conceptions of prestige. Therefore, Garvin's (1980) model is modified to exclude research productivity which may not be easily available to alumni. The next section summarizes empirical studies on utility-maximizing models to explain the pursuit of prestige at colleges and universities and

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provides concurrent evidence supporting the use of Garvin's (1980) utility-maximizing model.

Prestige and Utility Models

In addition to Garvin (1980), other scholars (Lee et al., 1975; Massy & Zemsky, 1994; Massy & Zemsky, 1997; Melguizo & Strober, 2007) developed utility-maximizing models to understand the behavior of nonprofit higher education institutions. This section discusses these utility maximization models and contrasts them with Garvin's (1980) model.

Scholars (Massy & Zemsky, 1994; Massy & Zemsky, 1997; Policy Perspectives, 1990; Zemsky, Shaman, & Shapiro, 2001; Zemsky et al., 2005) associated with the Pew Higher Education Research Program developed a utility-maximizing model to help explain the relationship between prestige and administrative costs in colleges and universities. Consistent with Garvin's (1980) model, Massy and Zemsky's (1994; 1997) model posits that faculty seek to maximize utility by increasing research productivity and providing high quality instruction. Their model also parallels Garvin's (1980) model by connecting the pursuit of prestige to higher education finance. Massy and Zemsky (1994;1997); Zemsky, Shaman, and Shapiro (2001); and Zemsky et al (2005) propose a model that focuses on the pursuit of prestige, the expansion of administrative staff to support faculty in pursing prestige, and the increase in administrative costs. These scholars (Massy & Zemsky, 1994; Massy & Zemsky, 1997; Policy Perspectives, 1990; Zemsky, Shaman, & Shapiro, 2001; Zemsky et al., 2005) developed a set of metaphors to describe their model of university behavior. The "academic ratchet" represents faculty's

pursuit of prestige through research and the resulting disengagement of faculty away from their home institution, while "administrative lattice" represents the resulting increase in administrative staff and associated investments required to finance prestige (Policy Perspectives, 1990; Zemsky et al., 2005).

In order to test their claims, Massy and Zemsky (1994; 1997) conducted two studies on faculty time to demonstrate the focus on prestige and the increasing reliance on administrative staff. In one study, Massy and Zemsky (1994) examined faculty discretionary time in departments at four private colleges and two private universities. Using descriptive statistics and OLS, they show that faculty discretionary time is devoted more toward research toward classroom activities. In a second study, Massy and Zemsky (1997) analyzed data from the same universities to test a utility model for teaching-load decisions. Using two-stage least squares regression, Massy and Zemsky (1997) found that faculty are concerned with educational quality (i.e., keeping class size low) and minimizing course work load. Because of the limited number of institutions in both of Massy and Zemsky's (1994; 1997) studies, more research is required to understand the relationship between faculty time and prestige.

In an extension of Massy and Zemsky's (1994; 1997) studies, Melguizo and Strober (2007) implicitly used a utility-maximizing model to examine the relationship between faculty salaries and prestige. In their model, Melguizo and Strober (2007) posit that faculty gain utility by enhancing the prestige of their respective institutions. Activities that enhance utility include being a principal investigator on a research grant, increasing the selectivity of the institution, publishing articles in refereed journals, publishing books, and receiving patents. Using data from the National Study of

Postsecondary Faculty (NSOPF), Melguizo and Strober (2007) tested whether reward systems at colleges and universities are aligned with the goal of enhancing prestige. In a fixed effects regression model using survey data from 28,576 faculty, Melguizo and Strober's (2007) findings suggest that salaries are higher for faculty who enhance institutional prestige.

Cyrenne and Grant (2009) also used a utility model, based upon Garvin's (1980) utility-maximizing framework in their study on university decision making and prestige at Canadian universities. Cyrenne and Grant (2009) found that administrators at Canadian universities, much like their counterparts in the United States, seek to maximize prestige through selectivity and research productivity. Using panel data from *Maclean's* magazine rankings, Cyrenne and Grant (2009) used a panel data ordered probit-random effects model to test Garvin's (1980) theory for Canadian institutions. The results of their study revealed that faculty and administrators seek to maximize utility through selectivity and research productivity. The findings, however, are only generalizable to Canadian higher education institutions. The next section reviews the literature that addresses the prestige-maximizing behaviors of higher education from a market perspective where institutional behavior is proposed to be driven by market forces.

Prestige and Market Models

Economists (Epple, Romano, & Sieg, 2006; Hoxby, 1997; Winston, 1999) have noted that the pursuit of prestige in higher education is driven by market forces that are unique to nonprofit higher education institutions. These scholars (Epple et al., 2006; Hoxby, 1997; Winston, 1999) adopted economic theories of the nonprofit market for

application to higher education institutions to illustrate how nonprofit colleges and universities increase prestige to compete in the higher education market. This section discusses how the higher education market drives colleges and universities to maximize prestige.

Hoxby (1997) describes one theory that drives college and university behavior in the higher education market. Using concepts from market economics, Hoxby (1997) developed her own theory of college pricing for private four-year institutions, which describes what drives universities to pursue prestige. Hoxby (1997) contends that the higher education market has shifted from a local market with a focus on local needs and consumer preferences to a national market that competes for high ability students. She posits that the focus on prestige or student quality has increased because of competition on a national instead of regional scale. National competition forced higher education institutions to either reduce tuition or increase marketing and financial aid expenditures to attract students. Hoxby (1997) contends that as institutions increase selectivity, these institutions are perceived to be of higher quality and this higher quality allows colleges or universities to increase revenues through higher tuition. Additionally, wealthy higher education institutions, with support from government, research grants, endowments, or voluntary support, can use their resources to attract high ability students. She describes how the rich institutions become richer through a multiplier effect: enrolling high ability students increases an institution's desirability and demand, which increases academic quality, and subsequently increases revenue by attracting other high ability students willing to pay the increased tuition.

Hoxby (1997) used descriptive statistics, instrumental variable regression, and nine years of panel data from 1,221 colleges and universities to test the influence of prestige (as measured by student selectivity) on tuition prices. She found that the market changed, from a localized market in 1940 to a national market in 1991. She also found that higher SAT scores over time are related to higher tuition prices. Although Hoxby's (1997) study only describes the behavior of private colleges and universities, Geiger (2004) has conceptually applied the model to public four-year higher education institutions in the market as well. No studies have tested Hoxby's (1997) model on public universities.

Winston (1999) also proposes a model where the market drives institutions to enhance prestige. Using a "church and car dealership" metaphor that describes how colleges and universities operate, Winston (1999) contends that colleges and universities are part charity and part commercial enterprise (i.e., a firm). Winston (1999) states that the higher education market is composed of "donative-commercial nonprofit" institutions where the customer is also an input for the product they produce: an education. Because the quality of the output depends on the quality of the institution's input, competition exists for high ability or talented students. Donative and commercial revenues enable institutions to compete for high ability and talented students by providing general subsidies in the form of attractive physical facilities to all students and financial aid to specific students. Winston (1999) argues that, among donative-commercial nonprofit higher education institutions, the pursuit of high ability students creates a market environment that drives higher education institutions to further enhance prestige via increased student selectivity.

Epple and his colleagues (2006) proposed another model of the market which, in part, examines the factors that predict quality at colleges and universities. They used a general equilibrium model to examine the higher education market. Equilibrium models are designed to identify what level of price and production yield an optimum level of demand. Defining institutional quality by combining mean SAT score, expenditures per student, and the mean income of the student body, Epple et al. (2006) propose that colleges and universities seek to maximize institutional quality using financial aid and admissions processes. Using OLS and instrumental variable regression in an equilibrium model of the higher education market, Epple and his colleagues (2006) examined 768 private nonprofit colleges and universities to understand institutional quality and tuition pricing. Epple et al. (2006) found that higher education institutions attempt to compete in the market to enhance quality by increasing expenditures and provide higher levels of financial aid in order to attract high ability students. Similar to how Epple and his colleagues (2006) examined the inputs and outputs in their equilibrium model of the market, other scholars (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006; Volkwein & Sweitzer, 2006) made an effort to determine the inputs that yield higher levels of prestige. The next section reviews the literature that discusses prestige within the context of input-output models.

Prestige and Input-Output Models

Many researchers (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006; Volkwein and Sweitzer, 2006) utilize input-output models to understand which factors

impact desired organizational outputs, such as prestige. This section discusses models of prestige and institutional outputs.

In their input-output models, several scholars (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006) identified a number of outputs that enhance an institution's prestige. Dolan and Schmidt (1994) and Porter and Toutkoushian (2006) introduce a conceptual framework that theorizes that institutions of higher education attempt to maximize their outputs rather than their profits. Such outputs include the number of alumni who earn doctoral/professional degrees, student quality, and faculty quality (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006), as well as faculty research productivity and reputation (Porter & Toutkoushian, 2006). These scholars (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006) found that prestige-related outcomes, such as research productivity and student quality, are simultaneously determined. Using three-stage least squares regression, Porter and Toutkoushian (2006) found that an institution that can successfully maximize multiple outcomes will increase its reputation. Maximizing outputs that are simultaneously determined can be especially challenging because one output can have a negative relationship with another output. Porter and Toutkoushian (2006), for example, found that, although simultaneously determined, student quality was negatively correlated with research productivity. Although useful in understanding prestige as an outcome, the framework presented in these studies is not applied to all types of higher education institutions. Dolan and Schmidt (1994) did not include public institutions in their study while Porter and Toutkoushian (2006) excluded comprehensive higher education institutions and community colleges.

Volkwein and Sweitzer (2006) developed an input-process-output model combined with systems theory to explain factors that contribute to institutional prestige. Volkwein and Sweitzer (2006) propose a conceptual model where institutional mission, control, governance, size, and wealth influence how an institution deploys its resources to enhance prestige. Their model suggests that the availability of endowment and non-tuition revenue enables institutions to invest in faculty research resources, student financial aid, and student services. These investments serve to enhance an institution's prestige. Using two OLS block regression models and data from 242 national universities and 202 liberal arts colleges, Volkwein and Sweitzer (2006) provided evidence that institutional characteristics such as age, size, and level of expenditures predict an institution's prestige. When faculty research productivity and student outcomes were entered into the model, the effect of these institutional characteristics was diminished. Volkwein and Sweitzer (2006) postulate that institutional characteristics and wealth are necessary, but not sufficient, for an institution to enhance prestige. Consistent with Garvin's (1980) model, Volkwein and Sweitzer's (2006) model suggests that an institution requires wealth or multiple sources of revenue to enhance prestige, although wealth alone does not in itself predict prestige. Volkwein and Sweitzer's (2006) findings, however, are limited to describing public and private research universities and selective liberal arts institutions.

Other scholars (Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) attempted to understand how colleges and universities change administrative processes to increase prestige as measured by rankings publications. Without using a clear conceptual framework, these scholars (Meredith, 2004; Monks &

Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) used the *U.S. News and World Report* college and university rankings to measure quality at colleges and universities. They (Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) proposed that higher education institutions attempt to change admissions and financial aid policies to increase student selectivity. In a working paper using a linear regression model and 10 years of panel data from 16 institutions, Monks and Ehrenberg (1999a) demonstrate that institutions increased financial aid to students to enhance the institutions' selectivity as measured by admissions yield rates and standardized test scores (Monks & Ehrenberg, 1999a). Caution should be used with these results because Monks & Ehrenberg (1999a) did not adequately describe the statistical method or how they controlled for correlation across time periods.

While Monks and Ehrenberg (1999a) focused only on private institutions in their research study, a study by Meredith (2004) found similar results using a broader sample of institutions. Meredith (2004) attempted to understand the effects in changes in *U.S. News* rankings on admissions outcomes. Using four fixed effects regression models (by sector) on data from 2,154 institutions, Meredith (2004) found that changes in rank were correlated with changes in admissions outcomes, such as the selectivity of an incoming class. Results from Meredith's (2004) study should be used with caution because endogeneity (i.e., variables that have their own predictors) was not accounted for in the model. The next section describes how resource dependence theories are used to examine how public higher education institutions pursue prestige.

Prestige and Resource Dependence Theory

Some researchers (Grunig, 1997; Pfeffer & Moore, 1980; Volkwein & Sweitzer, 2006) used concepts from resource dependence theory to examine the pursuit of prestige among higher education institutions. As described above in the review of alumni giving theories, resource dependence theorists approach the study of organizations by viewing organizations as coalitions that need to leverage power to obtain or maintain resources. The need to acquire resources creates dependencies between organizations and these dependencies constrain organizational choice (Pfeffer & Salancik, 1978). In order to survive, organizations need to be responsive to the actions of competing organizations as a resource is consumed (Pfeffer & Salancik, 1978). In the higher education literature, scholars (Grunig, 1997; Pfeffer & Moore, 1980; Volkwein & Sweitzer, 2006) propose that colleges and universities seek to increase prestige in order to acquire resources necessary for survival. This section describes how concepts from resource dependence theory are used to examine the pursuit of prestige among higher education institutions.

In applying resource dependence theory to higher education, Salancik and Pfeffer (1974) developed a model that presumes that prestige ensures that institution and department subunits gain access to resources. Salancik and Pfeffer (1974) hypothesized that college or university subunits acquire power to the extent that they provide resources critical to the institution. When resources are scarce within the college or university, this power ensures continued resources to the department. Variables used to represent the concept of resources in the study include the number of students, national rank or prestige of the department, outside grants, public visibility, and administrative services. Using multiple methods including descriptive statistics, OLS regression, and qualitative

methods to examine 17 departments at one university, Salancik and Pfeffer (1974) found

that departments that are able to secure national prestige for the institution are the

departments with the most power to leverage resources.   In this study, prestige is seen as

a way to obtain resources as well as a resource in itself. More recent studies (Grunig,

1997; Volkwein & Sweitzer, 2006) used resource dependence perspectives to examine

resource acquisition across multiple institutions instead of at just one.

Drawing from resource dependence theory, Grunig (1997) developed a conceptual

model that is used to examine how reputation motivates university behavior. Grunig

(1997) contends that institutional characteristics, such as the level of doctoral enrollment,

undergraduate enrollment, standardized tests scores, and research and development

activities, influence an institution's reputational rankings. Grunig (1997) asserts that

colleges and universities structure their activities in such a way as to make them valuable

in the environments in which they exist. An institution adjusts its size and selectivity in

order to enhance its perceived service quality (through the reputational rankings) which

allows the institution to acquire more resources (Grunig, 1997). Grunig (1997) argues

that when university administrators focus on increasing reputation through increased

selectivity and research productivity, they do so for the survival of the institution at a

time of reduced funding from external sources.

In their study mentioned previously, Volkwein and Sweitzer (2006) argue that

institutional behaviors that enhance prestige are consistent with assumptions in resource

dependence theory. As stated above, Volkwein and Sweitzer (2006) used an input-

process-output model to understand the factors that explain prestige. Volkwein and

Sweitzer (2006) argue that the findings of their study suggest that colleges and

universities interact with their environments to maximize the acquisition of human and financial resources. They also argue that enhancing prestige through increasing student selectivity enables colleges and universities to more easily interact with their environments to attract additional resources. Volkwein and Sweitzer (2006) suggest that older, larger, and wealthier institutions have an advantage in maximizing prestige. As a result, these institutions are more likely to successfully compete for financial and human resources. The next section discusses literature that connects higher education costs with the pursuit of prestige and illustrates why wealthy institutions have an advantage in maximizing prestige.

Prestige and Cost Models

Another theme in the higher education literature is the relationship between prestige and costs. In his discussion of the economics of higher education, Winston (1999) observed that, compared to low-selectivity institutions, high-selectivity higher education institutions have higher costs. Additionally, using descriptive statistics, he demonstrated that financial resources are not evenly distributed among higher education institutions (Winston, 1999). This section discusses how cost-related theories have been used to examine prestige among higher education institutions.

Archibald and Feldman (2008) contrasted two theories in order to explain increases in higher education costs. Archibald and Feldman (2008) attempted to determine whether cost disease theory or revenue theory of cost was responsible for increased expenses in higher education. Although they were interested in which theory explains costs in higher education, Archibald and Feldman (2008) also examined how

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each theory views quality or prestige in relation to costs of providing higher education. Both theories are consistent with regard to explaining how most colleges and universities increase quality but differ in their explanations for how pursuing prestige impacts costs.

Prestige in cost disease theory is not seen as a root cause of increased costs. Cost disease theory, based on the work of Baumol and Bowen (1966), attributes increased costs to an industry's ability to incorporate new technology to increase productivity. Baumol and Bowen (1966) assert that manufacturing industries are better positioned to increase productivity by incorporating technology than service industries are. Lagging productivity growth in service industries relative to the manufacturing sector puts upward pressure on costs to attract highly skilled labor (Baumol, 1967; Baumol & Bowen, 1966). In higher education, prestige, from a cost disease theory perspective, is recognized but is not seen as the cause of increased costs. Baumol (1967) asserts that even though in education, technology (e.g., teaching machines, closed circuit televisions) has been introduced into the classroom, class size must stay low in order to maintain quality. Colleges and universities, therefore, may choose not to maximize class size to increase the productivity of graduates because greater class size decreases prestige and education quality. Additionally, Baumol (1967) states that quality becomes more expensive across institutions when productivity does not keep pace with the manufacturing sector. From a cost disease theory perspective, colleges and universities seeking to enhance quality or prestige would expect costs to increase because it takes more investment to produce higher quality in higher education than it does in the more productive manufacturing sector.

In contrast to cost disease theory, revenue theory of cost attributes increased costs to access to additional revenues. Developed by Howard Bowen (1980) to describe higher education, revenue theory of cost attributes increased costs in higher education to unrestricted increases in revenues. As a result, higher education institutions will continuously spend all revenues they are given (Bowen, 1980).

Prestige and Isomorphism

Some researchers (Dey et al., 1997; Milem et al., 2000; Morphew, 2002; Morphew & Baker, 2004; Morphew & Hartley, 2006) examine prestige in higher education using the sociological theory of institutional isomorphism. DiMaggio and Powell (1983) define isomorphism as a process by which firms or organizations emulate each other by adopting similar structures and policies. When applied to higher education, isomorphism occurs when a college or university adopts structures, policies, and processes similar to other institutions in order to improve its prestige. This section discusses prestige within the context of the literature on institutional isomorphism.

Dey, Milem, and Berger (1997) and Milem, Berger, and Dey (2000) used institutional isomorphism as a framework in studies that examine faculty time allocation and publication productivity. These scholars (Dey et al., 1997; Milem et al., 2000) argue that, over time, colleges and universities have begun to emulate each other by increasing research productivity in order to increase prestige. In one study, Dey, Milem, and Berger (1997) used two faculty surveys to examine the production of research articles between two time periods at 99 institutions. Using OLS regression, they found that faculty have increased their research production between the two time periods to emulate research

institutions (Dey et al., 1997). In another study, using identical data and methods, Milem, Berger, and Dey (2000) found similar results when comparing faculty time allocation on research activities between the two time periods. Dey and associates (1997) argue there is a hierarchy of institutions based on the level of research productivity. Less prestigious colleges and universities at the bottom of the hierarchy are emulating institutions at the top of the hierarchy in order to increase their prestige.

Using DiMaggio and Powell's (1983) theory of isomorphism, Morphew and Baker (2004) examined the relationship between prestige maximization and administrative costs among higher education institutions. Morphew and Baker (2004) tested the hypothesis that prestige causes administrative costs to increase as institutions changed designations from comprehensive institutions to doctoral extensive institutions. Using an OLS regression model and IPEDS data from 88 research universities over two time periods, they found that enhancing prestige at these institutions did not necessarily increase administrative costs. Instead, Morphew and Baker (2004) found that institutions changed how they allocated expenditures to emulate the expenditure allocations of research institutions. The lack of evidence of a relationship between prestige and administrative costs appears to contradict the results of research by Massy and Zemsky (1994; 1997) and Bowen (1980), who contend that the pursuit of prestige leads to increased costs.

Institutional isomorphism seeks to explain why and how a higher education institution maximizes prestige. Under this perspective, a higher education institution attempts to increase prestige by emulating the success of other institutions that are successful in gaining prestige. This perspective parallels Garvin's (1980) utility-

maximizing model, which posits that faculty and administrators maximize utility by increasing research productivity and student ability, in part because other prestigious colleges and universities maximize utility through these same processes.

Summary of Prestige Theories

This section discussed several theories of prestige in higher education. Utility theories provide a framework to examine the behavior of administrators and faculty that seek to maximize utility by increasing prestige primarily through research productivity (Garvin, 1980). Market theories provide perspectives that presume that higher education institutions enhance prestige to interact with and respond to the market (Epple et al., 2006; Hoxby, 1997; Winston, 1999). Input-output models contend that higher education firms are multi-product firms and outputs are simultaneously determined, with prestige being one component (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006). Cost theories presume that prestige is expensive because the technology used to enhance prestige does not increase productivity in higher education as much as technology increases productivitiy in other sectors of the economy (Archibald & Feldman, 2008; Baumol, 1967). The theory of isomorphism describes how higher education institutions emulate each other and consequently maximize utility via prestige (Dey et al., 1997; Milem et al., 2000; Morphew, 2002; Morphew & Baker, 2004; Morphew & Hartley, 2006).

A common theme across all these theories is that higher education institutions are required to make significant investments to enhance prestige. The drive to invest in prestige coupled with declining state appropriations (Heller, 2006), requires higher

education institutions to seek funding from outside sources, such as alumni donations, to remain competitive. These theories on prestige, however, have not been used to model alumni giving at public research universities. The next section discusses the conceptual framework that is used in this study to examine the relationship between alumni giving and selectivity in public research universities.

IV. Conceptual Framework

Grounded in the economic theory of nonprofit organizations and extended to higher education institutions, the conceptual framework developed for this study posits that prestige influences alumni giving at public research universities. This economic conceptual framework addresses a major limitation in the alumni giving literature in that it addresses the need for institution-level analyses over time. As shown in Figure 2.1, the conceptual framework comprises two components. The first component includes concepts reflecting alumni giving at higher education institutions. The second component includes concepts that reflect institutional prestige. This section will present each of these interconnected components.

Alumni Giving Component

Drawing from concepts in economics and the philanthropic giving literature in higher education, the first component of the conceptual framework is used to examine the predictors of alumni giving at public research institutions. Prestige, the variable of interest for this study, is included in the model based upon Garvin's (1980) utility-maximizing model and connects this model with conceptual frameworks proposed by
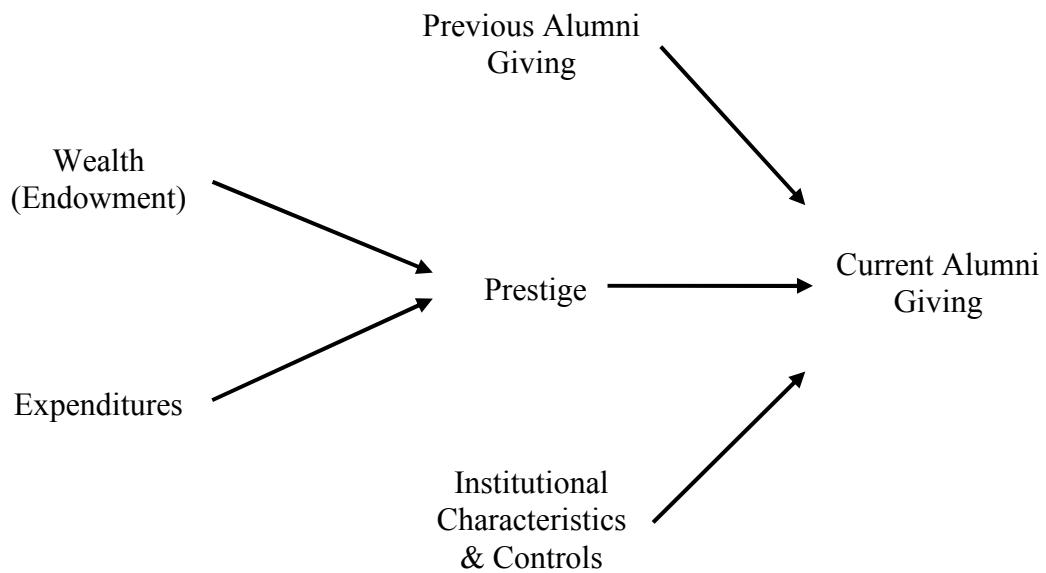
Figure 2.1. Conceptual framework: A dynamic model of alumni giving

several scholars (Cunningham and Cochi-Ficano, 2002; Leslie and Ramey, 1988; Rose-

Ackerman, 1996), who hypothesize that prestige in nonprofit higher education

institutions influence alumni giving. Several scholars (Harrison, 1995; Monks, 2003;

Volkwein & Sweitzer, 2006; Weerts & Ronca, 2006) also suggest that alumni from

prestigious and selective institutions give to colleges at higher rates or give more money.

Therefore, prestige is included as a predictor in the alumni giving component of the

conceptual framework.

The second predictor in the alumni giving component of the conceptual

framework presumes that past levels of alumni giving influence future levels of giving.

Previous alumni giving is included in the model because several scholars (Ehrenberg &

Smith, 2003; Harris, 1990; Harrison, 1995; Martin, 2005) posit that institutions with established development programs and the demonstrated ability to solicit donations are likely to have higher future levels of giving. Winston (1999) and other scholars (Geiger, 2004; Hoxby 1997) have observed that resources are unevenly distributed in higher education, so past success in soliciting donations should predict future success. Another benefit of including lagged alumni giving in the model is the ability to test the second research question in this study.

The third set of predictors of alumni giving includes institutional characteristics or controls that influence alumni giving. Several scholars (Cabrera et al., 2005; Harrison, 1995; Leslie & Ramey, 1988; Monks, 2003; Volkwein & Sweitzer, 2006; Weerts & Ronca, 2006) have found that other variables can influence alumni giving. Many scholars (Belfield & Beney, 2000; Blumenfeld & Sartain, 1976; Harrison, 1995, Monks, 1999; Okunade, 1993; Okunade, 1996) have found that the presence of professional programs (law, medicine, and business) can impact alumni giving. Smith and Ehrenberg (2003) and Leslie and Ramey (1988) show that an institution's size can also influence the aggregate level of alumni giving to an institution. Size, in terms of full-time equivalent (FTE) enrollment, is used to scale the finance variables to remove the effects of institutional size from the model.

The three predictors in the alumni giving component of the conceptual framework are used to construct the first equation in a system of equations to model prestige's influence on alumni giving. Based on variables included in the conceptual model, this equation is summarized as follows:

$$AG_{it} = f(AG_{it-1}, P_{it}, IC_{it}) \tag{2.1},$$

where alumni giving (AG_{it}) in a current period is a function of prestige (P_{it}) and institutional characteristics (IC_{it}). Alumni giving from the previous period (AG_{it-1}) is included to examine the convergence/divergence of prestige on alumni giving over time, conditioned on the variables included in the model.

Prestige Component

As shown in Figure 2.1, the second component of the conceptual framework uses a modified version of Garvin's (1980) utility-maximizing framework as a guide to model prestige at higher education institutions. Because other scholars (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006) have shown that prestige is presumed to be an endogenous variable, a second component is included in the conceptual framework. Because much of the literature on prestige and alumni giving is congruent with Garvin's (1980) utility-maximizing model, the conceptual model is modified to include concepts from the alumni giving literature.

Although Garvin (1980) proposes two prestige variables in his model, the conceptual framework for this study includes prestige only in terms of student quality, as measured by the selectivity of an institution. In this study, selectivity is used as a measure of prestige for several reasons. First, Dolan and Schmidt (1994) and Porter and Toutkoushian (2006) developed a model where higher education outcomes, such as the selectivity of a class, and faculty research productivity are simultaneously determined. As a result, each prestige component should be modeled separately when examining alumni giving. Second, because several scholars (Grunig, 1997; Pascarella et al., 2006; Webster, 2001) have noted that selectivity is highly correlated with *U.S. News and World*

Report rankings, this study uses the selectivity definition as measured by standardized test scores. Alumni have access to these ranking publications and may be more responsive to institutional performance based on selectivity rather than to performance based on faculty research productivity. As a result, this study focuses on student selectivity as a measure of prestige.

Garvin's (1980) model suggests that colleges and universities are constrained by capital when maximizing prestige. Garvin (1980) formulates his model to maximize the utility function with budgetary limitations reflected by the inclusion of finance variables. Because attracting talented faculty and students may increase costs, a college or university may need to raise funds by expanding enrollment, raising private gifts, or increasing research grants. As demonstrated in Figure 2.1, institutional wealth and expenditures are hypothesized to influence prestige. Several scholars (Geiger, 2004; Hoxby 1997; Winston, 1999) provide additional support for incorporating these two predictors, noting that institutions with the most wealth and highest expenditures are the ones with the highest level of prestige. Geiger (2004) and Hoxby (1997), for example, state that institutions use endowment wealth and extra revenues to increase financial aid packages and marketing expenditures to attract talented students. These expenditures, as a result, increase the institutions' selectivity. The following equation is used to represent the prestige component of the conceptual framework and takes into account the wealth and level of expenditures that research universities require to enhance prestige:

$$P_{it} = f(W_{it}, E_{it}) \qquad (2.2),$$

where prestige (P_{it}), as measured by student selectivity, is a function of an institution's wealth (W_{it}), measured by the size of its endowment (Epple et al., 2006; Winston, 1999),

and its expenditures (E_{it}). A system of equations representing the alumni component (equation 2.1) and the prestige component (equation 2.2) in the conceptual framework is used in this study to model prestige's influence on alumni giving, given the predictors of prestige.

V. Summary

This chapter presented a conceptual framework based on economic concepts that describe how nonprofit organizations strive to increase their prestige or status rather than to maximize revenues (Garvin, 1980; Newhouse, 1970). The framework is developed by combining Garvin's (1980) modified utility-maximizing model with concepts from models proposed by several scholars (Cunningham & Cochi-Ficano, 2002; Leslie & Ramey, 1988; Rose-Ackerman, 1996), reflecting the economic perspective of donative giving applied specifically to alumni giving in higher education institutions. The model departs from the traditional economic model of profit maximization to explain the behavior of nonprofit organizations and provides an alternative framework via the use of the concept of utility (Garvin, 1980; Lee, 1971; Newhouse, 1970; Valentinov, 2006). Building on Garvin's (1980) economic model of university behavior, this study utilizes a conceptual framework that includes student selectivity, rather than research productivity, as a measure of prestige. Using the student selectivity definition, prestige is hypothesized in the conceptual model to influence alumni giving.

CHAPTER 3

METHODOLOGY

Introduction

Drawing on concepts from Garvin (1980) and other scholars (Cheslock &

Gianneschi, 2008; Ehrenberg & Smith, 2003; Leslie & Ramey, 1988; Rose-Ackerman,

1996), this study examines how an institution's selectivity influences the amount of

alumni giving among public research universities. The conceptual framework for this

study utilizes a modified version of Garvin's (1980) economic model of university

behavior and economic perspectives of alumni giving (Cheslock & Gianneschi, 2008;

Ehrenberg & Smith, 2003; Leslie & Ramey, 1988; Rose-Ackerman, 1996) to examine

this relationship. The purpose of this study is to examine how selectivity influences

alumni giving, while taking into account predictors of selectivity. Specifically, this study

will address the following research questions:

1. After taking into account predictors of student selectivity, to what extent

   does an institution's selectivity influence alumni giving at public research

   universities?

2. Taking into account student selectivity, is there evidence of convergence

   or divergence among public research universities over time in alumni

   giving?

This chapter describes the research design, data sources, statistical methods, variables,

and limitations of this study.

Research Design

In this study, the research design involves the use of panel data, also known as time series-cross sectional (TSCS) data covering 11 years from fiscal 1997 through fiscal 2007. The panel data are based on multiple surveys of colleges and universities that contain institutional information such as endowment income, expenditures, alumni giving, student selectivity, faculty research, and other related variables.

Data Sources

This study utilizes data drawn from three sources. The first data source is the Integrated Postsecondary Education Data System (IPEDS), sponsored by the National Center for Education Statistics (NCES). IPEDS is the U.S. Department of Education's postsecondary education data collection program. IPEDS data are compiled from eight surveys collected directly from providers of postsecondary education in the United States. The survey is a census of colleges and universities that receive Title IV federal aid.

The surveys in IPEDS include the Institutional Characteristics, Completions, 12-Month Enrollment, Human Resources, Fall Enrollment, Finance, Student Financial Aid, and Graduation Rate surveys. The data collected in these surveys provide aggregate measures of an institution's yearly financial, enrollment, graduation, and institutional characteristics. This study draws data from the IPEDS Institutional Characteristics, Completions, Fall Enrollment, and Finance surveys. The IPEDS Institutional Characteristics Survey provides general information about the institution including educational offerings, mission statements, admissions requirements, and student charges. This study utilizes educational offerings and admissions data from this survey. The

Completions Survey captures data on the number of credentials awarded by an institution by academic program, gender, and race. Data from the Fall Enrollment Survey include the number of students by award level, race, gender, and residence. This study utilizes data on the number of undergraduate and graduate students attending the institution in the fall semester. The Finance Survey describes the financial condition of each institution. Data elements from the finance data include financial aid, expenditures, revenues, and endowment data from audited financial statements (National Center for Education Statistics, 2008). This study utilizes expenditure and financial aid data. Although each of these surveys is distinctly different, data collection is coordinated using the same collection process.

NCES has collected data through IPEDS from colleges and universities since 1986. Prior to that, NCES conducted similar data collections under the Higher Education General Information Survey (HEGIS), the Survey of Non-Collegiate Postsecondary Institutions (SNPI), and the Vocational Education Data System (VEDS) (Jackson, Peecksen, Jang, Sukasih, & Knepper, 2005). Institutions that receive Title IV funds under the Higher Education Act are required to submit data or risk the loss of funding. As a result, nearly all postsecondary institutions operating in the United States participate in the IPEDS surveys. Depending on the year, NCES collects the Institutional Characteristics, Completions, and 12-Month Enrollment surveys in the fall; Human Resources, Fall Enrollment, and Finance surveys in the winter; and Student Financial Aid and Graduations Rate surveys in the spring. In many states an IPEDS coordinator verifies that the surveys were correctly administered. After the surveys are submitted to the National Center for Education Statistics, NCES staff checks the surveys and contacts

institutions if there are any errors. NCES conducts regular technical quality studies of the data to ensure the surveys are standardized across institutions and the integrity of the data is maintained (Jackson et al., 2005).

The second data source draws from an annual survey on voluntary support from the Council for Aid to Education (CAE). Beginning in 1957, CAE has conducted the Voluntary Support of Education (VSE) survey every year in all sectors of education, from colleges and universities to secondary schools (Kaplan, 2001). It provides standard measures across institutions for every year the survey has been offered.   The data collected in the VSE survey include information on all aspects of giving to education in the United States, including:

- Gifts and grants to the institution, both for current operations and for capital purposes, regardless of form (cash, products, property, securities, etc.);

- Gifts and grants to affiliated foundations and organizations created to raise funds for the institution;

- Securities, real estate, equipment property, or other noncash gifts, evaluated at fair market value placed on them by an independent appraiser, not the cash income [from such properties];

- Deferred gifts;

- Cash values of life insurance contracts;

- Cash payments returned as contributions from salaried staff; and

- Insurance premiums paid by donors (Kaplan, 2001 p. 44).

The data in VSE surveys are reported in a regular fiscal year (July 1 to June 30), although a minority of institutions use different dates to define their fiscal year. The VSE survey does not track advertising revenue, contract revenues, contract research, contributions from government entities, earned income, transfers from affiliated foundations, or investment earnings (Kaplan, 2001). Only aggregate alumni giving and endowment data from the VSE survey are used in this study.

The data collection for the VSE survey begins on July 1 of a collection year. The CAE sends email notices to nearly 3,000 colleges and universities with follow-up emails for those institutions with valid email address. Additional educational institutions are eligible to participate. In any given year, more than half of the four-year colleges in the United States participate in the survey. For example, as shown in Table 3.1, nearly 50% of the four-year colleges and universities responded to the survey in 2001 (Kaplan, 2001, p. 45). As depicted in Table 3.2, in 2001, 81% of the public research/doctoral

Table 3.1

Voluntary Support of Education Survey response rates by type: 2001

	Four-Year Colleges and Universities	Two-Year Colleges	All Higher Education
Invited to Participate	1,858	1,115	2,973
Responses	947	113	1,060
Response Rate (%)	51	10	36

Note. From *Voluntary Support of Education* by A. Kaplan (2004).

Table 3.2

Voluntary Support of Education Survey response rates of public four-year colleges and

universities by Carnegie Classification: 2001

Carnegie Type	Number Invited	Number Participating	Participation Rate (%)
Research/Doctoral	161	133	81
Masters	269	150	56
Liberal Arts	73	18	25
Specialized	45	20	44
Total	548	321	59

Note. From *Voluntary Support of Education* by A. Kaplan (2004).

institutions, 56% of the public master's institutions, and 25% of the public liberal arts

institutions responded to the survey (Kaplan, 2001 p. 45). Overall, 59% of public four-

year institutions responded to the survey, representing 53% of all public four-year higher

education institutions in the United States.

The third data source is the *U. S. News and World Report's* yearly survey of

colleges and universities. *U.S. News* collects data from higher education institutions for

the purposes of ranking colleges and universities for a yearly publication. *U.S. News*

surveys institutions on academic reputation, student selectivity, faculty resources,

graduation and retention rates, financial resources, and alumni giving (Ehrenberg, 2002a).

This study uses data on the 25th and 75th percentile SAT score of an entering class from

each institution as a measure of student selectivity. The standardized definitions for how

to report SAT scores were developed collaboratively by magazine publishers, the College

Board, and national higher education associations, and have remained unchanged for the years of interest in this study. Average standardized test score data from the *U.S. News* surveys are used for this study.

Analytic Sample

The analytic sample for this study comprises public research universities drawn from NCES-sponsored IPEDS surveys. Exactly 165 institutions were eligible for selection in this study. The analytic sample comprises institutions that responded to all three data sources utilized for this study during a collection year. After taking into account the available data from the IPEDS, VSE, and *U.S. News* surveys, the final size of the analytic sample is 147 public research universities across 11 years representing 89% of all public research universities. The analysis includes 1,364 out of a possible 1,617 institution/year observations, indicating that the dataset is unbalanced. An analysis of the missing cases did not indicate there were differences between the analytical sample and the population of institutions.

Variables

The dependent variable in this study is the amount of alumni giving per FTE student. Alumni are defined as previous students who have earned credit toward a degree, regardless of whether they have earned a credential (Kaplan, 2001). The independent variable of interest in this study is the selectivity of an institution, a proxy for one measure of prestige.

As discussed in the literature review, selectivity is included in the model based upon Garvin's (1980) utility-maximizing model in conjunction with conceptual frameworks proposed by several scholars (Cunningham & Cochi-Ficano, 2002; Leslie & Ramey, 1988; Rose-Ackerman, 1996), who hypothesize that prestige in nonprofit higher education institutions influences alumni giving. Several scholars (Harrison, 1995; Monks, 2003; Volkwein & Sweitzer, 2006; Weerts & Ronca, 2006) also suggest that alumni from prestigious and selective institutions give to colleges at higher rates or give more money.

Student selectivity is measured in the model using the midpoint between the 25th and 75th percentiles in standardized test scores of an admitted class. Because several scholars (Brewer, Gates, & Goldman, 2002; Geiger, 2004; Hoxby, 1997; Meredith, 2004; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b) have used standardized test scores to measure selectivity, standardized test scores are used as a measure of prestige. Both SAT and ACT scores are used to measure selectivity. ACT scores are converted to SAT scores using a conversion chart from the College Board based upon the national distribution of test scores on both examinations (Dorans, Lyu, Pommerich, & Houston, 1997). Although there are many definitions of prestige, standardized test scores are used because there is a high correlation between student selectivity and *U.S. News* ranking (Grunig, 1997; Pascarella et al., 2006; Webster, 2001) and it is plausible that alumni have access to this information and may be responsive to institutional performance based on selectivity.

A number of control variables are also included in the model for this study. Many scholars (Cabrera et al., 2005; Harrison, 1995; Leslie & Ramey, 1988; Monks, 2003;

Volkwein & Sweitzer, 2006; Weerts & Ronca, 2006) have found that other variables can influence alumni giving. Only a few variables, however, can be used at the institutional level to predict alumni giving. Prior research (Belfield & Beney, 2000; Blumenfeld & Sartain, 1976; Harrison, 1995, Monks, 2003; Okunade, 1993; Okunade, 1996) has demonstrated that professional programs (law, medicine, and business) can have predictive value in determining alumni giving levels. Therefore, dummy variables indicating the presence of a program offering law (JD), business (MBA), or medical (MD) degrees are included in the model. Because Smith and Ehrenberg (2003) and Leslie and Ramey (1988) show that an institution's size can also influence the aggregate level of alumni giving to an institution, FTE enrollment is used to scale the finance variables that are included in the model.

Because past levels of alumni giving influence future levels of giving, a lagged (by one year) alumni giving variable is included in the model. Previous alumni giving is included in the model because several scholars (Ehrenberg & Smith, 2003; Harris, 1990; Harrison, 1995; Martin, 2005) posit that institutions with established development programs and the demonstrated ability to solicit donations are likely to have high future levels of giving. The relationship between past giving and future giving also explains why wealthy institutions can maintain their wealth relative to other institutions (Geiger, 2004; Hoxby 1997; Winston, 1999). Another benefit of including lagged alumni giving in the model is the ability to address the second research question in this study.

In this study, selectivity is presumed to be an endogenous variable. Some scholars (Dolan & Schmidt, 1994; Porter & Toutkoushian, 2006) have indicated that prestige has its own predictors and may influence outcome variables. A number of

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researchers (Cheslock & Gianneschi, 2008; Epple, Romano, & Sieg, 2006; Massy & Zemsky, 1997; Volkwein & Sweitzer, 2006; Winston, 1999; Zemsky, Shaman, & Shapiro, 2001) have introduced predictors of prestige that are independent of alumni giving. Some scholars (Cheslock & Gianneschi, 2008; Epple, Romano, & Sieg, 2006; Volkwein & Sweitzer, 2006; Winston, 1999) suggest that institutional wealth allows colleges and universities to invest in prestige. Other scholars (Massy & Zemsky, 1997; Winston, 1999; Zemsky, Shaman, & Shapiro, 2001) indicate that administrative expenditures will also influence prestige. Predictors of prestige, therefore, include institutional wealth as measured by the end-of-year market value of an institution's endowment per FTE student and total expenditures (excluding hospital expenditures) per FTE student. Because data definitions of some finance variables changed between fiscal 2002 and fiscal 2005 as a result of new accounting standards developed by the Governmental Accounting Standards Board (GASB), a dummy variable is included in the model to take into account possible differences in the calculation of total expenditures under the new GASB standards.

Based upon the recommendations of Baltagi (2008), a time variable is included in the model to detrend the data and correct for trend stationary variables. Trend stationary variables are non-stationary variables that are stationary within a time period (Baltagi, 2008). Because a review of the descriptive statistics and a priori statistical tests indicates that the finance and selectivity data are trending upward (or trend stationary) even after they are differenced from the previous time period, a time variable is included in the model to remove these effects. Baltagi (2008) recommends that including a time variable

where a trend stationary variable is present will increase the efficiency of a statistical model.

All continuous variables in this study are log transformed to ensure normal distributions. Variables with zero values were assigned a value of one so they could be log transformed. Using the Consumer Price Index (CPI), all financial variables were transformed into 2006 dollars to adjust for inflation. See Table 3.3 for a description of all the variables used in this study. The descriptive statistics for the variables in this study are displayed in Table 3.4.

Statistical Techniques

In this study, dynamic fixed effects panel (DFEP) modeling techniques are used to examine the hypothesis that changes in an institution's selectivity influence alumni giving. This method is the most appropriate because it corrects for biased parameter estimates when using a lagged dependent variable as an independent variable with panel data. Although panel data provide additional observations to increase the statistical power of an analysis, the presence of dynamic data (i.e., time lags) may result in spurious rather than actual relationships between variables when using OLS regression analysis (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998; Nickell, 1981; Titus, 2009). This section will describe how more appropriate statistical techniques are used to answer the research questions in this study. This section also addresses how these statistical techniques address omitted variable and endogeneity bias.

Table 3.3

Description of variables

Variables	Definition	Source
Dependent Variable		
Alumni giving per FTE student	Alumni giving in 2006 dollars, divided by the number of full-time equivalent undergraduate, graduate, and professional students, and log transformed. Alumni are defined as previous students who have earned credit toward a degree, certificate, or diploma at the institution, regardless of whether they earned a credential (Kaplan, 2001).	VSE Survey
Control Variables		
Professional Degrees:		
Law (JD)	Dummy variable indicating an institution graduated students with a law degree (1 = yes, 0 = no).	IPEDS Completions Survey
Business (MBA)	Dummy variable indicating an institution graduated students with a business MBA degree (1 = yes, 0 = no).	IPEDS Completions Survey
Medicine (MD)	Dummy variable indicating an institution graduated students with a medical (MD) degree (1 = yes, 0 = no).	IPEDS Completions Survey
Use of new accounting standards	Dummy variable indicating that the institutions utilized new GASB accounting standards for financial figures reported on annual statements (1 = yes, 0 = no).	IPEDS Finance Survey
Time	Dummy variable for each year in the panel data for each institution (1 = yes, 0 = no).	

	Description	Source
Independent Variables (Endogenous)		
Selectivity (SAT midpoint score)	Derived variable by calculating the midpoint between the 75th and 25th percentile of SAT (or converted ACT) score, log transformed.	US News Indicators (IPEDS Institutional Characteristics Survey was used to impute missing data).
Independent Variables (Exogenous)		
Institutional wealth (endowment value per FTE student)	Endowment end-of-year market value in 2006 dollars, divided by the number of full-time equivalent undergraduates, graduate, and professional students, and log transformed.	IPEDS Finance Survey
Total expenditures per FTE student	Total expenditures in 2006 dollars, divided by the number of full-time equivalent undergraduate, graduate, and professional students, and log transformed.	IPEDS Finance Survey

Table 3.4

Descriptive statistics of sample (continuous variables log transformed): 1996-2006

Variables	Observations	Mean	S.D.	Minimum	Maximum
Dependent Variable					
Alumni giving per FTE student	1,364	2.566	0.554	0.000	3.988
Control Variables					
Professional Degrees:					
Law (JD)	1,364	0.416	0.493	0.000	1.000
Business (MBA)	1,364	0.823	0.382	0.000	1.000
Medicine (MD)	1,364	0.296	0.457	0.000	1.000
Use of new accounting standards	1,364	0.567	0.496	0.000	1.000
Independent Variables (Endogenous)					
Selectivity (SAT midpoint score)	1,364	3.042	0.034	2.037	3.130
Independent Variables (Exogenous)					
Institutional wealth (endowment value per FTE student)	1,364	4.050	0.511	0.000	5.311
Total expenditures per FTE student	1,364	4.467	0.168	4.067	4.985

Research Question 1: Selectivity and Alumni Giving

> After taking into account predictors of student selectivity, to what extent does an institution's selectivity influence alumni giving at public research universities?

The first research question in this study seeks to understand the extent to which student selectivity influences alumni giving at public research universities after taking into account predictors of selectivity. A dynamic fixed effects panel (DFEP) model is an appropriate technique to address this question for several reasons. First, compared to OLS or fixed effects regression, DFEP modeling allows researchers to model how past levels of alumni giving affect current levels of alumni giving more accurately (Arellano & Bover, 1995; Blundell & Bond, 1998). Second, DFEP modeling can take into account institution-related fixed effects and time-related fixed effects. In other words, DFEP modeling accounts for unobservable variables that are specific to each institution and year. As a result, selectivity's influence on alumni giving could be analyzed while taking into account unobserved variables that are of less interest. Finally, DFEP models can take into account the possible endogeneity of regressors (Arellano & Bover, 1995; Blundell & Bond, 1998) such as student selectivity. Because it can simultaneously provide parameter estimates for a lagged dependent variable, account for unobserved effects, and allow for the endogeneity of an independent variable, DFEP modeling is the most appropriate technique to address the first research question in this study.

Although there are many benefits of using DFEP modeling to address the first research question, several scholars (Arellano & Bover, 1995; Blundell & Bond, 1998) have noted possible problems with DFEP modeling. In earlier DFEP models, for example, Anderson and Hsiao (1982) proposed using differenced variables or instruments in the model to correct for possible correlations between the independent variables and the error term. Arellano (1989) found that the DFEP model that uses differenced instruments yielded parameter estimates with large standard errors for small sample sizes, which can result in spurious relationships between variables. Other researchers (Arellano & Bover, 1995; Blundell & Bond, 1998) recommend using a DFEP model in combination with general method of moments (GMM) techniques for models with a lagged dependent variable and endogenous predictors. Using GMM techniques yields more robust standard errors in the model and improves the accuracy of the parameter estimates (Arellano & Bover, 1995; Blundell & Bond, 1998).

Although GMM techniques improve the accuracy of the DFEP model parameter estimates, Blundell and Bond (1998) advocate adding an additional set of instruments. According to Nickell (1981), using estimators in first-differenced models yields inconsistent results in samples with a small number of time periods and a large number of cases. In these cases, causality between endogenous predictors and the dependent variable cannot be inferred since causality may be reversed. To address these limitations, researchers (Arellano & Bover, 1995; Blundell & Bond, 1998) advocate using system GMM estimation. The system GMM method corrects for the problems addressed by Arellano (1989) and reverse causality of endogenous variables by including a matrix of instrumental variables. The system GMM method corrects for the problem of the reverse

causality of endogenous variables in the model by including past and future values of differences of strictly exogenous variables as instruments (Blundell & Bond, 1998). In unbalanced panels (such as data in this study), forward orthogonal deviations or the average of all past and future observations are differenced in the system GMM method (Arellano & Bover, 1995; Roodman, 2006).

To illustrate the benefits of using DFEP modeling, this study reports the results for an OLS regression model, a fixed effects regression model, and an instrumental variable regression model in addition to the system GMM dynamic fixed effects models. The next sections will illustrate how system GMM DFEP modeling is used for this study; briefly summarize OLS, fixed effects, and instrumental variable regression techniques and illustrate the limitations of these commonly used statistical techniques when using models with a lagged dependent variable as an independent variable.

Dynamic Fixed Effects Panel Models

To illustrate the use of a dynamic fixed effects panel (DFEP) model for the influence of an institution's selectivity on alumni giving, the conceptual framework for this study can be summarized using a system of equations. In the first equation, alumni giving (AG_{it}) in the current period is a function of alumni giving (AG_{it-1}) in a previous period, prestige (P_{it}) (measured by student selectivity), and other institutional characteristics or controls (IC_{it}). Prestige is an endogenous variable predicted by wealth (W_{it}) and educational and general expenditures (E_{it}). These relationships are represented by the following:

$$AG_{it} = f(AG_{it-1}, P_{it}, IC_{it}) \qquad (3.1),$$

$$P_{it,} = f(W_{it}, E_{it}) \tag{3.2},$$

where i denotes the institution and t denotes the time. Combining the alumni giving and

prestige equations (Equations 3.1 and 3.2 respectively) yields the reduced form of the

dynamic equation:

$$y_{it} = \alpha y_{it-1} + \gamma_1 W_{it} + \gamma_2 X_{it} + \eta_i + \lambda_t + \varepsilon_{it} \tag{3.3},$$

where y_{it} is alumni giving per student; γ is the coefficient; W_{it} is the vector of endogenous

variables including prestige and previous alumni giving; X_{it} is the vector of exogenous

variables including control variables; η_i is an institution specific error term; λ_t is the time

specific error term; and ε_{it} is the residual error. Subtracting the value of each variable

from the previous time period (i.e., first differences) of Equation 3.3 yields a model

where researchers can account for unobserved variables:

$$y_{it} - y_{it-1} = \alpha(y_{it-1} - y_{it-2}) + \gamma_1(W_{it} - W_{it-1}) + \gamma_2(X_{it} - X_{it-1}) + \lambda_t + (\varepsilon_{it} - \varepsilon_{it-1}) \tag{3.4}.$$

The institution specific error term (η_i), which does not vary across time periods, is

subtracted out of the model.

Arellano (1989) found that the estimators in Equation 3.4 were inefficient and

yielded large variances. Additionally, Nickell (1981) showed that Equation 3.4 yields

biased estimators where the direction of causality between endogenous predictors and the

dependent variable cannot be inferred. The following equation represents Equation 3.4

rewritten to include the system GMM estimator:

$$y_{it} = \alpha + \beta y_{it-1} + \gamma_1(W_{it} - W_{it-1}) + \gamma_2(X_{it} - X_{it-1}) + \lambda_t + (\varepsilon_{it} - \varepsilon_{it-1}) \tag{3.5},$$

where β is the coefficient for the lagged dependent variable. Equation 3.5 represents the

DFEP regression model with system GMM-style instruments. With the corrections

employed by system GMM, the model produces more robust standard errors, which will

provide a better understanding of the relationship between the dependent and independent variables (Arellano & Bover, 1995; Blundell & Bond, 1998). The Hansen *J* test is used to ensure that the GMM-style instruments, as a group, are valid when included in the DFEP model. Although some scholars have disputed that the Hansen *J* statistic accurately tests for the validity of instruments (see Wright, 2003), the statistic is the best method available at the time of this analysis.

Stata (IC version 10.1), a statistical software package, is used to analyze the influence of selectivity on alumni giving by employing dynamic panel modeling via the Stata module, xtabond2. In addition to appropriately addressing unobserved institution fixed effects, the presence of a lagged dependent variable that gives rise to auto correlation, and a panel dataset that has a relatively short time dimension, the use of the module xtabond2 allows analysts to take into account the endogenous nature of variables such as selectivity. When using the Stata xtabond2 module, endogeneity is addressed in two stages. In the first stage, selectivity is regressed on all the variables in the conceptual model. In the second stage, alumni giving is regressed on the predicted values of selectivity along with other variables in the conceptual model. However, the Stata xtabond2 module provides regression results from only the second stage. Because of this limitation of the software, results from the first stage will be examined by reviewing p-values for each of the parameter estimates in the first-stage of a static instrumental variable (2SLS) regression model. Analyzing the first-stage should provide an indication of how consistent the model is with the conceptual framework.

Ordinary Least Squares Regression

Ordinary least squares (OLS) regression is employed in the analysis for this study to demonstrate the challenges of analyzing an autoregressive dynamic panel model with OLS regression. In order for OLS regression to yield accurate parameter estimates with corresponding standard errors, a number of assumptions must be met for a properly specified model. Three basic assumptions of the OLS model include: (1) the errors associated with one observation of the dependent variable are not correlated with errors associated with another observation, (2) the variance of the errors is the same at all levels of the independent variable (i.e., a state of homoskedasticity), and (3) the errors of the independent variable are not correlated with the dependent variable (Pedhazur, 1997). Violations of these assumptions can yield spurious relationships between variables. The use of OLS regression with the conceptual framework in this study violates at least two of these assumptions.

In a simplified autoregressive model (Equation 3.6, below), the dependent variable (y_{it}) has a group of predictors, plus an associated error term (ε_{it}). The lagged dependent variable in the model (y_{it-1}) should have similar predictors as the dependent variable, so the error term associated with y_{it-1} is going to be correlated with ε_{it} violating the first assumption.

$$y_{it} = \alpha y_{it-1} + \gamma_1 x_{it} + \varepsilon_{it} \qquad (3.6)$$

Under the same logic, the error associated with y_{it-1} is going to be correlated with the dependent variable. Additionally, when the lagged dependent variable is added to the model, it will account for the majority of the variance and yield a significant hypothesis test just because of its high correlation to the dependent variable and not because of any

substantive relationship. A fixed effects regression model can address some of the limitations of the OLS regression model.

Fixed Effects Regression

Another problem Roodman (2006) illustrates with OLS regression is that the fixed effects are not accounted for in the model. If, for example, there was an unusual event affecting the finance variables in one year of the panel, the variance associated with that event is applied to the error term for the entire panel decreasing the accuracy of the coefficient estimates. Similarly, if an unobserved institutional characteristic is not specified in the model, the error associated with that characteristic is again applied to the error term for all institutions. Fixed effects regression is designed to account for these unobserved independent variables and improve the accuracy of the model.

Of the many methods used to calculate the fixed effects estimator, one method that easily demonstrates how the model accounts for unobserved variables is the least squares dummy variable (LSDV) method. The LSDV method of modeling fixed effects applies dummy variables to the OLS regression model for each institution or time period (Roodman, 2006). Each dummy variable accounts for the variance of the fixed effects within each institution and time period. Other methods to calculate the fixed effects yield identical results but do not overtly use dummy variables.

Although fixed effects regression accounts for unobserved variables, Nickell (1981) and Roodman (2006) purport that the fixed effects model does not correct for dynamic panel bias. Roodman (2006) contends that the fixed effects model overcorrects for the presence of a lagged dependent variable in the model. Whereas the OLS model

biased the coefficient for the lagged dependent variable upward (yielding potentially unreliable statistically significant coefficients), the fixed effects model biases the coefficient downward (yielding potentially incorrect statistically insignificant coefficients). The true estimate, therefore, should be between these two coefficients. Hence, an alternative statistical technique is required to correct for dynamic panel bias in the model.

Instrumental Variable Regression (Two-Stage Least Squares (2SLS))

Instrumental variable regression, commonly known as two-stage least squares (2SLS) regression corrects for inaccurate coefficient estimates due to endogenous variables in the dynamic panel model. Verbeck (2004) describes 2SLS regression as a simultaneous equation system to correct for the presence of endogenous variables through a two-step process. In the first step, endogenous variables are regressed on exogenous variables using OLS regression analysis. In the second step, the endogenous variables are replaced with their predicted values from the first step, and then a final model is estimated using OLS regression. Additionally, this method can account for fixed effects as described above, as well as for a lagged dependent variable as a predictor in the model under the presumption that it is endogenous.

Roodman (2006) observes that 2SLS regression can still yield inefficient parameter estimates. 2SLS regression is very efficient under conditions of homoskedasticity (i.e., variability across the regression line is constant) but performs very poorly under conditions of heteroskedasticity (i.e. variability across the regression line is not constant) (Roodman, 2006). Under conditions of heteroskedasticity in dynamic panel

data, DFEP modeling is the most robust technique to address the first research question (Roodman, 2006).

Research Question 2: Convergence and Divergence of Alumni Giving Rates

Taking into account student selectivity, is there evidence of convergence or divergence among public research universities over time in alumni giving?

The second research question in this study seeks to understand if there is evidence of convergence or divergence over time in alumni giving at public research universities after taking into account the predictors of alumni giving and prestige. This research question is addressed by examining the sign of the coefficient for the lagged alumni giving variable (β in equation 3.5). A positive sign of the lagged dependent variable would indicate convergence and a negative sign would indicate divergence in alumni giving among public research universities over time.

Limitations of the Study

This study has at least three limitations. First, data that are used in this research are based on secondary sources. This study is dependent on the methodology and data definitions used by other researchers and findings can only be interpreted given these definitions. For example, the definition of alumni in the Voluntary Support of Education Survey includes previous students that did not graduate. Second, this study only models

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public research universities. The potential findings from this study should not be used to describe other sectors or institution types. Third, this study uses a rational perspective from the field of economics to understand the conceptual framework proposed in this study. Other scholars (Birnbaum, 1988; Cohen & March, 1986; Cohen, March, & Olsen, 1972; James, 1990) note that higher education institutions are highly ambiguous and complex. In future studies, other perspectives and frameworks that can account for this complexity should be used to examine the influence of selectivity or prestige on alumni giving to higher education institutions.

Summary

Drawing on concepts from Garvin (1980) and other economists (Cunningham and Cochi-Ficano, 2002; Leslie and Ramey, 1988; Rose-Ackerman, 1996) this chapter presented a model for understanding the relationship between an institution's selectivity and alumni giving. This chapter described a dynamic fixed effects panel (DFEP) model via system generalized method of moments (GMM). System GMM DFEP modeling is recommended by a number of scholars (Arellano & Bover, 1995; Blundell & Bond, 1998) as the most appropriate method to address the research questions in this study because it corrects for endogeneity, unobserved variables, heteroskedasticity, and dynamic panel bias. This study will demonstrate the use of modeling dynamic panel data by comparing the results of system GMM DFEP models with OLS regression, fixed effects regression, and instrumental variable regression.

CHAPTER 4

RESULTS

Introduction

This chapter presents the results of the study within the context of the two

research questions. Before presenting the results to address each research question, a

priori statistical analyses are presented to better understand the characteristics of the data.

Given the conceptual framework and the characteristics of the data, the a priori analyses

demonstrate which statistical technique is most appropriate to address the research

questions. Given this information, a DFEP model is the technique with the least number

of limitations.

The first research question for this study seeks to understand the extent to which

an institution's selectivity influences alumni giving at public research universities, after

taking into account the predictors of selectivity. Before addressing the research question,

this chapter compares the results of OLS, fixed effects, and instrumental variable

regression models to demonstrate how DFEP modeling addresses the limitations

presented in each model. The results of two DFEP models using difference and system

GMM are compared to each other and interpreted to answer the first research question.

The second research question seeks to address if there is evidence of convergence

or divergence in alumni giving. Using the results presented in the DFEP model described

above, this section demonstrates how to interpret the model to understand if convergence

or divergence is occurring in alumni giving.

A Priori Statistical Analyses

To ensure all the assumptions are met for the statistical models in this study, a priori statistical analyses are conducted to understand the structure and characteristics of the dataset. One set of tests seeks to understand how much observations in a time period depart from the mean in the entire sample (known as non-stationary data characteristics or a unit root). In order to uncover non-stationary characteristics of the data in this study two statistical tests are employed. In addition to testing non-stationary characteristics, a statistical test is employed to examine if heteroskedasticity of variance is present in the dependent variable. Heteroskedasticity describes a characteristic of data where the variability of the data changes along a regression line and can yield inconsistent results in OLS regression. A final test is used to determine the endogenous properties of variables. This section presents the results of these analyses and describes which method can yield the most robust results given these limitations in the data.

The first set of statistical tests used for this analysis seeks to understand if the dependent variable is stationary around a time trend. When testing unit roots in panel data with some institutions missing years of data (an unbalanced panel), Maddala and Wu (1999) propose using Fisher's test to compare unit root tests for each institution time-series. The null hypothesis is a non-stationary time-series for all higher education institutions. The alternative hypothesis is that at least one institution displays a stationary time series. As shown in Appendix B (see pages 136-140), the test rejects the null hypothesis indicating that at least one institution's data are stationary. Despite these results, non-stationary data may still be in the dataset, as the presence of just one institution with stationary data can yield a statistically significant result. A second unit

root test is conducted to understand the prevalence of non-stationary data in the panel dataset.

Using a subsample of 78 institutions with a complete panel of 11 years of data, a second unit-root test, using the Hadri (2000) technique, is conducted. The null hypothesis for this test, in contrast to Fisher's test, is a stationary trend, whereas the alternative hypothesis is non-stationary. As demonstrated in Appendix B, most of these unit-root tests reject the null hypothesis, providing evidence of non-stationary data in the panels. Given these results, it is presumed that the data are non-stationary and a statistical test robust to these characteristics is necessary.

The second statistical test examines heteroskedasticity of variance in the dependent variable. To test for changes in variance across institutions, the coefficient estimates of a generalized least squares regression model applied to panel data under assumptions of homoskedasticity were compared with the same model accounting for heteroskedasticity. A likelihood ratio test compares the coefficients between the two generalized least squares models to see if accounting for heteroskedasticity yields statistically difference coefficients. The null hypothesis for this test is that the coefficient estimates are the same for both models. The alternative hypothesis is that the coefficient estimates are different, indicating that a statistical technique must account for heteroskedasticity. As demonstrated in Appendix C (see pages 141-142), it is probable that heteroskedasticity exists in the dependent variable.

The third statistical analysis seeks to verify the assumption that SAT score is an endogenous variable in the statistical model. Table 4.1 displays the results of a first-

Table 4.1

First stage results of a static instrumental variable/generalized method of moments fixed effects regression model: estimated coefficients and standard errors of the endogenous variable SAT score: 1997-2007

	First Stage Instrumental Variable (2SLS)
Professional Degree Programs	
Law (JD)	-0.012
	(0.001)
Business (MBA)	0.001
	(0.001)
Medicine (MD)	0.000
	(0.002)
Endowment value	0.004*
	(0.002)
Expenditures, lagged 1 year	0.269*
	(0.012)
New GASB Standard	0.002
	(0.003)
Observations	1,173
Number of Institutions	141
Number of Instruments	15
Year Dummies?	Yes
F-Statistic	2.58**
R-Squared	0.181**
Hansen J Statistic	0.896

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; standard errors are in parentheses.

All continuous variables in this study are log transformed to ensure normal distributions. Variables with zero values were changed to one so they can be log transformed. All financial variables were transformed into 2006 dollars to adjust for inflation using the Consumer Price Index (CPI). The partial R-squared of excluded instruments is .0164 and is statistically significant ($p < .01$).

stage estimation generated by a static instrumental variable regression model (i.e. a lagged dependent variables is not in the model as an independent variable). In order to account for endogenous regressors, instrumental variable regression first regresses endogenous variables on exogenous regressors, and then uses the predicted values of the endogenous variables in the second-stage. The results from the first stage provide an indication of whether variables that are presumed to be endogenous in the model are endogenous. The first stage of the static model is statistically significant, with an R-squared statistic accounting for 18% of the variability in SAT score [$F(15,140) = 2.59$; R-squared $= .182$; $p < .01$}]. Two variables in the first stage are statistically significant predictors of the endogenous SAT score variable: endowment value per FTE (beta $=$ .0004; $p < .05$) and lagged expenditures per FTE (beta $= .269$; $p < .05$). Table 4.1 also shows that the Hansen J statistic is non-significant ($p < .34$), indicating that the instrumental variables, as a group, are not correlated with the error term. Although statistically significant, the instruments do not account for a large amount of variability. The partial R-squared of excluded instruments for SAT score is only .0164, but is statistically significant ($p < .01$). In other words, only 1.6% of the variance of SAT is reduced by including endowment value and expenditures. Although the partial R-squared value is low, the beta values, the overall R-squared statistic, and the Hansen J statistic suggest that SAT score is endogenous and should be instrumented in the dynamic statistical model.

The statistical tests for this a priori analysis show that non-stationary data, heteroskedasticity of variance, and endogenous variables may complicate the modeling required to answer the research questions. Pindyk and Rubinfeld (2000) note that first-

differencing variables will transform a non-stationary trend to a stationary trend. A

DFEP model using difference generalized method of moments (difference GMM)

accounts for non-stationary data and heteroskedasticity by utilizing a regression model on

first-differences. A system GMM captures the adjustment employed in difference GMM

in a system of matrixes to correct for the presence of endogenous variables and large

variances as described by Arellano (1989).

Results by Research Question

This chapter presents the findings for each of the two research questions. The

results are displayed by each question and summarized at the end of the chapter.

Research Question 1: Prestige and Alumni Giving

After taking into account predictors of student selectivity, to what extent does

an institution's selectivity influence alumni giving at public research

universities?

The first research question in this study seeks to understand the extent to which

changes in an institution's selectivity result in changes in alumni giving at public research

universities after taking into account the predictors of selectivity. In order to demonstrate

the method used for this analysis and to understand how inappropriate statistical methods

may be misinterpreted in the literature, this chapter presents five statistical models of

increasing sophistication, each addressing the limitations of the previous method. The

statistical regression models used to understand the influence of an institution's

selectivity on alumni giving include OLS regression, fixed effects regression,

instrumental variable (two-stage least squares (2SLS)) regression, and two DFEP models

using generalized method of moments (GMM). See Appendix D for detailed information

on the Stata commands used to estimate these models.

Table 4.2 displays the results from the first two models. Model 1 uses OLS

regression to understand how the SAT midpoint score influences alumni giving over

time. The first model tests whether the SAT score influences alumni giving per FTE

student, taking into account the presence of professional degree programs, endowment

value per FTE, and expenditures per FTE. At first glance, Model 1 appears consistent

with the hypothesis that SAT score influences alumni giving yielding a statistically

significant model [$F(17, 1,015)=104.03$; $r^2=.562$]. SAT score (beta=1.40; $p < .001$),

endowment value (beta=.650; $p < .001$), and expenditures (beta=.395; $p < .001$) are all

significant positive contributors to alumni giving per FTE student. Having a medical

degree program is a negative contributor to alumni giving (beta= −.177; $p < .001$).

In Model 2, the lagged dependent variable is added to the model as an independent

variable to create what is called an autoregressive model. The lagged alumni giving

variable accounts for the majority of the variance in the model (beta=.719; $p < .001$). The

R-squared increases from .56 to .80 and SAT score, the presence of the law professional

degree program, and expenditures are no longer significant predictors of alumni giving.

The number of observations drops from 1,364 to 1,177 because one less year of data is

included in the model, due to a lagged variable.

Table 4.2

The influence of selectivity on alumni giving: OLS, autoregressive OLS, and fixed effects regression models estimated coefficients and standard errors: 1997-2007

	Model 1: OLS Regression	Model 2: Autoregressive OLS Regression	Model 3: Fixed Effects Regression
Constant	-6.142***	-0.826	-0.777
	(0.994)	(0.743)	(2.633)
Alumni giving, lagged 1 year		0.719***	0.017
		(0.020)	(0.031)
SAT score	1.397***	0.146	0.244
	(0.386)	(0.282)	(0.826)
Professional Degree Programs			
Law (JD)	0.147***	0.033	-0.078
	(0.023)	(0.017)	(0.106)
Business (MBA)	0.046	0.013	0.020
	(0.026)	(0.019)	(0.042)
Medicine (MD)	-0.177***	-0.056*	-0.052
	(0.030)	(0.022)	(0.075)
Endowment value	0.650***	0.205***	0.137*
	(0.026)	(0.027)	(0.054)
Expenditures	0.395***	0.104	0.475*
	(0.105)	(0.076)	(0.218)
New GASB Standard	-0.005	-0.184*	-0.038
	(0.114)	(0.080)	(0.071)
Observations	1,364	1,177	1,177
Number of Institutions	145	145	145
Year Dummy Variables?	Yes	Yes	Yes
F-Statistic	104.03***	270.69***	3.78***
Adjusted R-Squared	0.562	0.796	0.410

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; standard errors are in parentheses.

All continuous variables in this study are log transformed to ensure normal distributions. Variables with zero values were changed to one so they can be log transformed. All financial variables were transformed into 2006 dollars to adjust for inflation using the Consumer Price Index (CPI).

According to Roodman (2006), the OLS model is prone to Type II error because of an upward bias in the parameter estimate of the dynamic variable (lagged alumni giving) or large standard errors. One approach to address this error is to purge out fixed effects. Roodman (2006) states that the lagged dependent variable term is endogenous to fixed effects (or unobserved variables) in the error term of the OLS model. Fixed effects regression accounts for unobserved independent variables but over-corrects the OLS model and provides downwardly biased parameter estimates (Roodman, 2006).

The results from the fixed effects regression model are displayed in Model 3. In this model, not as many predictors are statistically significant contributors to alumni giving when compared to the OLS autoregressive model. Only endowment value per FTE student (beta=.137; $p < .05$) and expenditures per FTE student (beta=.475; $p < .05$) are predictors of alumni giving. When comparing the OLS autoregressive model with the fixed effects model, Roodman (2006) states that the parameter estimate for the lagged dependent variable lies between the OLS regression model (Model 2) and the fixed effects model (Model 3). Therefore, it should be expected that the lagged alumni giving variable should have a beta that ranges between 0.017 (from the OLS regression model) and 0.719 (from the fixed effects regression model).

Table 4.3 displays the results of the regression models that address the limitations of the statistical model presented above. Model 4 presents the results of an instrumental variable regression model. Instrumental variable regression, more commonly known as two-stage least squares (2SLS) regression, is more appropriate than the previous methods because it can account for endogenous regressors as well as fixed effects. The method uses a two-stage process to calculate parameter estimates. In the first stage, using OLS

Table 4.3

The influence of selectivity on alumni giving: Instrumental variable and dynamic fixed effects panel models estimated coefficients and standard errors: 1997-2007

	Model 4: Instrumental Variable (2SLS)	Model 5: Difference GMM	Model 6: System GMM
Constant			1.837
			(3.742)
Alumni giving, lagged 1 year	0.036	0.141	0.120
	(0.054)	(0.125)	(0.081)
SAT score	19.776*	-2.062	-1.051
	(8.554)	(3.624)	(1.499)
Professional Degree Programs			
Law (JD)	-0.044	-0.066	0.116*
	(0.050)	(0.045)	(0.052)
Business (MBA)	-0.008	0.018	0.051
	(0.044)	(0.042)	(0.049)
Medicine (MD)	-0.065	-0.065	-0.223***
	(0.074)	(0.071)	(0.062)
Endowment value		0.097	0.642***
		(0.097)	(0.095)
Expenditures		0.572	0.505
		(0.313)	(0.290)
New GASB Standard	-0.090	-0.057	-1.286
	(0.086)	(0.335)	(0.803)
Observations	1,173	1,032	1,177
Number of Institutions	141	141	145
Number of Instruments	14	22	33
Year Dummies?	Yes	Yes	Yes
F-Statistic	3.53***	3.86***	43.05***
Hansen J Statistic	7.541*	10.49	10.69
Arellano-Bond tests for			
AR(1) in first differences (Z)		-3.44***	-3.69***
AR(2) in first differences (Z)		0.54	0.06

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; standard errors are in parentheses

Only second-stage results of the instrumental variable model are displayed. First stage results are available in Appendix D, page 146. All continuous variables in this study are log transformed and variables with zero values were changed to one so they can be log transformed. All financial variables were transformed into 2006 dollars.

regression, endogenous variables are regressed against exogenous regressors. In the

second stage, the endogenous variables are replaced with their predicted values from the

first stage, and then a final model is estimated using OLS regression (Verbeck, 2004). As

shown in Model 4, SAT score is once again a statistically significant predictor of alumni

giving per FTE (beta=19.78; $p < .05$). Although the model accounts for fixed effects and

endogenous variables, it is still subject to dynamic panel bias. According to a number of

scholars (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998;

Nickell, 1981; Titus, 2009), all the models presented thus far can yield spurious

relationships due to the correlation problems related to a lagged dependent variable in the

model. The only way to address this bias is through the transformations in DFEP

modeling techniques (Roodman, 2006).

In this analysis, a DFEP via GMM is used to address the research question

regarding the influence of an institution's selectivity on alumni giving. This method is

the most appropriate because it corrects for biased parameter estimates when using a

lagged dependent variable as an independent variable with panel data. Model 5 in Table

4.3 presents the results of the Arellano-Bond (1991) GMM estimator (difference GMM).

Difference GMM accounts for the fixed effects by first-differencing all the variables in

the model using data from the previous time period. For unbalanced panels (i.e., data

with missing cases in certain years), a similar transformation of the variables is used

instead of first differencing. Given that some observations may be missing, Arellano and

Bover (1995) propose subtracting the average of all lags and leads of the variable rather

than subtracting first differences, which may be missing for some institutions. Using this

alternate transformation method, Model 5 yields no statistically significant predictors of

alumni giving per FTE but does produce a statistically significant model [F (17, 141) =3.85, p < .001]. SAT midpoint score is no longer a predictor of alumni giving per FTE (beta=-2.06; p < .15); endowment value per FTE (beta=.097; p < .10) and expenditures per FTE (beta=.572; p < .35) also have no statistical significance.

Two diagnostic statistics are used to determine if a dynamic panel model using GMM is properly specified. The Hansen *J* statistic is designed to test whether all the variables (as a group) in the model are valid instruments (i.e., uncorrelated with the error term). The null hypothesis is that the instrumental variables included in the model are exogenous and uncorrelated with the error. The alternative hypothesis indicates that the instruments are correlated with the error term and cast doubt on the validity of the instruments. Although the Hansen *J* statistic is not significant at the .05 level, the probability that another sample will yield invalid instruments is still high (χ^2=10.49; p < .10).

The second diagnostic statistic tests for autocorrelation of the lagged dependent variable and other endogenous variables. Autocorrelation indicates that the lags of the dependent variable (or other endogenous variables) are not exogenous. The null hypothesis for this test is that the variables are exogenous and autocorrelation is not present. The alternative hypothesis indicates that autocorrelation is present and the estimated coefficients and standard errors may not be accurate. Two sets of statistics are presented in Table 4.2. The Arellano-Bond test for autocorrelation in first-differenced residuals (AR1) is expected to be statistically significant. If the test is not significant, then DFEP modeling is not required to model the data. The Arellano-Bond test for autocorrelation in the final GMM model (AR2) is not expected to be statistically

significant in a properly specified model, indicating that the variable transformations successfully corrected for autocorrelation (Arellano & Bond, 1991; Roodman, 2006). In the difference GMM DFEP model presented in Table 4.4, the Arellano-Bond tests for autocorrelation yielded a statistically significant test for first-order autocorrelation (AR1) ($Z=-3.44$; p < .001) and no statistical significance in second-order autocorrelation (AR2) ($Z=.54$; p < .60), indicating that the final model was free of autocorrelation.

Although the difference GMM model is an improvement on instrumental variable regression, Blundell and Bond (1998) have shown that it still produces weak instruments leading to spurious relationships among the variables. In order to provide more accurate parameter estimates, additional corrections to the model are required through system GMM. The final model on Table 4.3 shows more precise estimates of the standard error.

Model 6 presents the results from the DFEP using the Blundell-Bond (1998) system GMM estimator. The system GMM method corrects for the problems addressed by Arellano (1989) and reverse causality of endogenous variables by including a matrix of instrumental variables. The method incorporates the corrections from the first-difference GMM estimator into a system of these additional instrumental variables. Roodman (2006) recommends using an additional modification to the model through the Windmeijer (2005) finite sample correction for variance to adjust for a downward bias in the standard errors, which is endemic to other GMM models. With the corrections employed by system GMM, the model produces more robust standard errors which provides a better understanding of the relationships among variables (Arellano & Bover, 1995; Blundell & Bond, 1998).

As shown is Table 4.3, Model 6 provides a robust model that predicts alumni

giving per FTE with a statistically significant model [$F(17, 144) = 43.05$; $p < .001$].

Although the model as a whole is statistically significant, SAT score does not predict

alumni giving per FTE student (beta = -1.05; $p < .50$). Endowment per FTE student is a

significant positive predictor (beta = .64; $p < .001$) as is the presence of a law program

(beta = .116; $p < .05$). The presence of a medical program is a significant negative

predictor of alumni giving (beta = $-.22$; $p < .001$). The diagnostic statistics for this

model indicates that the model is appropriately specified with a Hansen *J* statistic,

showing no statistical significance ($\chi^2 = 10.69$; $p < .80$), and the Arellano-Bond test for

autocorrelation (AR2) also showing non-statistical significance ($Z = .06$; $p < .95$). As

shown in Model 6, SAT score is not a predictor of alumni giving after taking into account

other variables and fixed effects reflecting unobservable variables.

Research Question 2: Convergence and Divergence of Alumni Giving Rates

Taking into account student selectivity, is there evidence of convergence or

divergence among public research universities over time in alumni giving?

The second research question for this study seeks to understand if there is

evidence of convergence or divergence over time in alumni giving at public research

universities after taking into account the predictors of alumni giving and selectivity. This

research question is addressed by examining the sign of the estimated coefficient for the

lagged alumni giving variable. A positive sign of the lagged independent variable

(alumni giving) would indicate that alumni giving rates are moving toward the average (converging), whereas a negative sign would indicate that giving rates are moving away from the average (diverging). As shown in Model 6 in Table 4.3, lagged alumni giving was not statistically significant (beta = .12; $p < .15$), with a beta near zero. Therefore, there is no evidence of convergence or divergence in alumni giving rates.

Summary

This chapter provided the results of the findings for the two research questions in this study. The first research question for this study seeks to understand the extent to which an institution's selectivity influences alumni giving at public research universities after taking into account the predictors of selectivity. This chapter addresses the first research question by presenting the results of OLS, fixed effects, instrumental variable, and DFEP regression models. Blundell and Bond (1998) note that a DFEP using system GMM provides the most accurate coefficient estimates used to answer the first research question. The findings suggest that changes in an institution's SAT midpoint score have no explanatory value for predicting alumni giving per FTE student. The second research question for this study seeks to understand if there is evidence of convergence or divergence over time in the rate of change in alumni giving at public research universities, after taking into account the predictors of alumni giving and selectivity. This research question is addressed by examining the sign of the coefficient for the lagged alumni giving variable in the system GMM DFEP model. An examination of the coefficient estimate indicates that there is no evidence of convergence or divergence in the model. The next chapter attempts to discuss the results in context with the literature.

CHAPTER 5

DISCUSSION

Introduction

The purpose of this chapter is to provide an interpretation of the findings in this

study as it relates to the alumni giving literature. First, this chapter compares and

contrasts the results from the study with the alumni giving literature and describes why

the results of this analysis differ from other studies. Next, this chapter discusses the

implications of this study for future research and practice. Finally, the chapter concludes

by providing recommendations for future research.

Discussion of the Findings

As stated in chapter 2, the conceptual framework for this study describes how

nonprofit organizations, such as research universities, strive to increase their prestige or

status rather than maximize profits (Garvin, 1980; Newhouse, 1970). The conceptual

framework posits that alumni gain utility through their donations as a result of the

increase in the prestige of their institutions (Cheslock & Gianneschi, 2008; Ehrenberg &

Smith, 2003; Leslie & Ramey, 1988; Rose-Ackerman, 1996). The conceptual framework

further proposes that selectivity, the measure of prestige in this study, has its own

predictors (endowment values and expenditures). Lagged alumni giving and the presence

of professional degree programs are also posited to influence alumni giving. As

demonstrated by the next section, the conceptual framework, as developed through a

review of the economics literature, is inconsistent with the findings in this study. Alternative theories are proposed to explain these inconsistencies.

This section discusses the findings of this study by research question. The first research question focuses on the influence of selectivity and alumni giving. The findings on the relationship between selectivity and alumni giving, as well as the control variables such as professional degree programs and institutional wealth (endowment per FTE student), are discussed and compared with the literature on alumni giving. The answer to the second research question, which focuses on the extent to which there is a divergence or convergence in alumni giving among public research institutions, is also compared with the literature on alumni giving. This section concludes by discussing the contributions of the findings to the philanthropic literature.

Research Question 1: Selectivity and Alumni Giving

After taking into account predictors of student selectivity, to what extent does an institution's selectivity influence alumni giving at public research universities?

As shown in chapter 4, the results indicate that many of the control variables are associated with alumni giving. The presence of a law program is positively related to alumni giving, while the presence of a medical program is negatively associated with alumni giving. An institution's endowment value (or wealth) is positively related to alumni giving. SAT score, the presence of a business program, and an institution's

annual expenditures have no statistically significant relationship with alumni giving. This section will describe how and why the results of this study differ from the findings in the literature on alumni giving.

Professional Degree Programs

This study included three professional degree programs in the model as control variables. Two of the three variables were statistically significant and associated with alumni giving. The presence of a law program had a statistically significant positive relationship with alumni giving. This is consistent with Monks' (2003) study on alumni giving, which purports that graduate giving from law programs is associated with higher alumni giving. Inconsistent with Monks' (2003) study is the finding that the presence of an MBA program has no statistically significant effect. Monks (2003) did provide some evidence, however, that the presence of a medical program has a statistically significant negative relationship with alumni giving, which is consistent with the findings in this dissertation. Belfield and Beney (2000) and Monks (2003) found similar results when examining alumni giving at the individual level, though no explanation of their findings is provided by the authors.

The differences in the findings between this study and others on alumni giving may be attributed to the level of analysis. Because this study involved the use of organization-level data, the interpretation of the professional degree program parameter estimates is different than the studies that used individual-level data. Additionally, a negative statistically significant relationship between medical programs and alumni giving may be attributed to perceived institutional wealth. Oster (2003), for example,

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observes that the perception of an institution's high growth in endowment and wealth reduces the likelihood of donations for some donors. The presence of some professional programs, especially at larger institutions, may signal to some alumni that a donation is not needed. This explanation may also account for the non-significant relationship between alumni giving and the presence of an MBA program. Additional research is needed in this area.

Endowment Value and Expenditures

Endowment value per FTE student and expenditures per FTE were included in the model as predictors of SAT midpoint score in the first stage of the statistical model, but endowment value was also positively related to alumni giving. This finding is consistent with Winston (1999), who observes that wealthy institutions tend to have more leverage in increasing resources such as giving.

The results of this study indicate that alumni giving is not related to the level of expenditures per FTE student. Gottfried and Johnson (2006) provide evidence that the level of expenditures devoted to soliciting alumni donations is positively associated with giving. Due to the limitations of the data source and the change in accounting standards, this study did not use a variable that delineated the type of expenditure, which may have yielded different results.

Selectivity and Alumni Giving

Overall, the findings from this study indicate that it is unlikely that selectivity influences alumni giving over time. Although these results may appear to be inconsistent

with findings from cross-sectional studies on alumni giving (Cheslock & Gianneschi, 2008; Cunningham & Cochi-Ficano, 2002; Ehrenberg & Smith, 2003; Leslie & Ramey, 1988), the literature does provide some guidance on this inconsistency. This section describes how the findings relate to economic and alternative theories on prestige.

Maximizing Prestige and Alumni Giving

The findings from this study are inconsistent with the conceptual framework presented in this dissertation. The conceptual framework indicates that an institution's expenditures and endowment wealth would explain levels of prestige. Though the findings suggest that expenditures and endowment wealth are endogenous to student selectivity, endowment wealth is also positively related to alumni giving. Additionally, since student selectivity is not related to alumni giving, it is unlikely that alumni are gaining utility through a donation as a result of the institution's prestige as defined by institutional selectivity. The economic utility-maximizing conceptual framework presented in this dissertation is inconsistent with the findings in this study. Therefore, other theoretical perspectives are required to explain the relationship between student selectivity and alumni giving.

Accumulative Advantage and Institutional Isomorphism

Two theories from sociology assist in examining the findings in this study. While studying faculty research productivity, Dey, Milem, and Berger (1997) and Milem, Berger, and Dey (2000) assert that two theoretical perspectives (accumulative advantage and isomorphism) operate simultaneously to describe institutional behaviors.

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Accumulative advantage is the increased differentiation of institutions as prestigious institutions extend their advantage over less prestigious institutions (Dey et al., 1997; Merton, 1968). Isomorphism, on the other hand, is characterized by institutions adopting structures and procedures through social processes to become more similar. Dey et al. (1997) found evidence in their study that both processes are occurring in higher education. The authors (Dey et al., 1997) suggest that less prestigious institutions are changing to become similar to institutions with more prestige, but are unable to increase their rankings relative to other universities as institutions that already have wealth and prestige use their resources to maintain their position. In other words, less prestigious institutions are emulating institutions with more prestige by increasing research productivity, but are unable to increase their rankings. These processes may account for differences between the results from this dissertation study and cross-sectional studies on alumni giving.

Accumulative advantage and isomorphism theoretical perspectives are consistent with the findings in this study. The results of cross-sectional studies by several scholars (Cheslock & Gianneschi, 2008; Cunningham & Cochi-Ficano, 2002; Ehrenberg & Smith, 2003; Leslie & Ramey, 1988) show differentiation in alumni giving based upon selectivity or other measure of prestige, providing evidence for accumulative advantage. The results from this dissertation study show that although some institutions may successfully increase their selectivity by recruiting more talented students (institutional isomorphism), these institutions are unable to secure a comparable increase in alumni donations (accumulative advantage). The wealthier and more prestigious institutions maintain their position in soliciting donations while aspiring institutions are unable to

match the level of donations, despite increasing their prestige. The statistically significant relationship between institutional wealth (endowment) and alumni giving provides additional evidence of accumulative advantage.

Despite the seeming inconsistency with some research, the findings from this study have utility. The results of this study indicate that there is evidence that colleges and universities have increased alumni giving over time, which is consistent with the observations of a number of scholars (Cheslock & Gianneschi, 2008; Heller, 2006), who purport that institutions are replacing funds lost from reductions in state appropriations. The findings in this study further confirm the advantage that wealthy institutions have in raising funds from alumni, which is consistent with Winston's (1999) observation that resources in higher education are unevenly distributed. Finally, this study provides evidence that SAT midpoint score as a measure of prestige or student quality does not appear to influence alumni giving over time.

Research Question 2: Convergence and Divergence of Alumni Giving Rates

Taking into account student selectivity, is there evidence of convergence or divergence among public research universities over time in alumni giving?

In this study, the second research question is addressed by examining the sign of the coefficient for the lagged alumni giving variable. The sign of the lagged dependent variable coefficient indicates whether there is convergence or divergence in alumni giving among public research universities. A positive sign of the lagged dependent

variable would indicate convergence and a negative sign would indicate divergence in alumni giving among public research universities over time. A coefficient of zero would indicate that, over time, growth in alumni giving among institutions remains the same. Determining convergence or divergence of alumni giving over time allows researchers to understand if growth in alumni giving increases relative to other institutions for a college or university that increases their alumni giving levels over time.

The results from this study indicated that there is no evidence of convergence or divergence in alumni giving. This implies that if an institution with low alumni giving is able to greatly increase its alumni giving levels, growth in alumni giving would remain constant relative to institutions with high levels of alumni giving. Institutions with low alumni giving could increase the level of alumni donations, but only at the average rate, making it difficult for these institutions to "catch up" to colleges with high levels of alumni giving.

These results do not comport with the theories proposed by Hoxby (1997) and Geiger (2004) that purport that higher education institutions that increase student quality become richer through a multiplier effect: greater selectivity increases an institution's desirability and demand, which increases quality, and subsequently increases revenue through higher donations and higher levels of tuition charged to students willing to pay. Although tuition revenues may increase as a result of this multiplier effect, the findings suggest that this is not the case for alumni giving.

Even though the results from this dissertation are inconsistent with the theories proposed by some scholars (Geiger, 2004; Hoxby, 1997), the results are consistent with other studies on prestige. As stated above, Dey et al. (1997) and Milem et al. (2000)

propose two theoretical perspectives that explain why prestige may not influence alumni giving. Whereas colleges and universities are adopting structures and policies to become more similar and prestigious by increasing their selectivity (via institutional isomorphism), the wealthiest institutions are continuing to maintain their advantage in securing donations from alumni when compared to other public research universities (via accumulative advantage). In terms of alumni giving, all institutions in this study have increased their giving activities with an average increase in giving at $232 per FTE student over the 11 years of this analysis. Although institutions with low levels of alumni giving may be successful in increasing their giving, the growth in giving is the same relative to institutions with higher levels of alumni donations. Since the growth in alumni giving is not increasing over time and institutions with high levels of giving also experience an increase in alumni donations, it will be difficult for institutions with low levels of alumni giving to eventually match institutions with higher levels of giving.

Contributions to the Literature

In addition to addressing the two research questions presented in this study, this dissertation provides three major contributions to the literature in economics and philanthropy. First, this study connects theoretical perspectives of nonprofit organizations to the alumni giving literature. While scholars have examined public good (Andreoni, 2006; Halfpenny, 1999; Rose-Ackerman, 1996; Sun, Hoffman, & Grady, 2007), social exchange (Halfpenny, 1980; Holländer, 1990; Patouillet, 2001), expectancy (Weerts & Ronca, 2006), organization (Kelly, 1998; Patouillet, 2001), and other theories to explain alumni support, very little research attempts to explain alumni giving through

economic perspectives of nonprofit organizations. Additionally, no studies have extended Garvin's (1980) theory of university behavior to explain alumni giving. The application of these theories adds another framework to the alumni giving literature.

Second, this dissertation uses a methodology rarely used in education research. The findings from this study suggest that utilizing a system GMM DFEP model may be necessary for analyzing alumni giving time series/cross-sectional data. The OLS, fixed effects, and instrumental variable models presented in chapter 4 demonstrate that each method yields different findings based upon the assumptions of the statistical technique when using panel data. When evaluating the alumni giving literature, no studies have used a DFEP modeling technique to analyze alumni giving over time. Several researchers (Bristol, 1990; Drezner, 2006), for example, rely on descriptive statistics to describe factors that influence alumni giving. Others utilize OLS or logistic regression (Bruggink & Siddiqui, 1995; Clotfelter, 2003; Cunningham & Cochi-Fiano, 2002; Gaier, 2005; Harrison, 1995; Holmes, 2009; Leslie & Ramey, 1988; Marr et al., 2005; Monks, 2003; Okunade, 1996; Okunade et al., 1994; Sun et al., 2007; Weerts & Ronca, 2007) or advanced economic techniques such as fixed effects or instrumental variable regression (Cheslock & Gianneschi, 2008; Ehrenberg & Smith, 2003; Harrison et al., 1995), but none have utilized dynamic panel models. While some scholars used panel data (Gottfried & Johnson, 2006; Okunade et al., 1994) or utilized an analysis at the organizational (instead of individual) level of analysis (Ehrenberg & Smith, 2003), it is not representative of the literature. The results from this dissertation study addressed some of the limitations of prior studies by using panel data to understand alumni giving within a dynamic context.

Finally, the findings from this study provide a new perspective on the relationship between prestige, as measured by selectivity, and alumni giving. Many studies (Bruggink & Siddiqui, 1995; Cheslock & Gianneschi, 2008; Clotfelter, 2003; Cunningham & Cochi-Ficano, 2002; Ehrenberg & Smith, 2003; Leslie & Ramey, 1988; Yoo & Harrison, 1989) on alumni giving suggest that the prestige of an institution is positively related to the level of alumni giving. The method and level of analysis used in this study were better positioned than previous studies to examine prestige's influences on alumni giving over time among public research universities. The absence of a statistically significant relationship between selectivity and alumni giving in this study challenges a paradigm in the literature that prestige influences alumni giving.

Conclusions

There are at least three conclusions from this study. First, in the limited circumstance where prestige is defined as student selectivity, it is highly unlikely that, among public research universities, prestige influences alumni giving over time. As demonstrated above, this finding is consistent with the literature using the theoretical perspectives of accumulative advantage and institutional isomorphism. It should be noted that the results may be different if prestige is defined as research productivity or college rankings.

Second, the results from this study are inconclusive as to whether the conceptual framework based on Garvin's (1980) utility-maximizing model is viable for public research universities. Although this adaptation of Garvin's (1980) model may explain university behavior with regard to research productivity, the model may not be viable for

prestige (in terms of student selectivity) and alumni giving. This is a significant finding, given that SAT midpoint score (the measure of student selectivity in this study) is highly correlated with rankings publications (Grunig, 1997; Pascarella et al., 2006; Webster, 2001), which are accessible to alumni. The conceptual framework, however, may still be viable for other definitions of prestige (e.g., research productivity, college rankings, athletic success) or donative support (e.g. contributions from corporations, parents) which future research should address.

Third, there is no evidence of convergence or divergence in alumni giving among public research universities between fiscal years 1997 and 2007. Because the lagged alumni giving variable is not statistically significant, the growth in alumni giving over time is the same for all institutions.

Implications for Policy, Practice, and Research

The results from this study pose a number of implications for policy, practice, and future research. This section will describe the implications for policy, practice, and research, and provide recommendations for future research on this topic.

Implications for Policy and Practice

The findings from this study have implications for policy and practice. The primary purpose of the study is to examine whether changes in one measure of prestige influence the amount of alumni giving among public research universities. Because the findings in this study are limited to one measure of donative support and one measure of prestige, there are no overarching policy recommendations. Since the findings of this

study did not indicate that changes in SAT midpoint score influence alumni giving, higher education leaders (particularly at public research universities) should not presume that increased selectivity increases revenues. Until further research is done on the effects that other measures of prestige have on revenue streams, higher education leaders should use caution when enhancing the prestige of the institution using student selectivity.

While this dissertation makes no overall policy recommendations for higher education leaders, due to its limited scope, the findings imply that increasing prestige may not always result in financial benefits. Although higher education institutions with high prestige appear to have more resources and higher graduation rates (Geiger, 2004; Meredith, 2004; Winston, 1999), there are unintended consequences to increasing selectivity. Some scholars claim that investing in prestige increases tuition prices (Winston, 1999), limits access to college for minority and low income students (Bernal, Cabrera, & Terenzini, 2002; Meredith, 2004), reduces the emphasis on classroom engagement and student learning (Pascarella & Terenzini, 1991; Pike, 2004; Winston, 1999), increases faculty workload, and reduces institutional diversity (O'Meara, 2007). Given that selectivity is not statistically related to alumni giving, policymakers should use caution when increasing selectivity or other prestige measures, given these negative consequences.

Implications for Research

This study provides several implications for educational research. First, because few studies examine change in alumni giving over time, prior research on alumni giving is very limited. This study demonstrates that a DFEP statistical model may be a viable

option for exploring other research questions with respect to prestige and alumni giving. Additionally, given that the findings from this study demonstrate differences in results between cross-sectional alumni giving studies and dynamic panel modeling techniques, it is vital that conventional alumni giving theories be retested using time series/cross-sectional data and more rigorous statistical techniques.

Second, this study uses an economic perspective of nonprofit organizations for examining the influence of prestige on alumni giving. Because economic perspectives of nonprofit organizations aren't widely used in the alumni giving literature, this study contributes to the literature by introducing a new conceptual framework. An economic model of nonprofit organizations should be utilized to examine other aspects of college and university behavior.

Finally, theories on alumni giving are typically based on individual behavior. This study uses an organization level framework to describe how organizational behavior influences aggregate alumni giving. This study introduces researchers to a different unit of analysis for examining alumni giving and should be expanded to other areas of university operations.

Recommendations for Future Research

This study builds on the broader literature on the economics of nonprofit organizations in addition to the literature on alumni giving. This research uses a perspective and a method not widely employed in higher education research. Given its limited scope, this study could be expanded by examining other types of prestige, other

forms of donative support, and other sources of revenue. As a result, a number of recommendations are provided to expand understanding of university behavior.

First, future research should expand on this study by using different definitions of prestige. As described in chapter 2, a review of the higher education literature shows that prestige is discussed from the perspective of faculty research productivity (Brewer, Gates, & Goldman, 2002; Cyrenne & Grant, 2009; Dey, Milem, & Berger, 1997; Dolan & Schmidt, 1994; Melguizo & Strober, 2007; Milem, Berger, & Dey, 2000; Morphew & Baker, 2004; Porter & Toutkoushian, 2006), success in intercollegiate athletics (Brewer et al., 2002; Tucker & Amato, 1993), and college and university magazine rankings (Ehrenberg, 2002a; Ehrenberg 2002b; Monks & Ehrenberg, 1999; O'Meara, 2007), in addition to perceived student quality/selectivity (Brewer et al., 2002; Cyrenne & Grant, 2009; Geiger, 2004; Hoxby, 1997; Monks & Ehrenberg, 1999a; Monks & Ehrenberg, 1999b). Each of these definitions should be analyzed in future studies to see if alumni maximize utility through prestige or if they are motivated by other factors.

Second, future research could build on this study by analyzing different variations of donative support. Although alumni represent a majority of the individual donations to colleges and universities (Kaplan, 2008), higher education institutions receive voluntary support from a variety of sources. These include corporations, non-alumni individuals, and other nonprofit organizations (Kaplan, 2008).

Third, since Garvin's (1980) theoretical model of university behavior was originally proposed in 1980, doctoral research universities have diversified their funding streams, mostly because of a reduction in state appropriations (Heller, 2006). The higher

education market has greatly changed in the past 30 years and the model should be examined to understand university behavior in this new context.

Finally, given that the findings of this study indicate that the student selectivity definition of prestige is unlikely to influence alumni giving, this assumption should be tested using other theoretical perspectives from the field of industrial/organizational psychology, sociology, and education.

Summary

The purpose of this study was to examine whether an institution's selectivity influenced the amount of alumni giving among public research universities. This study also introduced a relatively new and rigorous statistical technique for analyzing panel data. Overall the findings from this study question the relationship between this definition of prestige and alumni giving. These findings challenge a major paradigm in the literature about the influence of prestige and suggest that more research using panel data and rigorous statistical techniques is required to provide a more thorough understanding of how prestige influences giving behaviors. Future research is need to expand on this study, including the application of the conceptual framework using other definitions of prestige, other forms of donative support, and other forms of revenue. Finally, the influence of prestige on alumni giving over time should be examined using other theoretical perspectives.

APPENDIX A

DESCRIPTIVE STATISTICS AND BIVARIATE CORRELATION MATRIX

Before conducting statistical tests on the data for this study, this analysis used

descriptive statistics to understand correlational relationships among the variables. The

results demonstrate that without accounting for other variables or endogenous variables,

researchers can presume that selectivity influences alumni giving. This appendix

displays a bivariate correlation matrix and cross-sectional tables to show this relationship.

Bivariate correlation matrices are used to understand initial relationships among

variables. The matrix displayed in Table A1 displays the bivariate correlations among

the variables used in this study. The correlation matrix shows a statistically significant

relationship between midpoint SAT score, the measure of prestige used in this study, and

alumni giving per FTE.

A cross-sectional analysis of the data confirms the findings in the bivariate

correlation matrix that a correlational relationship between selectivity and alumni giving

exists. Table A2 displays the mean amount of alumni giving per FTE by the institution's

SAT midpoint score quartile. In fiscal 2007, institutions with a midpoint SAT score in

the first quartile had a mean alumni giving of $317 whereas institutions in the fourth

quartile solicited $1000 more dollars per FTE student. Although SAT score is correlated

with alumni giving in one year, it does not directly address if a relationship between

Table A1

Bivariate correlation matrix of variables

	Alumni Giving per FTE	Lagged Alumni Giving	SAT Midpoint Score	Law School	Business School	Medical School	Endowment per FTE	Expenditures per FTE	GASB Standard	Year
Alumni Giving per FTE	1.000									
Lagged Alumni Giving	0.879***	1.000								
SAT Midpoint	0.456***	0.456***	1.000							
Law School	0.372***	0.381***	0.189***	1.000						
Business School	0.036	0.036	-0.049	0.030	1.000					
Medical School	0.161***	0.169***	0.162***	0.371***	0.016	1.000				
Endowment per FTE	0.729***	0.734***	0.497***	0.398***	0.018	0.286***	1.000			
Expenditures per FTE	0.495***	0.491***	0.595***	0.327***	-0.013	0.600***	0.611***	1.000		
GASB Standard	-0.045	-0.049	0.008	-0.006	0.055	-0.023	0.016	-0.025	1.000	
Year	0.000	-0.035	0.031	0.001	0.060	-0.013	0.059	0.005	0.861***	1.000

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

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Table A2

Mean alumni giving per FTE by SAT midpoint quartile: Fiscal 2007

SAT Midpoint Quartile	SAT Midpoint Interquartile Range	Mean Alumni Giving per FTE
1st Quartile	800 – 1045	$ 316.73
2nd Quartile	1046 – 1105	572.17
3rd Quartile	1106 – 1165	894.07
4th Quartile	1166 – 1600	1334.57

Notes: SAT midpoint score is significant correlated with Alumni Giving per FTE student with a Pearson R correlation of 0.570 and a significant p-value less than 0.001.

selectivity and alumni giving exists over time.

When comparing the change in SAT midpoint score with the change in mean alumni giving between two time periods, there is an indication that selectivity may influence alumni giving. As demonstrated in Table A3, most public research universities in this study saw an increase, controlling for inflation, in alumni giving per FTE between fiscal 1997 and fiscal 2007 with a mean increase in alumni giving of $232 per FTE. Institutions with an SAT midpoint score that dropped one or more quartiles had a lower change in alumni giving per FTE at $195. Institutions with that improved SAT midpoint score by one or more quartiles had a higher change in alumni giving per FTE at $310. This descriptive data, however, fails to take into account other variables or changes in selectivity and alumni giving in the intervening years. In order to accurately determine if prestige as measured by SAT score influences alumni giving, this study utilizes more complex statistical models.

Table A3

Change in mean alumni giving per FTE by change in SAT midpoint quartile: Fiscal 1997

and fiscal 2007

Change in SAT Midpoint Quartile	Change in Mean Alumni Giving per FTE
SAT Midpoint Score Decreased (n=22)	$ 194.77
SAT Midpoint Score Remained Steady (n=60)	216.38
SAT Midpoint Score Increased (n=22)	310.40
All Institutions (n=104)	231.71

Notes: Values are inflation adjusted using the Consumer Price Index for

Urban Consumers.

APPENDIX B

PANEL TESTS FOR NON-STATIONARY DATA CHARACTERISTICS

To ensure all the assumptions are met for the dynamic fixed effect panel models, two statistical tests, called unit root tests, are used to test non-stationary characteristics of the data in this study. The first test, proposed by Maddala & Wu (1999) is designed for unbalanced panels. The second test, proposed by Hadri (2000) provides detailed information about non-stationary characteristics under differing assumptions. This section describes the method and results for these two statistical tests.

Stata software (IC version 10.1) is used to uncover non-stationary characteristics of the data using these two tests. Table B1 displays the Stata variable names for the commands used in this analysis. Using the xtset command, the dataset was declared to be a time series panel with the institution specific identifier (unitid) as the panel variable and year (year) as the time variable:

. xtset unitid time (6.1).

In the first statistical test, Maddala and Wu (1999) propose using the fisher statistic to compare independent unit root tests for each institution time-series to uncover non-stationary characteristics in the data. This statistic is the only panel unit-root test available for unbalanced panels. The user-written Stata command, xtfisher, calculates the statistic proposed by Maddala and Wu (1999):

. xtfisher *<variable name>* (6.2).

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Table B1

Stata variable names

Variable	Stata variable name
Dependent Variable	
Alumni giving	alum
Independent Variables (Endogenous)	
Alumni giving, lagged 1 year	L1.alum
SAT score	sat
Independent Variables (Exogenous)	
Professional Degree Programs	
Law (JD)	law
Business (MBA)	bus
Medicine (MD)	med
Endowment value	endw
Expenditures	exp
New GASB Standard	gasb
Year	year

The results are displayed in Table B2 for all the variables in this study. The null

hypothesis is a non-stationary time-series for all higher education institutions. The

alternative hypothesis is that at least one institution displays a stationary time series. As

demonstrated in Table B2, all the tests resulted as statistically significant at the 0.001

level.   Although these significant tests suggest that some data are stationary, it only takes

Table B2

Fisher panel unit root test results by variable

	Fisher χ^2 Statistic
Alumni giving	897.772***
Alumni giving, lagged 1 year	564.579***
SAT score	348.558**
Endowment value	555.464***
Expenditures	496.797***

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

one stationary panel to trigger the significant results. Another unit-root test is required to understand non-stationary characteristics in the data.

Hadri (2000) developed another test to uncover non-stationary characteristics in data that provides more information than Maddala & Wu's (1999) panel fisher unit root test. Although Hadri's (2000) test can only be used with a balanced panel, it can provide results under assumptions of homoskedasticity or heteroskedasticity. Additionally, the test can also uncover both time trend and individual unit roots.

Because the test can only be used on a balanced panel, a subsample of 78 institutions with complete panels is included in the analysis. Stata software is used to test for non-stationary characteristics of the dependent variable utilizing the user-written hadrilm command:

.hadrilm alum   (6.3).

The null hypothesis for this test, in contrast to the fisher test, is a stationary trend whereas the alternative hypothesis is non-stationary. As demonstrated in Table B3, all unit-root tests except for one reject the null hypothesis providing evidence of non-stationary data in the panels. Under conditions of homoskedasticity, the test indicates a non-significant result at the 0.05 level indicating the possibility of stationary alumni giving data. The probability of non-stationary data, however is still high with a p-value of 0.072 or significance at the 0.10 level. In other words, under conditions of homoskedasticity, random sampling from identical populations would lead to a smaller difference than observed 92.8 percent of the time and larger than observed 7.2 percent of the time. Non-stationary alumni giving data is expected because of large one-time donations from wealthy donors.

Table B3

Hadri panel unit root test results for alumni giving per FTE student in subsample

	Z Statistic
Homoskedastic Across Units	
Time Trend Unit Root ($Z\tau$)	1.460
Individual Unit Root ($Z\mu$)	5.155***
Heteroskedastic Across Units	
Time Trend Unit Root ($Z\tau$)	2.335**
Individual Unit Root ($Z\mu$)	4.919***

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

These findings show that corrections are necessary to model the effects of selectivity on alumni giving with non-stationary data. A dynamic fixed effects panel model using generalized method of moments, by definition, uses first-differenced terms to compute the statistic. Other linear regression models presented in this dissertation will not have these corrections and may yield unreliable coefficient estimates and standard errors.

APPENDIX C

TEST FOR HETEROSKEDASTICITY

Since heteroskedastic characteristics of variance may yield incorrect standard

errors for coefficient estimates, this study includes a test for heteroskedasticity. To test

for heteroskedasticity, Wiggins and Poi (2009) recommend saving the coefficient

estimates of a panel Generalized Linear Model (GLS) with corrections for

heteroskedasticity and compare these coefficient estimates with the same model without

corrections for heteroskedasticity using a likelihood ratio test. This section describes that

method for testing heteroskedasticity using Stata software.

Stata software (IC version 10.1) is used to test for heteroskedasticity by

comparing two versions of a panel GLS model. Using the xtset command, the data set

was declared to be a time series panel with the institution specific identifier (unitid) as the

panel variable and year (year) as the time variable:

. xtset unitid time   (6.4).

The following Stata command yields the results of the panel GLS model with corrections

for heteroskedasticity:

. xtgls alum L(1/1).alum sat law bus med endw exp time gasb, igls

panels(heteroskedastic)   (6.5).

The coefficient estimates are then saved to memory so the two models can be compared

at a later step. The file is called "hetero" to represent a model with the corrections:

. estimates store hetero   (6.6).

A model without the correction for heteroskedasticity is yielded with the following

command:

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. xtgls alum L(1/1).alum sat law bus med endw exp time gasb $\qquad$ (6.7).

Wiggins and Poi (2009) recommend constraining the number of panels to be a single value in the second model using the following command:

. local df = e(N_g) – 1 $\qquad$ (6.8).

The test likelihood ratio test is obtained by comparing the coefficients from the first model "hetero" with those of the second model represented by a period in the following command:

. lrtest hetero . , df(`df') $\qquad$ (6.9).

The null hypothesis for this test is the coefficient estimates are the same for both models. The alternative hypothesis is that the coefficient estimates are different indicating that corrections for heteroskedasticity are necessary. The test yielded a Chi-Square value of 781.62 with a p-value less than 0.001 indicating that it is highly probable that alumni giving per FTE has heteroskedastic residuals. Dynamic fixed-effect panel models using system Generalized Method of Moments is robust to heteroskedasticity.

APPENDIX D

DESCRIPTION OF STATA COMMANDS FOR STATISTICAL MODELS

This Appendix presents the commands and the results for the statistical models presented in this study. All of the statistical models presented in this study were generated using Stata software (IC version 10.1) using the variables names presented in Table B1. For each of the regression models in this study, the dataset was declared to be a panel dataset using the xtset command:

. xtset unitid time   (6.10).

The following commands and results are presented in this appendix:

- ordinary least squares regression;

- panel fixed effects regression;

- panel instrumental variable regression;

- dynamic fixed effects panel using difference generalized method of moments; and

- dynamic fixed effects panel using system generalized method of moments.

Ordinary Least Squares and Fixed Effects Regression

The first sets of models presented in this study are Ordinary Least Squares and Fixed Effects regression models. The following Stata command yields the OLS model presented in chapter 4, Table 4.2:

. regress alum sat law bus med endw exp yr* gasb   (6.11);

. regress alum L1.alum sat law bus med endw exp yr* gasb (6.12);

where "regress" designates the Stata command for OLS regression and alum is placed in

the first position designated for the dependent variable. The asterisk "*" next to the "yr"

variable name indicates that all variables that begin with "yr" should be included in the

model. The year 1996 is the reference year. The fixed effects regression model is

specified using the following command:

. xtreg alum L1.alum sat law bus med endw exp gasb yr*, fe (6.13).

where "xtreg" indicates a special case of regression designed for a panel dataset and the

command "fe" requests the fixed effects estimator. The results presented in Table 4.2 do

not account for cluster effects within each institution in the panel. The following

commands correct for clustering effects to provide more robust standard errors by

accounting for intragroup correlation:

. regress alum L1.alum sat law bus med endw exp yr* gasb, vce(cluster unitid) (6.14);

. xtreg alum L1.alum sat law bus med endw exp gasb yr*, fe vce(robust) (6.15);

where the "vce" command is used to account for intergroup correlation. Table D1 displays the

results from these two commands.

Table D1

The influence of SAT score on alumni giving per FTE Student: Ordinary least squares and fixed effects regression models with error correction estimated coefficients and standard errors

	Model 1a: OLS Regression	Model 2a: Fixed Effects Regression
Constant	-0.826	-0.777
	(0.793)	(3.329)
Alumni giving, lagged 1 year	0.719***	0.017
	(0.500)	(0.054)
SAT score	0.146	0.244
	(0.307)	(1.073)
Professional Degree Programs		
Law (JD)	0.033	-0.078*
	(0.017)	(0.035)
Business (MBA)	0.013	0.020
	(0.019)	(0.037)
Medicine (MD)	-0.056**	-0.052
	(0.021)	(0.054)
Endowment value	0.205***	0.137*
	(0.043)	(0.069)
Expenditures	0.104	0.475
	(0.087)	(0.259)
New GASB Standard	-0.184	-0.038
	(0.216)	(0.074)
Observations	1,177	1,177
Number of Institutions	145	145
Year Dummy Variables?	Yes	Yes
F-Statistic	369.23***	4.87***
Adjusted R-Squared	0.800	0.410

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; standard errors are in parentheses.

Panel Instrumental Variable (2SLS) Regression

The next model presented in the results section is panel instrumental variable regression, commonly known as two-stage least squares (2SLS) regression. The following Stata command yields the model presented in chapter 4, Table 4.3:

. xtivreg2 alum L1.alum law bus med gasb yr* (sat = endw exp recordid), small

cluster(unitid) fe first gmm2s orthog(recordid)   (6.16).

The first variable list yields the second stage of the calculation with alumni giving per FTE as the dependent variable and lagged alumni giving, law, business, medicine, GASB standards, and year dummy variables as independent variables. SAT score is also an independent variable but isn't listed until the second variable list in the parentheses. The first stage of the calculation is in the second variable list where SAT midpoint score is the endogenous variable and endowment and expenditures are the predictors. Record ID is included in the list to test for overidentifying restrictions. The "small" command requests the small-sample statistic (F-statistic rather than a chi-squared); "cluster(unitid)" requests corrections of intragroup correlation for each institution; "fe" requests the fixed effects estimator; "first" requests output detailing the first stage of the calculation; "gmm2s" requests that computations use the two-step generalized method of moments estimator; and "orthog(recordid)" tests for overidentifying restrictions. The two stages of the model is presented in Table D2.

Table D2

The influence of SAT score on alumni giving per FTE student: Panel instrumental

variable (2SLS) regression estimated coefficients and standard errors

	First Stage	**Second Stage**
Dependent Variable	SAT score	Alumni giving
Alumni giving, lagged 1 year	0.001	0.036
	(0.001)	(0.054)
SAT score		19.776*
		(8.554)
Professional Degree Programs		
Law (JD)	-0.001	-0.044
	(0.001)	(0.050)
Business (MBA)	0.001	-0.008
	(0.001)	(0.044)
Medicine (MD)	0.001	-0.065
	(0.002)	(0.074)
Endowment value	0.004 [1]	
	(0.002)	
Expenditures	0.018	
	(0.012)	
New GASB Standard	0.002	-0.090
	(0.003)	(0.086)
Observations	1,173	1,173
Number of Institutions	141	141
Number of Instruments	16	14
Year Dummy Variables?	Yes	Yes
R-Squared	0.117	
Hansen *J* Statistic		7.541*
F-Statistic	2.46**	3.53***

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; standard errors are in
parentheses.

[1] Endowment value per FTE was significant at the 0.10 level.

Dynamic Fixed Effects Panel Model with Difference and System GMM

The next models presented in the results section are the dynamic fixed effects panel models using difference and system generalized method of moments (GMM). The following Stata command yields the initial difference GMM model:

. xtabond2 alum L1.alum sat law bus med endw exp gasb yr*, gmm (L1.alum sat, collapse) iv(endw exp law bus med yr*) small twostep robust orthogonal nolevel   (6.17).

In this initial model, the first variable list represent the linear regression model with alumni giving per FTE (alum) the dependent variable and SAT midpoint score, law, business, medicine, endowment per FTE, expenditures per FTE, GASB standards, and year dummy variables as independent variables. The "gmm" subcommand requests the GMM estimator and endogenous variables are included in the parenthesis including lagged alumni giving and SAT score. The "collapse" command within the parenthesis minimizes the number of instruments. The "iv" subcommand lists the variables that are presumed to be exogenous. GASB is not included in this list because it is in the model as a control. The "small" command requests the small-sample statistic (F rather than a chi-squared). The "twostep" command requests the calculation of the two-step estimator instead of the one-step estimator. "Robust" request that the Windmeijer (2005) finite sample correction for variance be used in the two-step estimator. When calculating first-differences, the "orthogonal" command subtracts the average of past and future values of lagged variables instead of the value from the previous time period. Roodman (2006) recommends using the "orthogonal" command in unbalanced panels. The "nolevel"

command requests the Arellano-Bond (1991) first-difference GMM calculation instead of the Blundell-Bond (1998) system GMM.

Because this initial command produces more instruments than is necessary, the extra instruments can cause standard errors to increase and the model to be overspecified. The model is therefore adjustment by reducing the number of lags used to calculate the GMM estimator. This is done by including another term in the "gmm" command. The final model is listed below and is presented in Table 4.3 in the results section:

. xtabond2 alum L1.alum sat law bus med endw exp gasb yr*, gmm (L1.alum sat, collapse lag(1 4)) iv(endw exp law bus med yr*) small twostep robust orthogonal nolevel (6.18).

The initial system GMM command is similar to equation 6.17 except that the "nolevel" command is excluded. Instead of calculating the Arellano-Bond (1991) first-difference GMM estimate, it calculates the default Blundell-Bond (1998) system GMM estimator:

. xtabond2 alum L1.alum sat law bus med endw exp gasb yr*, gmm(L1.alum sat, collapse) iv(endw exp law bus med yr*) small twostep robust orthogonal (6.19).

Again, the lags are limited so that only the strongest instruments are used to correct the standard errors in the model. The final system GMM model is listed below requesting the first through eight lags be used to compute the statistic:

. xtabond2 alum L1.alum sat law bus med endw exp gasb yr*, gmm(L1.alum sat, collapse lag(1 8)) iv(endw exp law bus med yr*) small twostep robust orthogonal (6.20).

APPENDIX E

IRB DETERMINATION LETTER OF NON-HUMAN SUBJECT RESEARCH

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Notice: Review of Request for Determination of Non-Human Subject or Non-Research Form

Date: January 11, 2009

To: Dr. Marvin Titus
                         Sean Simone
                         Department of Educational Leadership, Higher Education, and
                         International Education

From: Mary Ann Ottinger, Ph.D   *TB for Mary Ann Ottinger*
                         Associate Vice President for Compliance & Policy
                         Acting IRB Manager
                         University of Maryland, College Park

Re: *Request for Determination of Non-Human Subject or Non-Research
                         Form*
                         #08-NHS-0074
                         Project Title: *Examining How Alumni Giving is Influenced by Prestige
                         at Public Four-Year Colleges and Universities: A Dynamic Model*

The *Request for Determination of Non-Human Subject or Non-Research Form* for the
above-cited project was reviewed. It has been determined that your project does not meet the
Federal definition of research involving human subjects because your project does not involve
human subjects. A human subject is a living individual about whom an investigator (whether
professional or student) conducting research obtains (1) data through intervention or interaction
with the individual, or (2) identifiable private information. Since your project does not involve
human subjects, your project does not require IRB review and approval. Please contact the
IRB Office at 301-405-0678 if you have any IRB-related questions or concerns.

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