GROW ME THE MONEY: CORPORATE SOCIAL RESPONSIBILITY INITIATIVES AND ALUMNI PHILANTHROPY IN HIGHER EDUCATION

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

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May 2018

GROW ME THE MONEY: CORPORATE SOCIAL RESPONSIBILITY INITIATIVES AND ALUMNI PHILANTHROPY IN HIGHER EDUCATION

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Economics

Abstract

Today, thanks to reduced state and federal funding, alumni donation participation not only plays a pivotal role in the national ranking and prestige of a given college, it is a critical source of income necessary for institutional stability. How, then, can a college like Colorado College (CC) distinguish itself; attracting and identifying more potential alumni donors? Using Advancement Services data from CC on roughly 25,000 alumni between the years 2012 and 2017, this study builds on previous econometric models to investigate and predict patterns of giving as they relate to individual characteristics and various Corporate Social Responsibility (CSR) initiatives. While the majority of individual level findings are consistent with past research, explorations of philanthropic giving tied to CSR and corporate match programs as well as specific institutional projects and funds lead to significant conclusions which warrant continued review to aid in effective donation practices.

KEYWORDS: (alumni giving, philanthropic giving, higher education, CSR)
JEL CODES: (G34, I22)

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ACKNOWLEDGEMENTS

First, I want to thank my advisor, Daniel Johnson for all of his help and support in this lengthy process. I also want to thank Kevin Rask for his guidance and serving as my 'second' advisor. Thank you both for allowing me to constantly ask you questions at all hours of the day. Without their help on this project and excellence in teaching over the years I would not be where I am today. Furthermore, I cannot express enough gratitude to the members of Colorado College's Advancement office who were so gracious in their time helping me collect and formulate this dataset. Specifically, I want to recognize Ann Rule, Greg Walters, and Carolyn Dickerson. Lastly, I want to say thank you to my family who never stops supporting me. To Mom, Dad, and Rachel, here is to the 'you do you' movement. Love you guys!

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CHAPTER I

INTRODUCTION

In the current world of higher education, we are experiencing a "lost decade" of sorts. In the 10 years since the great recession of 2007, federal and state funding appropriations for higher education have remained below historic levels. In fact, after adjusting for inflation, state-funding at two- and four- year colleges in 2017 totaled nearly $9 billion less than its 2008 level.[1] As a result, schools have been forced to simultaneously raise tuition prices and make budget cuts that serve to potentially reduce the quality of education they provide. Not only do these tuition hikes increase the financial burden for middle-class students seeking a desirable college education, it also reduces the value and quality of a degree for students that can afford to attend. Without a strong and well educated middle class in this generation, the future of our skilled labor force and economy are at risk.

Exacerbating the problem even further, increasing tuition prices not only deter students from enrolling but the students choosing not to attend college often come from historically disadvantaged and low-income populations, resulting in reduced campus diversity. In fact, a 2015 study conducted by New York University found that "All else equal, a $1,000 tuition increase for full-time undergraduate students is associated with a drop in campus diversity of almost 6 percent" (Allen and Wolniak, 2015). Even if a lower-income student is high achieving, they still may choose to forgo the price of secondary education or choose a less selective school due to perceptions and misinformation about financial aid and cost (Avery and Hoxby, 2013).

[1] https://www.cbpp.org/research/state-budget-and-tax/a-lost-decade-in-higher-education-funding#_ftn1

As a potential solution to remedy such financial problems and mitigate tuition hikes, schools often look to alumni donations to supplement operating revenues and decreases in governmental assistance. Even more importantly, institutions of higher education are currently looking to reinforce the size of their endowment positions in advantageous stock market years like that of 2017. In fact, largely fueled by a strong stock market performance, philanthropic giving for the fiscal year ending June 30, 2017 totaled $43.6 billion, representing a 6.3 percent growth rate from 2016 (3.7% after adjusting for inflation).[2] Quadruple the rate of growth from the previous year, alumni nationwide responded to increased disposable incomes with increases in donative behavior, accounting for $11.37 billion or 26.1% of the voluntary support of higher education. Of the $43.6 billion total, 28.1% or $12.23 billion went to the top 20 institutions alone, representative of a quasi-wealth inequality among secondary institutions.

Although 2017 marked strong stock and philanthropic performances, over time, the swings tend to balance out (e.g. averaging 2017 giving with 2016 shows only a 4% jump).[3] This is especially true when the market is down, as higher education often becomes discretionary not only in state budgets but also an individual's decision to donate. Securing consistent forms of revenue and capital is critical for a college to maintain its focus on both short and long term goals. In this way, if institutions can smooth revenue volatility, they may be able to better focus on long term institutional

[2] https://www.insidehighered.com/news/2018/02/06/personal-giving-pushes-donations-colleges-and-universities-new-level-2017
[3] https://www.insidehighered.com/news/2018/02/06/personal-giving-pushes-donations-colleges-and-universities-new-level-2017

goals, reacting thoughtfully and dynamically to erratic financial streams (Tuckman and Chang, 1991).

1.1 Corporate Social Responsibility and its Implications

Armed with sufficient alumni donation revenue, stakeholders and school leadership can promote innovative practices and developments core to its institutional mission rather than focusing on the day to day minutiae that comes with keeping a struggling school afloat financially. Such a mission, or value proposition may involve the active pursuit of Corporate Social Responsibility (CSR) initiatives which Rasche et al. (2017) describe as "ensuring proactive compliance and leadership in advancing ethical standards." Examples of college-based CSR can range from financial and institutional commitments to environmentally sustainable practices, increased diversity initiatives, or robust financial aid programs. Not only do these initiatives address the failures of our educational system to support disadvantaged populations, they also attract goodwill to an institution in the form of national recognition and potential donations from alumni passionate about such issues. A 2016 working paper revealed that alumni upward social mobility served to improve giving probabilities as well as donation amounts at a large, public research university (Hoffman).

Outside of the institution itself, some corporations and alumni employers will offer a donation match program, effectively doubling the gift of their employee to a chosen cause. This offers another avenue from which we can analyze the effects of CSR initiatives as there is little research in the field of corporate match programs as they relate to the effective cost and impact of an individual's donation.

1.2 Colorado College as a Case Study

Taking the previously outlined problems into consideration, we look to Colorado College as an exemplary institution, actively pursuing consistent revenue streams through alumni donation while striving for CSR and ethical excellence.

After three years in private leadership phases, Colorado College (CC) launched the public phase of its comprehensive fundraising campaign called *Building on Originality* on Saturday October 14, 2017.[4] Among one of the 15 largest ever launched in the realm of higher education, the campaign aims to raise $435 million slated for capital projects, 180 new student scholarships, and operational funds. By December 20 of 2017, $313 million had been raised thanks in large part to a Colorado Springs Fine Arts Center endowment gift valued at $175 million in addition to the participation of more than 26,700 donations from alumni, non-alums, and parents.[5] However, while nearly 27,000 individuals gave during this period, participation from CC alumni totaled only 38% of its alumni base population, far short from the campaign's 50% goal.[6]

In the past seven years since its *Vision 2010* campaign, CC has also implemented the *Building on the Block* campaign (2015)[7] and made a number of institutional changes and improvements to promote alumni giving and national prestige. Additionally, CC has

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[4] https://www.coloradocollege.edu/newsevents/newsroom/cc-launches-435-million-fundraising-campaign#.WqiWkpPwZ24

[5] https://www.coloradocollege.edu/newsevents/newsroom/cc-launches-435-million-fundraising-campaign#.WqiWkpPwZ24

3 years of leadership phase donations:

2016-17 gifts = $44.7 million (cash, pledges, estate commitments)
2015-16 gifts = $42.2 million
2014-15 gifts = $37.1 million

[6] https://www.coloradocollege.edu/newsevents/newsroom/cc-ends-2017-with-notable-gifts#.Wp3D3RPwbXG

[7] https://www.coloradocollege.edu/other/strategicplan/progress/ - Board of Trustees update, February 2015

made concerted efforts to improve and self-regulate a higher education oriented commitment to CSR. Illustrative of this mission, CC has completed numerous capital projects like building the country's largest net-zero library in addition to new campus housing featuring environmentally sustainable irrigation and landscaping. Even further, CC has made strides in its mission to enhance institutional diversity and financial commitments to aid its students and faculty.[8]

In fact, in 2011 CC enrolled students of color at 18% and by the fall of 2017 that number grew to 24.3%. Since 2013, CC has more than doubled its enrollment of first generation college students from 4% to 8.3% in 2017.[9] Although tuition prices have risen on average 5% annually over the last five years,[10] CC has maintained substantial financial support of its students, providing some form of aid to more than a third of the undergraduate population. Such improvements in diversity and equal opportunity initiatives have also been matched with rising national prestige, as CC has moved up from 26th in 2011 to 23rd in U.S. News & World Report's most recent 2018 ranking of national liberal arts colleges.[11]

Given that Colorado College has seen consistent growth in terms of CSR leadership and national status, it is perplexing that the school's alumni participation rate witnessed a 10% drop from 33% in the fall of 2007 to 23% in 2016.[12] This begs the question: How can CC leverage its existing initiatives and alumni base to enhance financial support, flexibility, and security for the institution? As it stands, total giving

[8] https://www.coloradocollege.edu/other/strategicplan/recommendation_1.html#financialaid
[9] https://www.coloradocollege.edu/offices/ipe/diversity-student-demographics.html
[10] Calculated from historical tuition prices listed on U.S. News & World Report's rankings
[11] https://www.usnews.com/best-colleges/colorado-college-1347
[12] Colorado College Board of Trustee Dashboards

($44.7 million) per student was roughly $21,275 in 2017 based on a student population of 2,101 as reported by U.S. News. This study aims to investigate and predict the overall and CSR factors that may cause that number to rise in the future.

1.3 Purpose and Significance of Study

This study sets out to observe not only the predictive powers of sophisticated econometric modeling on Advancement Services data enrichment associated with alumni giving, but also attempts to explore the relatively under-researched areas of CSR as it affects monetary value in higher education. Specifically, we aim to quantify the effects of CSR initiatives by the college as well as the CSR initiatives taken on by alumni's respective employers where corporate match programs can significantly impact alumni giving amount, by definition doubling it. While most individual level findings in this analysis confirm previous academic research, our explorations of philanthropic giving tied to corporate match programs as well as specific institutional projects and funds lead to significant conclusions which warrant continued review to aid in effective donation practices.

As it relates to CSR-specific giving probabilities and dollar amounts, we observe varying effects of alumni age over time, positive effects exhibited by non-white alums, and go on to identify potential 'impact donors' who should give more than they do currently. In this way, this research has compelling evidence for Colorado College or an institution of similar characteristics to pursue, or not pursue, capital and admission efforts in line with corporate social responsibility and best ethical practices to attract alumni donations and increase revenues. If successful, colleges and universities alike can address

the financial difficulties they presently face while also promoting class equality and sustainability measures integral to CSR.

CHAPTER II

LITERATURE REVIEW

In conducting a relevant survey of literature on this topic, it quickly becomes apparent that authors conducting research and publishing work in this field are consistent across time and in the theoretical frameworks they choose to employ. As such, there is a great deal of crossover and similarity from one published literature review to the next. Given this, and the clear parallels that exist between this work and that of Lara and Johnson (2012), we credit them for their appropriate interpretation and presentation of this topic's field of knowledge. However, while this section serves to first cite past studies and sources, outlining the underlying theoretical premise of altruism, we also point to unanswered gaps in the literature as they relate to CSR and alumni philanthropy.

2.1 Economic Theory of Giving, Donations and Philanthropy

One of the foundational principles economic theory assumes is that humans are self-interested agents that act to obtain greater amounts of utility through the consumption of increasingly more goods. Conversely, philanthropic giving serves as the theoretical antithesis to this basic macroeconomic assumption, as individuals surrender a portion of wealth or income yet receive nothing material to consume in return. Therefore, advanced economic theories beyond the standard frameworks are required to best model and understand altruistic behavior and its emotional motivations. There exist several individual but related theories which not only account for the various aspects of this altruism-utility anomaly but also demonstrate that the basic assumption of individuals acting in their own self-interest persists. The following theories will outline the ways in which an individual can benefit and derive partial utility from philanthropic giving.

According to Barro (1974), the dynastic model of the family asserts that parental figures care about all members of the family equally and as a result, money transferred from one generation to the next is done in a way to equalize the utility of consumption for the entire household. Open to interpretation, if one considers the family to be the smallest economic unit, replacing the individual, then 'individuals' (i.e. families) would again be acting in their own self-interest.

Separately, Andreoni (1989) claims that individuals not only demand more of a public good to which they give, they also receive, as a private good, a 'warm-glow' feeling from their donation. This intangible feeling is at the heart of this study; we expand on the warm glow phenomenon, relating it back to CSR initiatives that may serve to maximize donor rates though positive perceptions of not only giving, but giving to ethically sound causes (i.e. those promoting environmental sustainability, diversity, class equality, etc.).

Academic research conducted in this field of higher education can range from narrow focusses on giving to financial aid or it can describe overall patterns in alumni giving at the institutional (Bruggnik and Siddiqui, 1995) and multi-institutional level (Monks, 2003). Generally, still, the models used in such analyses are constructed using the demand function of consumer theory such that an individual's consumption is a function of their income (Lara and Johnson, 2012). Furthermore, these studies employ either time-series or panel data in addition to a range of regression models inclusive of ordinary least squares (OLS), generalized least squares, logit, probit and tobit. However, the OLS method is limited in its predictive and informational power associated with not giving (i.e. this is not the same as giving $0, which is impossible). To capture the

informational power of an alum's decision not to give, Lara and Johnson (2012) regress using a two-stage hurdle model (described in chapter three).

2.2 Donor Behavior, Cost of Giving and the Implications of CSR Framing

Ancillary to the general behavior and economic phenomena of philanthropic giving, it is important to analyze the relative *price* or *cost* of giving and the ways in which it affects donor behavior. In a 1981 study, Clotfelter and Stuerle demonstrated that while income taxes decrease the amount individuals are willing to gift philanthropically, tax incentives like deductions can serve to counteract such discouragement. In 2010, Huck and Rasul also go on to claim that when transaction costs for giving are low, a donor is more able and willing to donate to a given cause.

Drawing parallels from the work of Clotfelter and Stuerle, Huck and Rasul, as well as the warm-glow theory from Andreoni, Eckel and Grossman (2003) demonstrated at the corporate level how to best subsidize charitable contributions using matching programs rather than subsidies. While considered functionally equivalent, subjects were expected to respond identically to both rebate and matching subsidy programs. However, donations were observed to be much higher for matching subsidies, likely due to what Eckel and Grossman cite as a "cooperative framing" between the giver and the matcher.

Further academic research, as it relates to corporate philanthropy and CSR, mainly analyzes how altruistic and CSR investment decisions affect shareholder value (Borghesi, Houston, and Naranjo, 2014). Other works have argued that corporations should only engage in philanthropy if a comparative advantage exists over non-profits and government (Henderson and Malani, 2009).

To the best of our knowledge, this is the first study to explicitly examine the effects of corporate social responsibility initiatives and alumni philanthropy in higher education. Providing a sophisticated computational exploration of institutional data, we aim to fill this gap in the proceeding chapters, examining the 'framing' power of CSR to affect alumni and corporate level altruism.

CHAPTER III

THEORY & MODELS

This chapter outlines the economic theory utilized to model both the likelihood of a potential donor as well as the dollar amount of such a donation given various pre- and post-graduation characteristics and corporate matching subsidies. This analysis is carried out for both total giving to the college (e.g. athletics, academic departments, and memorial funds, and all others) in addition to alumni giving towards strictly CSR-related funds, which are outlined in greater detail in chapter five.

Following the theoretical precedent set by Lara and Johnson (2012) the following model, based on a supply function of giving from consumer theory, will have both the predictive power and capacity to identify specific potential alumni donors. Empirically, the probability or odds of alumni giving is first estimated, followed separately by the amount given, conditional on the act of choosing to give. This two-stage model is known as "hurdle," for it corrects for sample selection bias and specification error by only taking into account the alumni that have crossed a threshold or hurdle for giving (at zero dollars) which is choosing to give at all.

3.1 Theoretical Motivation and Models

Given the foundational assumption of economic theory that philanthropic giving is predicated on the reception of something in return (e.g. 'warm glow' or tax deduction), we create a specialized supply function from consumer theory inclusive of the individual gain associated with a 'warm glow'.

$$G = f\left(Y, \vec{P}, \vec{Z}\right) \tag{1}$$

Where G is philanthropic giving for total or CSR fund giving (the effective model and dependent variable is the same for both), Y the income, $\vec{P}$ a vector for the price of giving or charity, and $\vec{Z}$ a vector made up of other explanatory variables related to giving. Although basic, this model has been utilized in a number of variations to interpret the effects of tax-related incentive and rate changes as they relate to donative behavior.[13]

An estimable supply function for the philanthropic giving model is as follows:

$$g_i^* = Y_i\beta + P_i\gamma + Z_i\delta + \varepsilon_i \quad (2)$$

where, inclusive of an additive error term ε_i, g_i^* represents the dollar amount of a donation (to total or CSR giving) by a CC Alumni, dependent on explanatory variables: Y_i, P_i, Z_i (vectors) and their related regression coefficients.

Although not shown in equation form, vector $\vec{P}$ takes into account the effects of both marginal federal tax rates as well as the net cost of giving related to corporate matching subsidies. However, while the proxy measure of income (ψ, explained in chapter four) is reasonably accurate in this study, it lacks the power to effectively account for changes in tax policy on donative behavior, nor is that the goal of this investigation. Therefore, following precedent, and in line with previous research, we omit the effects of tax policies as they would best be calculated using the actual income measures of alumni that we do not have.[14]

In this way, we maintain vector $\vec{P}$ in the model through a dummy variable highlighting the use of corporate match programs that effectively double an individual's

[13] Bruggink & Siddiqui (1995), Cunningham (2002), and Meer & Rosen (2007)
[14] Bruggink & Siddiqui (1995); Cunningham & Cochi-Ficano (2002)

donation amount by halving the net price of charity. It is important to note that we can only measure and quantify the effects of matching subsidies on the dollar amount given (second part of hurdle), for we only know if someone has access to a matching subsidy if they chose to use it. As a result, we cannot compare the probabilities of giving related to matching because there may exist individuals who have access to a match but choose not to use it or those that have access, use it, but do not donate to CC. Implicitly, then, we can assume that for alumni who have a match and use it to donate to Colorado College, there is a positive impact on their probability of giving, yet the magnitude of such an effect is immeasurable.

Like vector $\vec{P}$,vector $\vec{Z}$ is split into two new vectors that describe before ($\vec{B}$) and after ($\vec{A}$) graduation alumni attributes. More specifically, vector ($\vec{B}$) corresponds to variables that were measurable during an undergraduate's college tenure, while vector ($\vec{A}$) variables demonstrate alumni characteristics and engagement level with the school after leaving CC.

Putting all the vectors and explanatory coefficients together, the binary decision to donate to total giving or to CSR funds is represented by binary variable g_i:

$$g_i = \begin{cases} 1 \; if \; g_i^* \geq \tau \\ 0 \; if \; g_i^* < \tau \end{cases} \tag{3}$$

Where τ is the minimum threshold for giving at \$0.01 for g_i^* (i.e. smallest donation amount possible). Explained plainly, g_i or the "giver" dummy variable will assume a value of 1 if the amount donated to CC by alumnus *i* is more than or equal to one penny. Essentially, the alumnus must choose to give *something*. Anything less than this threshold and g_i will take on a value of 0 in our regression analysis and will be excluded from the

second stage of the hurdle regression which calculates the amount given, conditional that the alumni gave at all (i.e. $g_i = 1$)

3.2 Empirical Models

In the hurdle's first stage, a logistic probability function is estimated to represent the likelihood of giving. As explained in the previous section, the 'hurdle' in question is the year by year decision for a Colorado College Alumni donating or not donating to the school. Such a decision and the dollar amount of their gifts, has been tracked in each year between 2012 and 2017.

Given that the data set is longitudinal, the first stage binary decision of giving or not giving is measured by a random effects xtlogit model for panel data. Furthermore, the standard errors and variance for this model are corrected using the "vce cluster" command which allows for intra-cluster comparisons and correlations. This command allows for observations to be attributed and correlated to a specific group or individual independent from others, relaxing the typical requirement that each observation in the data set must be independent.[15] In the case of this study, we cluster the data on each alumni's *FakeID* (unique to each individual since we do not have names), to track and compare intra-individual donative behavior over time.

Consulting literature on this topic, the panel logit model was first considered to be run under fixed effects. However, upon further investigation, the vce cluster command necessary to our investigation is not a post-estimation command option for a fixed effects panel logit regression. However, given such computational limitations and after further exploration of relevant work, we are comfortable running the panel model using random

[15] https://www.stata.com/manuals13/xtvce_options.pdf

effects. In this way, we run the logit under the assertion that person-specific effects that change the dependent variable (giving) are random and unrelated to the beta coefficients of the independent variables. *To see the Stata input for this specific model, consult Appendix A.*

In the second stage of the model, we estimate a nonlinear function with significant rightward skew given that individuals typically choose not to give ($0 observation) or if they do give, the 50th percentile donation is less than $100 at $93.03 while the maximum observed is $300,000. As a result, we observe a non-normal distribution of alumni giving in this study.

Specifically, we employ a zero-truncated negative binomial function representative of the dollar amount given to Colorado College, conditional on a donation being made. Lara and Johnson (2012) demonstrated the effectiveness of a hurdle model using a Poisson regression in the second stage, citing its advantage in avoiding the potential multicollinearity problems outlined by Leung and Yu (1996) seen with a Heckman selection correction. Expanding further on Lara and Johnson's work, we find theoretical justification for the negative binomial model rather than the Poisson regression, given the over-dispersion and overall fit of the data.

In this sense, over-dispersion can be described by Cameron and Trivedi (1986) as "extreme observations resulting in spread (variance) greater than the mean in the observed distribution." Furthermore, the negative binomial model produces z-values that are consistently smaller as a consequence of over-dispersion, yet the model adds a parameter alpha, α, that reflects unobserved heterogeneity (differences) among the observations of individual alumni giving. If the parameter is greater than zero, the dataset

is over dispersed and is best estimated using the negative binomial over the Poisson (UCLA Institute for Digital Research and Education). In the case of the Poisson model which does not account for over-dispersion, standard errors are biased downward which may result in spuriously large z-values and p-values (Cameron and Trivedi, 1986).

We also considered best econometric practices when choosing to specify the negative binomial as either a zero-inflated model or as a zero-truncated hurdle model. Both options account for high numbers of observed zeros in the data (alumni that chose not to give). However, according to Hu, Pavlicova, and Nunes (2011) only the zero-inflated model contends that the zeros may come from *both* a "structural" source and a "sampling" source, the latter of which allows for zeros to be produced by chance. In contrast, the zero-truncated (hurdle) model assumes that the zero observations must come *only* from a "structural" source. In the context of this study, only non-givers will donate zero dollars for any observation, and by that same token, only givers can produce a non-zero number for the dollar amount donated (the amount of which is random). In this way, the observed zeros in the data can only be attributed to one "structural" source that is non-givers, givers that donate any amount equal to or above $0.01 have crossed the hurdle and cannot give $0, as this is not possible. While the difference between the zero-truncation or zero inflation of the model seems understated, the two types of models are important in specifying the model correctly as they both produce different results and with them their own set of interpretations. *To see the Stata input for this specific model, consult Appendix B.*

CHAPTER IV

DATA & METHODOLOGY

Due to the generosity and engagement of the Advancement Department at Colorado College, the majority of the variables used in this study were readily available in usable form on 24,950 alumni over a five-year period between 2012 and 2017. However, several variables and proxy variables were constructed and further refined for the purposes of this analysis. In this section, we will outline the ways in which the dataset was gathered, manipulated, tested, and analyzed given a variety of assumptions.

4.1 Alumni Pool and Giving Statistics

The alumni pool in this study consists of graduates of Colorado College who have completed a specified degree field and are registered/tracked by the college's Advancement Services department. After receiving the data, corrections were made to parse out any alumni that became deceased in the five-year span of observation or reached an age that did not make interpretable sense. The average age of an alumnus in this study was roughly 46 (46.47).

To calculate the age of an alumni in any given year of observation we add an assumed graduation age of 22 to the difference the year the gift was made and the self-designated class year (*PREF_CLASS*). This difference represents the years elapsed since graduation and the current gift. We assume that the effects of age on donation likelihood and amount are nonlinear functions and change over the course of one's lifetime. In this way, we create a quadratic age-squared term (*Age2*) and analyze the effects in the next chapter.

Total giving (*TotGiving*) in this study is representative of any donation amount greater than $0.01 directed to any fund at the college. The dummy variable *giver* corresponds to any positive value of *TotGiving* and is used in the first regressions of this analysis. In total, we observe 19,626 observations of giving. This is not the same as people, we only observe specific instances of giving, meaning that some people may give in one year but not the next. Giving to any CSR-related fund like the Butler Center Discretionary Fund, CC EcoFund among others (see Appendix C), is represented by the dummy variable *csrdum* and the continuous variable *csr* to tabulate giving amounts to these funds. CSR-related giving is observed only 646 times in this dataset, representing only 3.29% of overall giving as CSR donations are included in the *TotGiving* statistics. While the number is initially higher in the raw data from advancement (768 in Appendix C), we lose usable observations due to missing data (e.g. no address, no class year) or if there is double counting where an alumnus gives to two or more CSR funds. In this way, the frequency of CSR giving may be higher than reported in this study.

Table 4.1
Alumni Donation Amount Summary Statistics

Variable	Description	Obs.	Mean	Median	Std. Dev.	Min	Max
TotGiving	Dollar amount given to all funds	19,626	$285.54	$93.03	$2,392.45	$0.01	$300,000
csr	Dollar amount given to CSR-related funds (see Appendix C)	646	$169.26	$20.15	$541.93	$0.01	$10,000

4.2 Before Graduation Vector Variables, $\vec{B}$

Variables collected about an alumnus prior to their graduation involve a variety of demographic and school specific information. We observe that the slight majority of individuals in this study are female (51.6%) which is consistent with the historical

makeup of the school. We also calculate that the majority of students graduating from Colorado College are Caucasian or Non-Hispanic, represented by the variable *whiteonly*. However, given that this measure was self-reported (people may leave this blank) and included seemingly countless categories for people to choose from, we assume that this metric is under-reported and the proportion of white alumni is higher than what is observed and regressed. In this way, observations related to ethnicity are taken with caution in the framework of this analysis. Table 4.2 provides insight into the variables *Greek, Sports, firstgen, Maj2,* and *Arts.*

Major codes are also assigned to each alumnus but for the purposes of presentation in this study, the results are presented in the appendix. Although there are 124,196 observations in total, the number of useable points is limited by missing data, especially those without a major. There exist 83 individually-specified major codes in this study with some only recording five observations over the five-year period, representative of only one person choosing this major. These majors, which are omitted in some regressions due to insignificant counts, include: Architecture, Civil Engineering, Black Studies, and Geography among others. The full list of *Majcode* summary statistics can be viewed in Appendix I.

Table 4.2

Before Graduation Vector Dummy Variables, $\vec{B}$

Variable	Description	Mean	Std. Dev.	Frequency (%)	
				1	0
male	Value = 1 if male, 0 if female	0.484	0.450	48.4	51.6
Greek	Value = 1 if member of fraternity/sorority, 0 if otherwise	0.260	0.439	26.02	73.98
Sports	Value = 1 if member of CC varsity sports team, 0 if otherwise	0.223	0.416	22.33	77.67
Firstgen	Value = 1 if first in family to attend CC, 0 if otherwise (legacy)	0.805	0.396	80.54	19.46
Whiteonly	Value = 1 if white or white/non-Hispanic, 0 if otherwise	0.614	0.490	61.41	38.59
Maj2	Value = 1 if double major, 0 if otherwise	0.020	0.140	1.99	98.01
Arts	Value = 1 if involved in campus publication or production, 0 if otherwise	0.038	0.190	3.75	96.25

4.3 After Graduation Vector Variables, $\vec{A}$

Table 4.1 below outlines the after-graduation dummy variables included in vector $\vec{A}$. Single, widow and spouse variables are straightforward and pertain directly to an alum's relationship status. We predict to observe positive donative effects from the spouse variable but negative and undetermined effects from single and widow respectively.

The *Tier1* dummy variable corresponds to alumni that live or have listed as their primary mailing address one of the following 12 metropolitan areas: Washington D.C., Los Angeles, Chicago, Boston, New York City, Denver, Twin Cities, Boulder, Colorado Springs, Seattle, Portland, and San Francisco. In the words of Anita Pariseau, Director of Alumni Relations, "because of the population density [of CC alums] we spend a significant portion of our time cultivating relationships [in these cities], hosting events and visits." For these reasons, we expect to see increased likelihood of giving and donation amounts associated with Tier 1 city inhabitants.

Engagement is comprised of an alumni's involvement in any of the following committees or boards where "AAB" stands for "alumni association board": AAB Admissions, AAB Advancement, AAB Engagement, AAB Nominations/Awards, AAB Student Life, Active constituent, Alumni trustee voter, PIFP Committee. We expect positive relationships between alumni donations and their active engagement after graduation, especially as it relates to CSR initiatives at the college. If an active alum or board member proposes or brings about an institutional change or goal, it follows that that individual would be highly motivated to support such a cause financially.

Not listed in the table is the continuous variable, "*EVENTS_ATTENDED*" which represents the number of events like homecoming and city meetups an individual attended. Again, we expect a positive range of effects on giving for every unit increase in the number of events an alum has attended.

Table 4.3
After Graduation Vector Dummy Variables, $\vec{A}$

Variable	Description	Mean	Std. Dev.	Frequency (%)	
				1	0
Single	Value = 1 if single, 0 if otherwise	0.547	0.498	54.7	45.3
Widow	Value = 1 if widow, 0 if otherwise	0.007	0.085	0.73	99.27
spouse	Value = 1 if married to CC alum, 0 if otherwise	0.111	0.314	11.12	88.88
Tier1	Value = 1 if residing in Tier1 city, 0 if otherwise	0.529	0.499	52.92	47.08
Engagement	Value = 1 if involved in engagement role, 0 if otherwise	0.435	0.495	43.54	56.46

4.4 Constructing an Income Proxy, ψ

The Advancement Department at Colorado College does not track actual income amounts of its graduates for a variety of reasons ranging from sheer informational

capacity to invasion of privacy. In this way, we must develop a sophisticated income proxy to best measure the effects of income, or financial ability to give, on both the likelihood of giving as well as the donation amount given. To do this we have taken the preferred mailing-addresses self-reported by alums in the database and then grouped them according to their U.S. Census Bureau Block Groups. According to the informational webpage, www.census.gov, these Census block groups last update in the 2010 Census, vary in their geographic size but contain between 600 and 3,000 people. From these block groups, we can then deduce what the median income is in each individual tract and attribute that income proxy to each alumnus based on their reported address in a given year (observation). In this way, we have established a reliable proxy for income that can track income alongside age and change readily if the alumnus moves addresses from one year to the next. The summary statistics for income can be seen in table 4.4.

Table 4.4
Block Group Median Income Proxy, ψ

Variable	Mean	Std. Dev.	Min	Max
eSHMEDINC	$86,307.58	$46,927.52	$0.00	$293,066.00

4.5 Corporate Matching Proxy for Price of Charity Vector, $\vec{P}$

To represent the price of giving in our analysis, we utilize a dummy variable, *Matching,* to categorize whether an alumnus has used a corporate match program in their donation. Conditional on giving any amount, the dummy variable takes on a value of 1 if a match program has been used and a 0 if it has not. While promising for the purposes of this study and future research, there are limitations to this variable. We do not know, for instance, whether the donation amount recorded is a combination of two halves (the

alum's and their employers) or, if the donation is made first by the alumnus followed separately by the corporate match amount recorded under corporate/institutional giving (to which we do not have access). We also do not know if an alumnus has access to such a program, gives to the school but chooses not to use it or report it. Of the 19,626 observations of alumni giving between 2012 and 2017, there exist only 357 instances of corporate match programs being utilized. While this number represents only 1.82% of positive observed donation amounts, we postulate that this number will increase with improved data collection and tracking.

4.6 Correlation Testing

Using a Pearson pairwise correlation matrix, all variables used in this analysis were tested and evaluated. Not only did most of the variables exhibit correlation coefficients less than 0.1 at a 99% confidence level, none of the correlation values approach anything close to 0.7 or 0.8 where models begin to exhibit multicollinearity problems. However, some variables displayed elevated values that warrant explanation. Namely, the correlation between sports and male of +0.159 is likely due to the historical preponderance of male sports programs at CC prior to Title IX's adoption in 1972. Also, these male sports included football, with significantly larger rosters until the program was dissolved following the 2008 season.

The age variable in our study was highly correlated positively with Greek involvement at +0.3499 and negatively with being single at -0.3643. For older alumni, it is likely that they are not single and are married or widowed, negating their single status. Furthermore, while there are currently only three fraternities and three sororities on campus the number was much higher in the mid 1900s before fraternities lost charters or

dissolved. For these intuitive reasons, we choose to leave the aforementioned variables in our regressions.

CHAPTER V

ECONOMETRIC RESULTS & ANALYSIS

In this section, we examine the results of our analytical investigation into the philanthropic behavior of Colorado College Alumni as it relates to both total, and CSR-related giving to the college. We begin by addressing the limitations of this study and subsequent alterations made to carry out a final analysis. Then, we look at each stage of the hurdle model separately, contrasting and drawing parallels and across both types of giving.

5.1 Model Alterations and Computational Limitations

One limitation to the analysis conducted in this study is how observations are recorded in the data set year by year. In this way, it is difficult to do individual level analysis without clustering the data by *FakeID* codes using the "vce cluster" command outlined in chapter three. While this does little to affect the outputs of our logit and negative binomial models individually, when combined in a hurdle-style regression we encounter significant computational difficulty.

Another significant problem involves our inability to simultaneously run the negative binomial regression as random effects panel data and use the vce cluster option. As a result, we only run an explicit time-series regression for the probabilities of giving in the first stage logit. We concede that this may limit the scope of the dollar amount estimates in the second stage but the negative binomial should still produce significant results due to its truncation of data conditional that an alumnus gave at all.

Initially, the intention of this study was to follow the textbook guidance in carrying out a hurdle regression model as described in Long and Freese's book,

Regression Models for Categorical Dependent Variables Using Stata (2014). This involved conducting a hurdle regression using the Stata post-estimation command, "suest". Standing for "seemingly unrelated estimates", this command serves to combine estimation results, parameter estimates and variance matrices from two separate regressions into one (Long and Freese, 2014). In other words, the suest command will obtain the correct standard errors for these two models as it considers that although they are each estimated independently, they are dependent on one another (i.e. the amount an alumnus donates to the college is dependent on the decision on whether to give).

With such a specified model, there are few options to carry out econometric testing for these regressions. However, potential multicollinearity problems are accounted for using Pearson pairwise correlation coefficients in chapter four. Ideally, to test for heteroskedasticity we would run a "white test" as one would with any OLS model, but this option is not possible for panel logit and negative binomial regressions. In this case, the vce cluster command corrects for standard errors and variance. Even further, while there is a specification test for zero-inflated negative binomial models using the "Vuong statistic," this test does not apply to the zero-truncated model employed in this analysis. We instead look to the alpha value as a justification of over-dispersion and model selection outlined in chapter three.

We also concede there may be omitted variables in this model but have constructed our models based on best practices in previous literature to feel confident that even without specified econometric testing, our results still yield interpretable estimates. Furthermore, we observe perfect failure in the negative binomial regressions for widow and some *Majcode* variables, meaning that no widows, or theatre majors for example

were total or CSR fund donors. Taking these econometric limitations into account, we run our two models separately with the concession that they are non-nested (second stage adds the matching variable) and not linked explicitly through our computational analysis. We are satisfied that the results described in this chapter hold statistical significance for future research and policy recommendations as they relate to CSR initiatives and alumni donations.

5.2 *Likelihood of Annual Giving*: Panel Logit Regressions

In this section, we examine the likelihood (odds ratios) of both total-giving and CSR-related giving for CC alumni, shown in tables 5.1 and 5.2. For the purposes of this study, it is important to analyze the total, aggregated effects of giving at CC in conjunction with analysis of results that set CSR giving apart. Are there noticeable differences in the likelihoods of giving if an alumnus has a specific target or frame for their donation? Through the analysis of multiple regressions below, we will attempt to answer this question. For total giving associated with any funds at Colorado College, our panel logit model produces odds ratio coefficients that are significant at the level of 95% apart from double major (*Maj2)* and sports dummy variables (Table 5.1). While for the CSR regression, estimates for the variables *male, Greek, firstgen, Arts* and *Tier1* are all statistically insignificant and are not analyzed here.

Income

For median income (*eSMEDINC*) we observe a 1.000001-unit change in the likelihood of giving to any fund at the school. In other words, for every dollar increase in median income, we will see a 0.001% increase in the odds of giving. So, for every $1,000 dollars of income, we would expect a logical 1% increase in likelihood of giving as

individuals have increasingly more disposable income. Interestingly, for CSR giving we see that for every 0.003% increase in the odds of giving for every dollar increase in median income, three times higher than that of total giving.[16]

Demographics

In this study, for both total and CSR giving, male alumni are only between 0.86 and 0.88 times as likely to give to CC as their female counterparts. Furthermore, first generation CC students (i.e. first in their family to go to Colorado College/non-legacy) demonstrate a 10.7% decrease in the odds of donating when compared to legacy students. This result makes sense as multigenerational relationships with an institution have been shown to foster increased donor behavior (Meer and Rosen, 2010). In terms of ethnicity, Caucasian/non-Hispanic alums are less likely to give to general or CSR-related funds compared with their minority counterparts. As a result, we see that persons of color (non-white) in our alumni pool show greater odds of donating to CSR funds at 35% than total funds at 21%. This may be indicative of a framing effect, where persons of color may be more inclined to donate to diversity-related CSR initiatives.

Although past research (Lara and Johnson, 2012) has found positive donative effects in married couples with spouses from the same undergraduate institution, in this study we observe the opposite to be true. However, we question the validity of this statistic as CC's advancement department has multiple methods for attributing a gift to either one or both alumni spouses, resulting in over- and under-reporting depending on the case.

[16] https://stats.idre.ucla.edu/stata/faq/how-do-i-interpret-odds-ratios-in-logistic-regression/

Engagement

For the dummy engagement variable, representative of an active alumnus, an odds ratio coefficient of 3.40 represents a 240% increased likelihood of total giving to CC. In a similar vein, we observe at the 99% level, that for every event attended by an alumnus, their odds of giving to any fund increases by roughly 13%. These coefficients remain positive for CSR giving but are muted as unit increases per event attended only increase the likelihood of giving by 8.5%. Alumni who serve on association boards, committees, or those who are trustee voters, (*Engagement* dummy = 1) are 2.28 times more likely to donate to CSR funds than those who are not. For this reason, engaged alumni should be a key target for CC Advancement Services to focus gifts to specific CSR funds, especially if they can tap into a large pool of trustee voters.

Majors

For the purposes of simplicity and presentation, the odds ratio effects of giving associated with college majors are shown in appendix D for total giving, and in appendix E for CSR giving. Each of the 83 major programs were regressed individually to produce interpretable results (outlined in chapter four). Most of our *Majcode* regression coefficients are insignificant at the 95% confidence level across both types of giving, but several degree fields stand out. For total giving, Computer Science graduates demonstrate odds of giving at 2.64 times the likelihood of their counterparts. Together with Mathematical Economics students' odds ratio of giving at 4.54, we see historically high-earning majors giving back to their alma mater.[17] For CSR giving, we observe only one major field that is significant at the 90% confidence interval (because there are only 646

[17] https://www.forbes.com/sites/susanadams/2015/07/02/the-college-majors-with-the-highest-starting-salaries/#6869962c3502

observations of CSR giving split across 83 majors) in Organismal Biology and Ecology (OBE) with an odds ratio of 9.65. Although suspiciously high, the OBE coefficient may offer insight into the type of alumni passionate about CSR-related funds and projects (e.g. EcoFund or net-zero l8ibrary renovation). If planning to promote a project in line with the specified CSR criteria of this study, it may prove fruitful for Advancement Services to pursue and seek out OBE majors.

Table 5.1
Total Giving: Fixed Effects Panel Logit Results (Excluding Majors)

Variable	Odds Ratio	Z	P>z
eSHMEDINC	1.000	3.64	0
Age	0.899	-17.21	0
Age2	1.001	12.69	0
male	0.884	-3.21	0.001
Greek	1.138	2.89	0.004
firstgen	0.893	-2.51	0.012
whiteonly	0.790	-5.35	0
Maj2	1.067	0.55	0.581
Sports	0.938	-1.48	0.138
Arts	1.259	2.64	0.008
Single	0.483	-15.48	0
Widow	0.598	-2.33	0.02
spouse	0.428	-13.51	0
EVENTS_ATTENDED	1.130	16.5	0
Engagement	3.403	26.55	0
Tier1	0.921	-2.36	0.018
_cons	0.615	-1.05	0.293

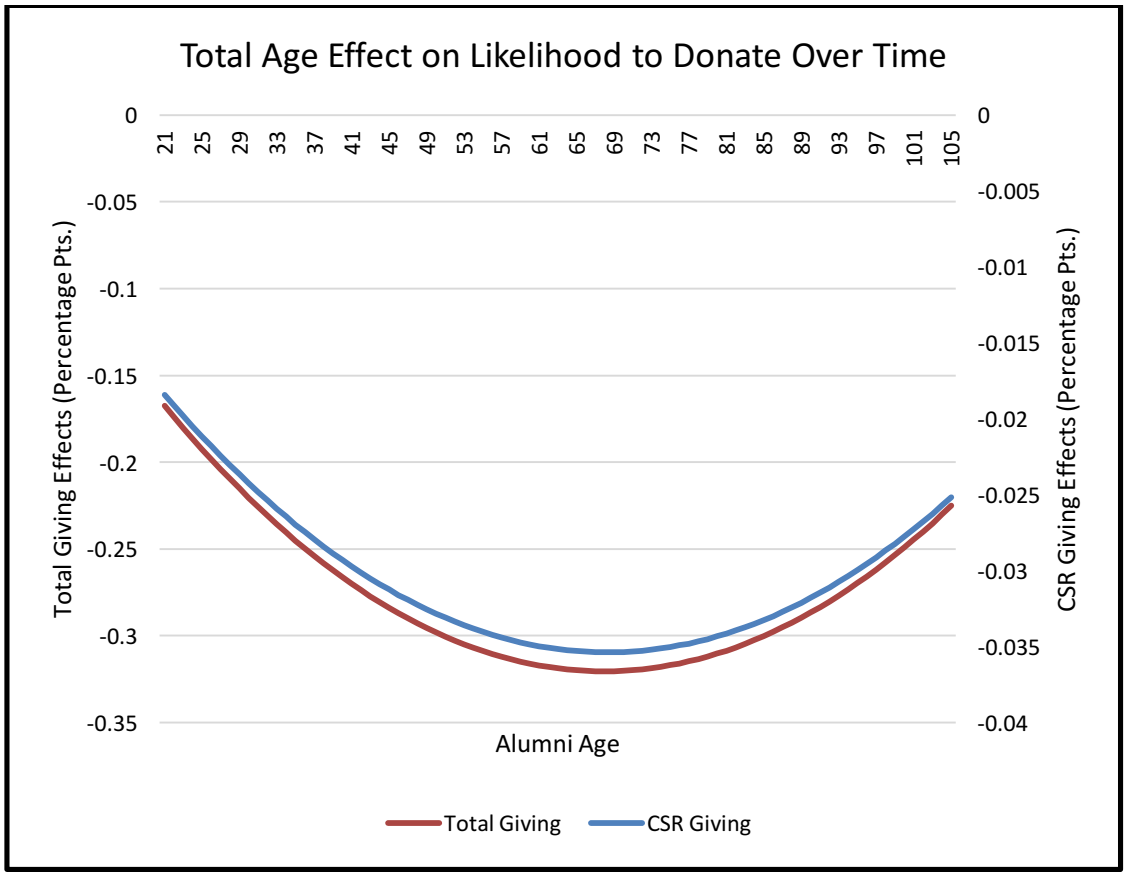
Table 5.2
CSR Giving: Fixed Effects Panel Logit Results (Excluding Majors)

Variable	Odds Ratio	Z	P>z
eSHMEDINC	1.000003	2.8	0.005
Age	0.809536	-13.19	0
Age2	1.001580	10.1	0
male	0.862756	-1.32	0.185
Greek	1.023281	0.15	0.878
firstgen	1.140253	0.92	0.359
whiteonly	0.648394	-3.73	0
Maj2	0.549808	-1.67	0.095
Sports	0.801202	-1.74	0.081
Arts	0.761273	-0.91	0.364
Single	0.726825	-2.03	0.042
spouse	0.606131	-2.14	0.033
EVENTS_ATTENDED	1.084812	9.82	0
Engagement	2.288382	6.27	0
Tier1	1.048683	0.46	0.647
_cons	0.181505	-1.36	0.173

Widow is omitted due to small sample size/missing data

5.2.1 Effects of Age on Likelihood of Alumni Donation Over Time

Graph 5.1



After running the xtlogit and computing odds ratio coefficients, we then run margins on the results to better interpret age and age-squared, both of which are significant at the level of 99%. Using and extrapolating the results over time, the above graph of a quadratic distribution was constructed, demonstrating the age effects on percentage point likelihood of donating to Colorado College in an alumni's lifetime. For both giving types, we observe after graduation (from age 21 onward) a decreased likelihood to donate, at a decreasing rate. However, when alumni reach the age of 68, this behavior reverses and the likelihood to donate not only increases, but continues to do so into old age at an increasing rate. Specifically, the minimum likelihood effect of age on giving give for total and CSR giving at age 68 is -0.32 and -0.035, respectively. This

means that at 68 a CC alum is 32% less likely to donate to any given institutional fund, but is only 3.5% less likely to give to CSR-related funds. This raises questions as to why the age effect is larger for total giving than it is CSR giving, even if the distribution shapes are relatively similar.

Interpretively, this graph illustrates that alumni are less likely to donate immediately after graduation, but the rate of this age effect over time decreases as one approaches or enters retirement. Given that the average retirement age is 62 in the United States,[18] these figures make intuitive sense in the way that young alums with smaller relative incomes are less likely to donate than those who are making more money and entering retirement. Furthermore, it fits that as alumni reach increasingly old ages (80s and 90s) and find more free time to engage with an institution, they may be inclined to donate to their alma mater.

5.3 *Dollar Estimates of Giving*: Zero Truncated Negative Binomial Regressions

In this section, we examine the dollar amounts of alumni donations to both general and CSR-related funds, shown in tables 5.3 and 5.4. Once again, it is important to analyze the total effects of giving amounts to any CC fund when also analyzing what sets a CSR-related donation apart. Here, we address the dollar amount differences between the two types of donation, conditional that an alumnus has given at all. In this second stage of the hurdle, the models now introduce a corporate match dummy variable that effectively decreases the relative price of charity. To see the original Stata output for total giving's zero-truncated negative binomial with "incidence rate ratio" (IRR) coefficients, refer to appendix F. The tables in this section display estimated coefficients in dollar

[18] https://money.usnews.com/money/retirement/articles/2014/05/12/the-ideal-retirement-age-and-why-you-wont-retire-then

amounts after they have been transformed using "margins, dydx(*)". As a final step in our investigation on alumni philanthropy, we can conduct predictive analysis on the efficacy of our model to determine percentages of correct donation amounts observed over a given threshold.

For total giving amounts, *Maj2*, *Arts*, *Single*, and *Widow* are insignificant at a confidence level of 95%; however, for CSR giving we observe the following statistically significant variables at 90%: *Male*, *Greek*, *firstge*n, *Events_Attended* and *Engagement*.

Income

Because we have such a limited observation set for CSR giving, many of the coefficient estimates will produce statistically insignificant values like that of median income with a p-value of 0.497 (Table 5.4). For total giving amounts, however, a $1,000 increase in median income serves to increase an alum's donation by $0.97, conditional that they have given any amount. This figure does not offer much in the way of targeting specific donors for the Advancement Department at CC as they should look to other factors that may cause an alum to give large sums.

Demographics

Although male alumni were observed to be less likely to give when compared to females in the first stage of our model, in the second stage, men who do choose to donate, give at higher dollar amounts ($77.63). However, although the gender effect is still positive, the donation amount for males is more than halved when looking at CSR giving ($35.84) signaling that males and females give more evenly (similar amounts) for CSR funds (i.e. closer to a zero coefficient). Non-legacy or first-generation CC alumni also exhibit a decreased donation amount to CSR funds by nearly $80. By that same token,

legacy students give roughly $50 dollars more to CSR initiatives than they do to total giving funds, at a confidence level of 90%. As a result, this may provide evidence for advancement personnel to focus fundraising efforts on legacy or intergenerational alumni families when pursuing CSR goals. Although non-white alumni were more likely give in the first stage, our results show that conditional on giving, Caucasian/non-Hispanic alumni give at higher amounts ($48.10) for total giving.

Engagement

For CSR giving, the increased dollar amount of donations related an engaged alum (*Engagement=1*) is nearly $20 more than the engagement coefficient in the total giving regression. As a result, when compared to their non-engaged counterparts, engaged alumni are not only more likely to give to CSR funds but do so at higher amounts. However, for every event attended by an alum, the greatest positive dollar effect on donations was seen in our total giving regression, at an increase of $19.75/event compared to $4.43/event for CSR funds.

Majors

The dollar amount coefficients of giving amounts for Colorado College major programs are shown in appendix G for total giving and in appendix H for CSR giving. The most salient of results comes from Business Economics majors who demonstrate a $332.46 increase in donation amount for total giving funds but then have a decreased (-$141.22) giving amount for CSR funds at a 95% confidence level. Something unobserved in our study is causing the peculiar behavior exhibited by Business Economics majors, and represents a significant opportunity for future research.

Matching

New to the model in this stage of the regression, the corporate matching variable, *Matching*, shows a $154.04 increase in the amount of alumni giving to any CC fund at a confidence level of 99%. This tells us that according to our model, when a corporate match is flagged in CC's alumni giving data, the effective donation to the college is $154 larger. As such, corporate match programs have incredible potential to boost alumni philanthropy totals and overall institutional revenue.

Table 5.3
Total Giving: Zero Truncated Negative Binomial Results (Excluding Majors)

Variable	dy/dx	z	P>z
eSHMEDINC	$0.00097	5.64	0
Age	$48.51	9.19	0
Age2	-$0.36	-8.24	0
male	$77.63	4.36	0
Greek	$56.56	2.99	0.003
firstgen	-$30.26	-1.7	0.089
whiteonly	$48.10	2.43	0.015
Maj2	$41.68	0.81	0.417
Sports	-$35.26	-1.97	0.049
Arts	-$62.14	-1.73	0.084
Single	-$16.33	-0.89	0.375
Widow	$138.89	1.1	0.273
spouse	$70.19	2.77	0.006
EVENTS_ATTENDED	$19.75	5.3	0
Engagement	$38.36	2.07	0.038
Tier1	$22.91	1.49	0.136
Matching	$154.04	4.35	0

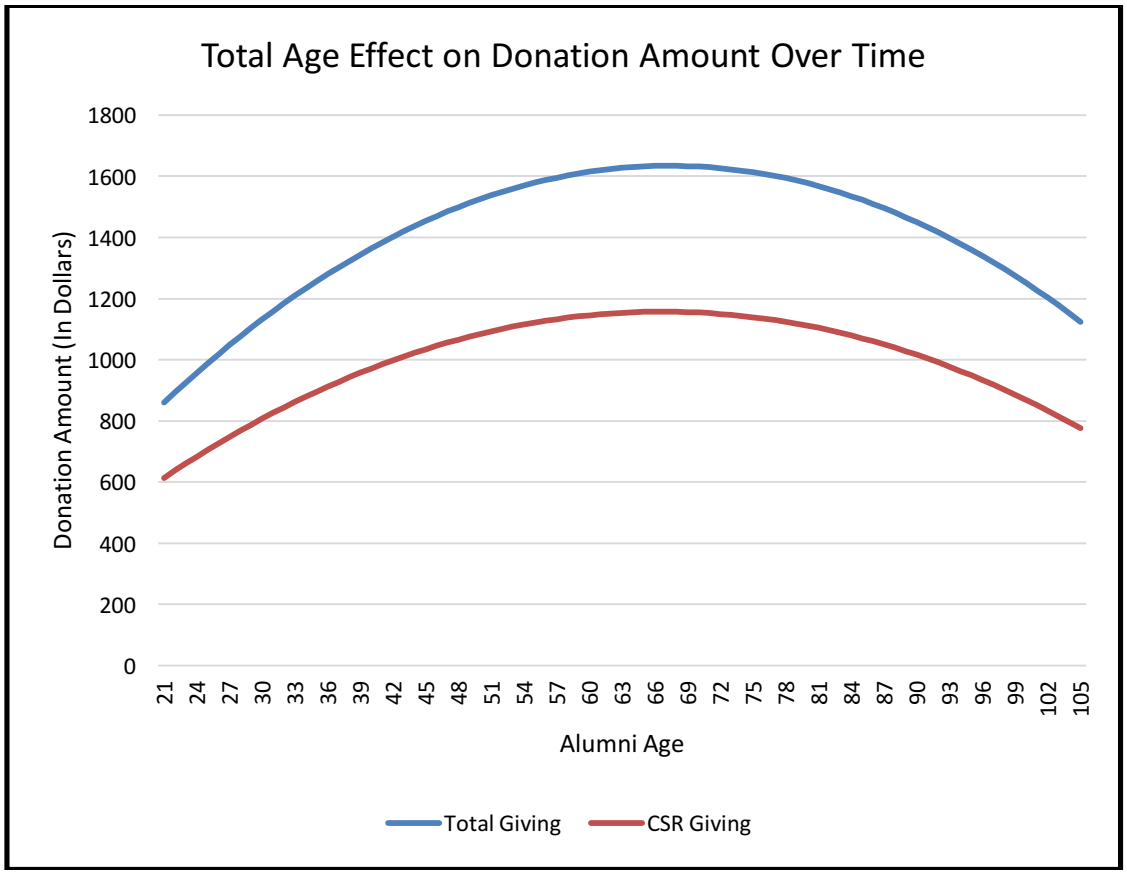
Table 5.4
CSR Giving: Zero Truncated Negative Binomial Results (Excluding Majors)

	dy/dx	z	P>z
eSHMEDINC	$0.0001	0.68	0.497
Age	$34.69	5.86	0
Age2	-$0.26	-5.07	0
male	$35.84	1.74	0.081
Greek	$50.84	2.05	0.041
firstgen	-$79.40	-2.49	0.013
whiteonly	-$22.83	-1.05	0.292
Maj2	$26.91	0.6	0.549
Sports	$30.07	1.27	0.203
Arts	-$45.06	-0.94	0.349
Single	$13.14	0.4	0.687
spouse	$46.53	1.27	0.203
EVENTS_ATTENDED	$4.43	2.19	0.028
Engagement	$58.15	1.96	0.05
Tier1	$2.46	0.14	0.888
Matching	$43.21	0.58	0.563

Widow is omitted due to perfect failure

5.3.1 Effects of Age on Alumni Donation Amount Over Time

Graph 5.2



Similar to the analysis in graph 5.1, the figure above illustrates the age effects on donation amount over time. The dollar amounts for total giving are consistently higher than the amounts for CSR giving with peaks at $1,634.13 and $1,157.09, respectively, when alumni are 67 years old. Interpreting the trend in the graph, we observe that donation amounts increase at a decreasing rate prior to their peak and decrease at an increasing rate afterwards. Given that the likelihood of giving effects witnessed in graph 5.1 are opposite to the effects above, a number of interesting interpretations can be inferred. Namely, young alumni approach retirement as less likely to give, but when giving at higher amounts they do so at a decreasing rate. Moreover, those individuals that

have retired in their 60s may be more likely to donate but give increasingly smaller amounts as they continue to age.

This may be due to consumption smoothing over the course of an alumni's lifetime.[19] Ideally, one would consume less of a good, namely that of a warm glow feeling associated with philanthropy, as they have limited or no income due to retirement. Armed with these insights, it may prove profitable for the Advancement Department to target alumni close to the age of retirement or shortly thereafter, as these individuals give at higher amounts and have increasing likelihoods of giving.

5.3.2 Predictive Analysis for Alumni Donation Amounts

In conducting predictive analysis for total and CSR-related alumni donation amounts, we developed new dummy variables contingent on an individual's actual and predicted giving amounts using the ZTNB model. This analysis was carried out for both giving types (total and CSR) and calculated the number of individuals who were predicted to give or below a certain threshold and how correct those predictions were given actual tallies from the data. As a threshold, we use the mean dollar amounts of total and CSR-giving, which come to $285.54 and $169.26, respectively.

At the observational level of total giving (i.e. each alum, each year), our model correctly predicts 69.96% of the actual values.[20] In comparison, we find that our CSR model is 82.67% accurate in predicting whether donation will be above or below the average donation amount.[21] Through this analysis, we are also able to learn when the

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[19] Gruber, J. (1997). The Consumption Smoothing Benefits of Unemployment Insurance. *The American Economic Review,87*(1), 192-205.

[20] This includes 11,687 observations of true negatives (predicted to give below the threshold and they do) and 2,044 true positives (predicted to break threshold and they do) out of 19,626 observations of total giving (true obs./total obs.)

[21] This includes 437 true negatives and 97 true positives out of 646 observations of CSR giving

predictive model is wrong (i.e. predicts incorrectly). Specifically, we can identify the quantity and identity of alums who are predicted to give above the threshold in each observation but fail to do so. Conversely, we are also able to deduce which alums 'over-give', or give above the threshold when they are predicted not to.

This ability to identify high impact donors (i.e. those that over-give and those that have the potential to give more) may serve as powerful tool for not only Colorado College's Advancement department but for other schools of similar size and composition as well. Due to the limited sample size of CSR donations we are cautious to make any grand claims to its significance, yet the results are promising and necessitate further exploration.

CHAPTER VI

CONCLUSION

In conclusion, this investigation has accomplished its goals in analyzing the effective differences between alumni philanthropy to general and CSR-related funds. Our results suggest the existence of significant alumni donation effects as they relate to ethnic/racial diversity, legacy alumni status and corporate matching programs. Taking these metrics into consideration, coupled with our predictive analysis of high impact donors, we provide implementable targets for Advancement Services to improve their donation revenues and institutional commitment to corporate social responsibility.

6.1 Discussion

Specifically, we find that non-white alumni (minorities) are more likely to give to CSR-related CC funds than they are to general funds. Furthermore, we observe that while this alumni population is more likely to give than their Caucasian counterparts, they do so at lower dollar amounts. On the other hand, 'legacy' alumni (non-first-generation CC student) comprise about 20% of the data pool and are not only more likely to give, but at higher amounts. In fact, legacies donate more to CSR than to general philanthropic funds by about $50 (Tables 5.3 and 5.4). Following a similar trend, 'engaged' alums are not only more likely to give to CSR funds but do so at higher amounts, when compared to non-engaged alumni.

By targeting these subgroups, Advancement Services can influence the donation revenue of the college while also financially supporting funds and programs working to improve diversity, inclusivity, scholarship, and environmental sustainability measures with the upmost ethical standards. If successful in attracting more minority students (non-

white) to the college and effectively supporting them, it is then possible to promote a diverse and engaged alumni base such that these alums might encourage their children to also attend CC (growing the high giving legacy population). Targeted growth in this manner would demonstrate how to simultaneously combat nationwide problems of (1) stagnant institutional revenues through increased giving participation and (2) growing class inequality in higher education by strengthening intergenerational academic achievement for historically disadvantaged populations.

6.2 Future Recommendations and Implications of Study

This study is useful beyond the scope of Colorado College, as other schools serious about bolstering their financial situation and growing CSR-related programs can replicate this analysis to target key donor populations. Even more importantly, this represents one of the first known studies on this specific topic, especially in the way that CSR is examined both from the point of the institution (Colorado College) and from corporate entities (proxied by their CC alum employee). However, our analysis of the corporate match effect was limited to alumni that chose to give any positive amount (where we see a match increase a general fund donation of $154). As such, it would be compelling for future research to model corporate match donations specifically, conducting a natural experiment in a large-scale company to examine the ways in which employees maximize and direct their matches, or if they chose not to use them (i.e. how does it affect likelihood of giving?).

Still, our result for corporate match donations is influential and applicable to the realm of higher education, most notably when considering tax implications for corporations and individuals alike. As a topic for future exploration, one might analyze

the potential of matching programs to replace federal tax deductions for individual and corporate donations to institutions of higher education (non-profits). Due to the concept of "cooperative framing" as outlined by in chapter two, the possibility of sufficiently increased philanthropic donations to compensate for losses in government appropriation warrants further investigation.

In summation, the results of this analysis are substantial and salient at a microeconomic level as they relate to school (higher-education) and corporate-level interactions with alumni philanthropy and CSR. At a macroeconomic scale, the recorded effects and questions raised here may have far-reaching impacts on the way we think about class-(in)equality, funding, and tax policy.

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APPENDICES

Appendix A
Stata Input: Fixed Effects Panel Logit Model for Alumni Giving Likelihood

>> "xtlogit giver (or csrdum) eSHMEDINC Age Age2 male Greek firstgen whiteonly i.Majcode Maj2 Sports Arts Single Widow spouse EVENTS_ATTENDED Engagement Tier1, re vce(cluster FakeID) nolog or"

Appendix B
Stata Input: Zero Truncated Negative Binomial Model for Alumni Donation Amount

>> "ztnb TotGiving(or csr) eSHMEDINC Age Age2 male Greek firstgen whiteonly i.Majcode Maj2 Sports Arts Single Widow spouse EVENTS_ATTENDED Engagement Tier1 Matching if TotGiving(or csr)>0, vce(cluster FakeID) nolog irr"
>> "margins, dydx(*)"

Appendix C
Funds Included in "csr" Giving Variable

Variable	Freq.	Fund Description
ECOFUND	171	The CC EcoFund
GROWMHA	133	GROW for Mental Health Awareness
BUTLERCEN	118	Butler Center Discretionary Fund
TUTTRENO	50	Library Expansion and Renovation Fund
MINORITYST	49	Minority Student Scholarship
C1991	48	Class of 1991 25th Reunion - Library Renovation
PIFP	37	Public Interest Fellowship Program
NATSCIPRIZ	22	Barbara Whitten Prize for Women in the Natural Sciences
LGBTQDISC	21	LGBTQ Discretionary Fund
PIFPEND	18	Public Interest Fellowship Program Endowment
ROCKIES	16	The State of the Rockies Project
C1967	12	Class of 1967 50th Reunion - Library Renovation
KELSOPLANT	11	Kelso Fund for the Study of Plant Diversity in the PP Region
COMMSVC	10	Collaborative for Community Engagement
SOUPPROJCT	9	Soup Project
ADAMSNATAM	8	Carla Lewis Adams Scholarship for Native Americans
BLUMENSTEI	5	Charlie Blumenstein Water & Wildlife Conservation Internship
SUSTAININV	5	Sustainable Investment Fund
VENETUCCI	5	CC Student Farm Project
BEIDLEMANI	4	Reba Beidleman Indian Scholarship
GLASSHSE	4	The Lennox "Glass" House Fund
1STGENINT	3	First Generation Internships Fund
TASHJIAN	3	Tashjian/Crecelius Family Prize for Women in Science
DISABILSVC	2	Accessibility Resources

ROCKIESFR	2	State of the Rockies Field Research Fund
SOLARARRAY	1	Solar Array Fund
SYNERGY	1	Synergy House Discretionary Fund

Appendix D

Total Giving: Fixed Effects Panel Logit Results (All Majors)

Variable	Odds Ratio	z	P>z
Majcode			
Anthropology	1.734	1.24	0.213
Art	1.976	1.55	0.121
Art History	0.968	-0.06	0.953
Art Studio	1.076	0.15	0.88
Asian Studies	1.180	0.32	0.746
Biochemistry	2.201	1.72	0.086
Biology	1.888	1.46	0.143
Botany	1.057	0.05	0.96
Business Administration	1.781	1.3	0.193
Business Economics	1.694	1.12	0.261
Chemistry	2.913	2.39	0.017
Classics	2.385	1.72	0.085
Classics/English	1.230	0.21	0.837
Classics/History/Politics	2.120	1.41	0.159
Comparative Literature	1.794	1.23	0.218
Computer Science	2.644	1.97	0.049
Creative Writing	1.133	0.25	0.804
Dance	1.855	1.1	0.27
Drama	1.375	0.67	0.504
Drama/Dance	1.069	0.11	0.915
Economics	1.970	1.56	0.119
Education	2.120	1.54	0.124
Engineering	0.826	-0.15	0.885
English	1.756	1.3	0.195
Environmental Policy	3.668	2.69	0.007
Environmental Sci Geology	6.639	1.33	0.185
Environmental Sci. Biology	1.427	0.62	0.537
Environmental Sci. Chemistry	1.632	0.47	0.641
Environmental Sci. Physics	1.543	0.36	0.719
Environmental Science	2.949	2.4	0.016
Feminist & Gender Studies	1.376	0.58	0.565
Film Studies	0.781	-0.36	0.721
Film and Media Studies	3.088	2.14	0.032

Film and New Media Studies	2.550	1.77	0.077
Fine Arts/Drama	3.840	1.59	0.112
French	1.142	0.17	0.865
French & Francophone Studies	1.775	0.86	0.388
French Culture	0.325	-1.1	0.271
Geography	1.525	0.97	0.332
Geology	2.409	1.99	0.046
Geology: Environmental	6.583	2.48	0.013
German	3.422	2.53	0.011
Health Administration	6.908	4.44	0
History	2.369	1.98	0.048
History/Philosophy	2.245	1.43	0.154
History/Political Science	1.905	1.44	0.149
Humanities for Elem Teachers	2.246	1.63	0.102
Independently Designed Major	2.900	2.17	0.03
International Affairs	0.853	-0.17	0.864
International Political Econ	2.352	1.92	0.055
Italian Studies	1.512	0.41	0.683
Liberal Arts & Sciences	1.555	0.98	0.327
Mathematical Economics	4.544	3.26	0.001
Mathematics	2.091	1.66	0.096
Medical Technology	2.362	0.92	0.356
Molecular Biology	2.974	2.17	0.03
Music	2.698	2.17	0.03
Neuroscience	2.196	1.73	0.083
Org. Biology and Ecology	4.081	2.91	0.004
Philosophy	1.782	1.3	0.195
Philosophy/Political Science	1.800	0.8	0.426
Physics	2.162	1.73	0.084
Political Economy	1.926	1.45	0.147
Political Science	1.890	1.46	0.144
Politics	0.283	-0.8	0.424
Psychology	1.548	0.99	0.32
Religion	1.826	1.32	0.185
Romance Languages	2.386	1.92	0.055
Russian	3.939	1.38	0.168
Russian & Eurasian Studies	1.023	0.02	0.982
Sociology	1.669	1.17	0.243
Southwest Studies	1.197	0.32	0.746
Spanish	1.297	0.53	0.595
Theatre	1.272	0.27	0.786

Women's Studies	0.556	-0.7	0.481
Zoology	3.579	2.62	0.009

6 major designations are omitted due to perfect failure

Appendix E

CSR Giving: Fixed Effects Panel Logit Results (All Majors)

Variable	Odds Ratio	z	P>z
Majcode			
Anthropology	0.900	-0.09	0.932
Art	0.792	-0.19	0.848
Art Studio	0.240	-0.9	0.366
Asian Studies	0.935	-0.05	0.963
Biochemistry	1.201	0.15	0.883
Biology	0.836	-0.15	0.881
Business Administration	0.606	-0.39	0.696
Business Economics	0.617	-0.31	0.757
Chemistry	0.330	-0.83	0.406
Classics	3.464	0.97	0.332
Classics/History/Politics	1.548	0.32	0.746
Comparative Literature	4.295	1.19	0.235
Computer Science	1.845	0.48	0.633
Dance	1.774	0.4	0.692
Drama	0.704	-0.24	0.807
Drama/Dance	1.998	0.43	0.665
Economics	0.701	-0.3	0.768
Education	1.122	0.09	0.928
English	0.745	-0.25	0.806
Environmental Policy	4.515	1.24	0.216
Environmental Science	1.839	0.5	0.614
Feminist & Gender Studies	5.992	1.43	0.154
Film and Media Studies	2.364	0.59	0.558
Film and New Media Studies	1.403	0.25	0.799
Fine Arts/Drama	14.596	1.45	0.147
French Francophone Studies	4.103	1.04	0.299
Geology	1.267	0.2	0.845
Geology: Environmental	5.926	1.05	0.294
German	1.357	0.23	0.822
History	0.680	-0.32	0.751
History/Philosophy	0.644	-0.28	0.778
History/Political Science	0.810	-0.17	0.866
Humanities for Elem Teachers	1.009	0.01	0.995
Indep. Designed Major	6.716	1.52	0.13

International Political Econ	0.672	-0.32	0.747
Liberal Arts & Sciences	1.383	0.26	0.796
Mathematical Economics	1.781	0.47	0.639
Mathematics	0.747	-0.24	0.813
Molecular Biology	2.759	0.77	0.443
Music	0.260	-0.96	0.336
Neuroscience	0.776	-0.2	0.838
Org. Biology and Ecology	9.651	1.78	0.075
Philosophy	0.889	-0.1	0.923
Physics	2.242	0.67	0.505
Political Economy	1.609	0.38	0.707
Political Science	0.728	-0.26	0.792
Psychology	0.874	-0.11	0.911
Religion	0.531	-0.5	0.62
Romance Languages	0.707	-0.26	0.792
Sociology	1.087	0.07	0.945
Southwest Studies	0.913	-0.06	0.95
Spanish	1.879	0.5	0.618

30 major designations are omitted due to perfect failure

Appendix F

Total Giving: Zero Truncated Negative Binomial Results (Incidence Rate Ratios, No Majors)

Variable	IRR	z	P>z
eSHMEDINC	1.000	6.42	0
Age	1.166	16.7	0
Age2	0.998	-12.25	0
male	1.281	4.91	0
Greek	1.197	3.06	0.002
firstgen	0.908	-1.69	0.091
whiteonly	1.165	2.58	0.01
Maj2	1.141	0.81	0.416
Sports	0.893	-2.04	0.041
Arts	0.821	-1.78	0.075
Single	0.949	-0.89	0.376
Widow	1.555	1.1	0.271
spouse	1.250	2.81	0.005
EVENTS_ATTENDED	1.064	9.23	0
Engagement	1.129	2.02	0.043
Tier1	1.075	1.49	0.137
Matching	1.632	4.55	0
_cons	0.620	-1.52	0.128

For presentation purposes IRR results for CSR giving have been omitted from this document

Appendix G

Total Giving: Zero Truncated Negative Binomial Results (Margins, All Majors)

Variable	dy/dx	z	P>z
Majcode			
Anthropology	$96.35	1.8	0.072
Art	$82.27	1.52	0.128
Art History	$92.48	1.19	0.235
Art Studio	$65.63	0.72	0.473
Asian Studies	$319.66	1.9	0.058
Biochemistry	$182.22	2.12	0.034
Biology	$148.68	2.94	0.003
Botany	-$51.66	-0.44	0.661
Business Administration	$67.27	1.33	0.185
Business Economics	$332.46	2.19	0.028
Chemistry	$185.07	2.44	0.015
Classics	$126.18	1.33	0.184
Classics/English	$88.04	0.88	0.376
Classics/History/Politics	-$86.98	-1.86	0.063
Comparative Literature	-$8.55	-0.19	0.852
Computer Science	$19.38	0.33	0.743
Creative Writing	$134.50	1.32	0.186
Dance	-$10.93	-0.2	0.843
Drama	-$40.90	-0.91	0.365
Drama/Dance	$219.52	0.84	0.403
Economics	$146.57	3.04	0.002
Education	-$51.36	-1.01	0.314
Engineering	-$153.64	-3.54	0
English	$57.05	1.32	0.187
Environmental Policy	$92.21	1.35	0.178
Environmental Sci. Geology	$26.47	0.49	0.626
Environmental Sci. Biology	$39.54	0.59	0.557
Environmental Sci. Chemistry	-$4.51	-0.08	0.937
Environmental Sci. Physics	$156.89	0.59	0.553
Environmental Science	$54.00	1.07	0.283
Feminist & Gender Studies	-$3.22	-0.05	0.957
Film Studies	$225.05	1.52	0.128
Film and Media Studies	-$38.04	-0.77	0.444
Film and New Media Studies	-$62.42	-1.25	0.211
Fine Arts/Drama	-$99.50	-2.31	0.021
French	-$95.64	-2.12	0.034
French Francophone Studies	$84.34	1.14	0.256

French Culture	$411.21	1.04	0.298
Geography	-$166.21	-3.98	0
Geology	$132.22	2.47	0.013
Geology: Environmental	$243.84	1.35	0.178
German	$90.16	1.09	0.275
Health Administration	$315.76	4.69	0
History	$76.98	1.68	0.093
History/Philosophy	$6.93	0.11	0.909
History/Political Science	$182.75	2.45	0.014
Humanities for Elem Teachers	-$2.57	-0.04	0.968
Indep. Designed Major	-$62.06	-1.46	0.143
International Affairs	-$133.84	-3.13	0.002
International Political Econ	$146.13	2.56	0.01
Italian Studies	-$76.03	-1.48	0.138
Liberal Arts & Sciences	$44.41	0.8	0.425
Mathematical Economics	$284.86	2.12	0.034
Mathematics	$90.20	1.65	0.099
Medical Technology	$7.31	0.09	0.932
Molecular Biology	-$47.13	-1.01	0.312
Music	$56.11	0.94	0.35
Neuroscience	$382.50	1.04	0.297
Org. Biology and Ecology	-$82.44	-1.95	0.052
Philosophy	$144.36	1.6	0.109
Philosophy/Political Science	$290.56	1.08	0.28
Physics	$107.54	1.69	0.091
Political Economy	$510.47	2.39	0.017
Political Science	$124.15	2.55	0.011
Politics	$20.64	0.35	0.725
Psychology	$107.10	1.79	0.073
Religion	-$13.17	-0.3	0.764
Romance Languages	-$42.28	-0.99	0.32
Russian	-$55.74	-0.89	0.371
Russian & Eurasian Studies	$1.38	0.01	0.989
Sociology	$92.60	1.21	0.228
Southwest Studies	$3.53	0.06	0.95
Spanish	$481.20	1.68	0.093
Theatre	-$114.79	-2.63	0.009
Women's Studies	$10.68	0.09	0.93
Zoology	$58.89	0.96	0.339

8 major designations are omitted due to perfect failure

Appendix H

CSR Giving: Zero Truncated Negative Binomial Results (Margins, All Majors)

Variable	dy/dx	z	P>z
Majcode			
Art	$27.40	0.31	0.753
Art Studio	-$57.54	-0.84	0.399
Asian Studies	$416.52	1.74	0.082
Biochemistry	$153.20	0.9	0.37
Biology	$1.84	0.03	0.979
Business Administration	-$44.62	-0.58	0.563
Business Economics	-$141.22	-2.21	0.027
Chemistry	-$13.46	-0.16	0.871
Classics	-$38.04	-0.47	0.64
Classics/History/Politics	-$112.32	-1.62	0.105
Comparative Literature	-$89.55	-1.34	0.181
Computer Science	-$105.18	-1.57	0.115
Dance	-$49.86	-0.68	0.497
Drama	-$133.30	-2.05	0.04
Drama/Dance	$257.58	0.83	0.405
Economics	-$91.45	-1.44	0.15
Education	-$87.98	-1.37	0.17
English	-$58.72	-0.87	0.386
Environmental Policy	-$86.33	-1.33	0.182
Environmental Science	-$23.97	-0.34	0.738
Feminist & Gender Studies	-$59.47	-0.82	0.412
Film and Media Studies	-$64.79	-0.94	0.35
Film and New Media Studies	-$69.41	-0.97	0.333
Fine Arts/Drama	-$154.43	-2.46	0.014
French Francophone Studies	$81.25	0.81	0.417
Geology	$158.29	1.24	0.213
Geology: Environmental	$809.63	4.14	0
German	$94.69	0.68	0.496
History	$22.30	0.24	0.812
History/Philosophy	-$170.24	-2.66	0.008
History/Political Science	$3.02	0.03	0.973
Humanities for Elem Teachers	-$150.79	-2.31	0.021
Indep. Designed Major	-$59.56	-0.93	0.352
International Political Econ	$122.33	0.69	0.489
Liberal Arts & Sciences	$78.32	0.46	0.643
Mathematical Economics	-$25.71	-0.37	0.715
Mathematics	-$97.04	-1.46	0.143
Molecular Biology	-$57.25	-0.89	0.375

Music	-$127.60	-1.67	0.095
Neuroscience	-$42.06	-0.51	0.608
Org. Biology and Ecology	-$82.93	-1.27	0.206
Philosophy	-$4.21	-0.05	0.962
Physics	-$64.41	-0.92	0.359
Political Economy	$172.55	1.29	0.199
Political Science	$92.87	0.72	0.471
Psychology	-$85.63	-1.28	0.201
Religion	-$74.66	-0.96	0.336
Romance Languages	$47.24	0.42	0.674
Russian & Eurasian Studies	-$181.79	-2.83	0.005
Sociology	-$82.43	-1.29	0.199
Southwest Studies	-$67.77	-1.09	0.274
Spanish	-$15.57	-0.18	0.855
Theatre	-$125.89	-2	0.046

31 major designations are omitted due to perfect failure

Appendix I: MajCode Summary Statistics

Majcode	Frequency	Percent
American Political Economy	210	0.17%
Anthropology	3,804	3.09%
Architecture	5	0.00%
Art	5,270	4.28%
Art History	318	0.26%
Art Studio	875	0.71%
Asian Studies	398	0.32%
Biochemistry	1,134	0.92%
Biology	11,809	9.60%
Black Studies	5	0.00%
Botany	85	0.07%
Business Administration	4,470	3.63%
Business Economics	1,119	0.91%
Chemistry	2,744	2.23%
Civil Engineering	5	0.00%
Classics	394	0.32%
Classics/English	45	0.04%
Classics/History/Politics	300	0.24%
Comparative Literature	905	0.74%
Computer Science	367	0.30%
Creative Writing	848	0.69%
Dance	270	0.22%
Drama	1,137	0.92%
Drama/Dance	357	0.29%
Economics	9,055	7.36%
Education	861	0.70%
Engineering	56	0.05%
English	11,738	9.54%
Environmental Policy	402	0.33%
Environmental Sci Geology	20	0.02%
Environmental Sci. Biolog	341	0.28%
Environmental Sci. Chemis	55	0.04%
Environmental Sci. Physics	40	0.03%
Environmental Science	1,396	1.13%
Feminist & Gender Studies	185	0.15%
Film Studies	278	0.23%
Film and Media Studies	55	0.04%
Film and New Media Studies	214	0.17%
Fine Arts/Drama	105	0.09%
French	184	0.15%
French & Francophone Studies	105	0.09%
French Culture	75	0.06%
Geography	5	0.00%
Geology	3,768	3.06%
Geology:Environmental	75	0.06%
German	716	0.58%
Health Administration	5	0.00%
Hispanic Studies	10	0.01%
History	7,133	5.80%
History/Philosophy	267	0.22%
History/Political Science	2,341	1.90%
Humanities for Elem Teachers	776	0.63%
Independently Designed Major	144	0.12%
International Affairs	10	0.01%
International Political Econ	2,145	1.74%
Italian Studies	48	0.04%
Law	5	0.00%
Liberal Arts & Sciences	2,585	2.10%
Mathematical Economics	779	0.63%
Mathematics	3,834	3.12%
Medical Technology	115	0.09%
Molecular Biology	145	0.12%
Music	1,512	1.23%
Neuroscience	1,262	1.03%
Organismal Biology and Ecology	124	0.10%
Philosophy	2,812	2.29%
Philosophy/Political Science	115	0.09%
Physics	2,365	1.92%
Physics/Biology	5	0.00%
Political Economy	2,055	1.67%
Political Science	8,952	7.28%
Politics	27	0.02%
Psychology	5,772	4.69%
Religion	1,749	1.42%
Romance Languages	2,158	1.75%
Russian	30	0.02%
Russian & Eurasian Studies	55	0.04%
Sociology	5,229	4.25%
Southwest Studies	180	0.15%
Spanish	696	0.57%
Theatre	63	0.05%
Women's Studies	133	0.11%
Zoology	791	0.64%
Total	**123,030**	**100%**