Major Donors and Higher Education: Are STEM Donors Different from Other Donors?

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Abstract
Philanthropic support of higher education is a growing area of interest among academic fundraisers and philanthropy scholars. The academic fields of science, technology, engineering, and math (STEM), in particular, are in need of a better understanding of their major donors. This article analyzes a unique database of announced gifts to higher education institutions from 1995 to 2017 to investigate relationships between major donors’ characteristics and the magnitude of their gifts to STEM and all other academic disciplines. Major donors to STEM are disproportionately entrepreneurs who, on average, give larger gifts to STEM than other major donors. Quantile regressions reveal a positive and statistically significant relationship between major donors’ entrepreneurial status and gift amounts at the 99th quantile (worth US$100 million or more). As major funding sources for academic STEM are increasingly threatened, these findings are pertinent to academic institutions seeking to leverage major donors as an alternative source of funding.

Keywords
major donors, philanthropy, science and technology, higher education

Introduction
Private donors have consistently been the primary financial supporters of philanthropic causes in the United States. High-net-worth donors are driving philanthropic giving (List, 2011), although less wealthy donors give higher proportions of their wealth to charitable causes. The literature on giving motivations (e.g., religion, identity, social
networks, and trust) typically refers to low-dollar philanthropic donors (e.g., Drezner & Garvey, 2016; Eckel & Grossman, 2004; Herzog & Yang, 2018). Few studies have explicitly addressed empirical findings on high-net-worth donors’ giving preferences (Osili et al., 2019).

Academic institutions, in particular, attract high-net-worth donors (Holmes, 2009; Monks, 2003). Universities seek support from development or fundraising professionals to raise private funds. According to the Giving USA Foundation (2019), the education sector, including higher education, received approximately US$58.72 billion from donors in 2018. Academic institutions have used donor-centric fundraising practices to encourage high-net-worth donors to give (Burnett, 2002), but there is still a need to critically analyze if their gifts are responsive to the priorities of academic institutions. Although athletics draw much media attention, higher education has ongoing funding difficulties that have affected all academic disciplines (Lye et al., 2011; Newfield, 2009).

This article focuses on major gifts from high-net-worth donors (or major donors) who support academic science, technology, engineering, and math (STEM). Funding for academic science is a public policy decision of utmost importance. Economic and political shifts have exposed gaps in our understanding of the appropriate levels of funding basic research. These gaps are complicated by the phenomenon of diversifying funding sources. These funding sources include the federal government, state governments, industry partners, foundations, and nonprofit organizations. Rectifying our understanding of funding gaps depends on the goals of the funding source.

Kohler (1985) argued that philanthropists’ support of science in the university context stemmed from the use of research grants to individual scientists in the 1920s and 1930s. Science philanthropy has since progressed away from the support of individual scientists to the support of large-scale initiatives. Scientific projects and initiatives have served as opportunities to attract philanthropic dollars (Feldman & Graddy-Reed, 2014). Potential reasons for this attraction may lie within some distinguishing features of academic STEM. For example, basic research and applied research and development (R&D) in STEM disciplines at universities have contributed to industrial innovation (Mansfield & Lee, 1996). Furthermore, R&D in STEM disciplines at colleges and universities remain critical to the national R&D enterprise (National Science Board [NSB], 2018).

Trends in high-net-worth donors’ gifts to STEM at U.S. colleges and universities have not been fully explored due to a lack of disaggregated data. High-net-worth donors’ gifts to support STEM at U.S. colleges and universities are currently categorized by the NSB as part of the “other” funding category, alongside nonprofit and foundation funding. The “other” funding category increased from 6.7% in 2006 to nearly 9.5% in 2016 as federal government funding remained stagnant. The rise of the “other” funding category warrants scholarly attention as philanthropic dollars become more important to institutions of higher education.

There is historical evidence of high-net-worth donors’ contributions to academic STEM. Consider the legacy of early industrialists who provided funding that established academic institutions that now bear their names, such as Duke, Stanford, and
Harvey Mudd. Media coverage of major gifts to academic institutions has become more common. For example, Phil Knight, the cofounder of the shoe brand Nike, announced a US$500 million gift in 2016 for a new science campus to his alma mater, the University of Oregon. Another major gift, US$30 million to Spelman College in 2018, came from Ronda Stryker and William Johnston; this gift was used to build a Center for Innovation and the Arts, which seeks to help students integrate scientific competencies within the liberal arts.

The term “major gift” has historically been applied to variable and unclear size ranges, with the definition of a major gift often depending on the recipient organization and its fundraising capacity (Sargeant et al., 2015). In this study, a major gift is defined as a philanthropic contribution of US$1 million or more. This article empirically analyzes 6,815 publicly announced major gifts to 944 academic institutions from 6,039 unique donors between 1995 and 2017. It explores the distinguishing characteristics of major donors who contribute major gifts to STEM in comparison to major donors who contribute major gifts to non-STEM fields.

This article uses quantile regression analysis to assess the relationship between donors’ characteristics and the amount of their major gifts, across the distribution of gift amounts. This approach accommodates different potential influences across the range of gift amounts. The results suggest that there are important differences in donor characteristics between STEM and non-STEM major gifts. The results provide empirical evidence of entrepreneurial status having a strong, positive relationship with major gift amounts at the 99th quantile of major gifts to STEM, but this is not the case for major gifts to non-STEM. This means the entrepreneurial status of donors may be a distinguishing characteristic of the wealthiest STEM donors as academic fundraisers seek to promote STEM projects. List (2011) argued for the need for additional information for successful donor prospecting and cultivation. Ultimately, the funding characteristics of STEM donors are relevant to modern institutions seeking to leverage major donors as an alternative funding source for academic science, especially STEM.

In the next section, I examine the existing literature on science philanthropy from the lens of higher education. This brief literature review describes the understudied, but growing, field of science philanthropy. After an explanation of the data and methodology is provided, STEM and non-STEM donors’ giving trends are discussed in the “Results” section. The article concludes with a discussion of the limitations of the study and areas for future research.

**Science Philanthropy and Higher Education**

Science philanthropy is an understudied field of philanthropy that is drawing scholarly attention to how philanthropy supports and shapes the study and practice of science. Federal sponsorship is the largest source of funding for academic R&D but has had cumulative funding declines and stagnation in recent years (NSB, 2018). Murray (2013) provided the first empirical evaluation of the role of science philanthropy and estimated that private gifts accounted for more than a third (36%) of philanthropic dollars to scientific research at the top 50 U.S. research universities. In addition, Katz
observed foundations being less interested in basic research and becoming more selective about the science they choose to support.

Considering how governments and foundations are changing their funding strategies, individual donors’, especially high-net-worth donors’, support of STEM warrants further investigation. Empirical studies on this topic are few, and existing studies have not fully considered individual donors’ characteristics and contributions to science philanthropy. Investigations of high-net-worth donors’ support of STEM are often focused on the medical sciences (Chervenak et al., 2010; Stewart et al., 2011; Wheeler et al., 2014).

The phenomenon of high-net-worth donors committing major gifts to science is evident in media reports. For example, Facebook co-founders Dustin Moskovitz and Mark Zuckerberg committed billions of dollars to high-risk basic and applied research through their own initiatives and foundations (Callaway, 2017). In addition, the Science Philanthropy Alliance (SPA), created in 2012, has advised high-net-worth donors and foundations on long-term philanthropic investments in basic research in response to governmental cuts in R&D funding (SPA, 2019).

As members of the upper percentiles of wealth in society, high-net-worth donors have been considered to practice “elite philanthropy” (Ostrower, 1995) and have sought to “shape” the causes they support (Schervish, 2005). Examinations of wealthy donors’ giving patterns revealed giving trends favoring the support of elite institutions, such as colleges and universities (Lincoln & Saxton, 2012; Odendahl, 1990; Rosqueta et al., 2011).

Alumni donors have remained a critical segment of potential donors to academic institutions (Boverini, 2006). Roughly 26% of individual donors to higher education were alumni donors, and they gave approximately US$12.15 billion in 2018 (Council for Advancement and Support of Education [CASE], 2019). The alumni of academic institutions have had varied experiences, and their level of satisfaction with their alma maters influences their willingness to support these institutions (Clotfelter, 2003). In regard to major gifts, Taylor (2018) found alumni donors preferred to give major gifts to support student aid, while non-alumni donors preferred to support academic programs. Yet, Leslie and Ramey (1988) found non-alumni donors typically gave to support academic programs as well as programmatic excellence.

The gender of alumni donors is potentially a defining feature of higher education donors, but research in this area has contradictory results. For example, in earlier works by Okunade (1996) and Wunnava and Lauze (2001), male alumni were found to give more than female alums. More recent evidence on the difference between male and female donors’ gifts to higher education shows no statistical difference in giving with respect to gender (Lara & Johnson, 2014). Further research is needed to resolve this discrepancy.

College attendance can serve as a gateway to career paths that provide income to support philanthropic initiatives. The relationship between donors’ occupations and industry sectors has been found to affect the likelihood of donating to academic institutions (Baade & Sundberg, 1996; Holmes, 2009; Monks, 2003; Olsen et al., 1989). In general, individuals working as entrepreneurs are found to have an interest in
supporting topics that support their local communities, such as education (Mickiewicz et al., 2016; Peake et al., 2015; Shaw et al., 2013).

The aforementioned studies broadly consider science philanthropy and higher education. To explore the characteristics of major donors that practice science philanthropy regarding higher education, I aim to answer the following research questions:

**Research Question 1:** What are the differences between STEM and non-STEM major donors’ giving trends?

**Research Question 2:** What are the key characteristics of high-net-worth donors who practice science philanthropy at institutions of higher education?

**Data**

To answer the research questions, I utilize a database of major gift announcements to higher education from 1995 to 2017. I created this database primarily using the Chronicle of Higher Education and the Chronicle of Philanthropy. The 1995 to 2004 data was hand coded because digital versions of these Chronicles were not available at the time of data collection. Next, the collection of 2005 to 2017 gift announcements, which were available online, was automated using web-scraping techniques in the Python programming language. Automated data collection and data cleaning occurred from January to December 2017. Data from the Million Dollar List, published by Indiana University’s Lilly Family School of Philanthropy, was also scraped as an additional source of data and used to verify data from the Chronicles.

The sample of major gifts for analysis consists of 6,815 gift announcements. Major gifts to higher education exhibit cyclical fluctuations that follow national economic trends. Within this sample of major gifts, a range of 200 to nearly 500 major gifts occur per year. Major gifts range from US$1 million to US$600 million. The average major gift is approximately US$10 million. Gifts of US$10 million or more increased in the most recent decade, despite fluctuations in the number of major gifts.

The analysis includes major gifts to STEM and non-STEM. This analysis uses the National Science Foundation’s (NSF) classification of STEM fields. Major gifts to STEM were assigned to the following fields: health and medicine, engineering, life sciences, physical sciences, mathematics and computer sciences, and interdisciplinary STEM (two or more fields of science). Gift categories for non-STEM are based on academic classification categories set by the Voluntary Support of Education (VSE) survey conducted by the CASE. Definitions for gifts reported by the VSE include gifts for student aid, faculty aid, library aid, and athletics. The VSE uses separate categories for gifts provided for unrestricted purposes, endowment, buildings and equipment, and physical plant operations and maintenance; this study classifies such gifts in a catch-all “other” category if the gift does not specify an academic discipline. The “mixed use” gift category does not include gifts to STEM but includes two or more fields of non-STEM academic disciplines. Major gifts with both STEM and non-STEM gift designations (n = 894) were excluded from the sample because these gift announcements do not specify how the funding is divided between the STEM and non-STEM discipline(s).
This results in a set of 1,637 major gifts to STEM and 5,178 major gifts to non-STEM for analysis.

There are 944 academic institutions represented in the database. To account for possible differences between academic institutions, the U.S. Department of Education’s Integrated Postsecondary Education Data System (IPEDS) was used to supplement the database with information about each academic institution. Most institutions receiving major gifts are private institutions (65%). The salient characteristics of the gift recipient institutions include public/private status, student enrollment, location (urban/rural and region), and Carnegie classification.

In total, 6,039 unique donors supported the 944 institutions. The Standard Occupational Classifications (SOC, 2010 version) and the North American Industry Classification System (NAICS, 2012 version) classifications were used to categorize donor occupations and assign industry sectors. A limited set of extrinsic motivators (e.g., gender, married status, occupation, and industry sector) were captured from gift announcements. If not specified, the variable coding was dichotomous (0, 1). Gender was determined by machine learning software for gendered names and was manually verified. The web-scraping method used for the database cannot yet account for donor age and different types of unmarried people, such as older widowed men. An individual’s wealth is not typically publicly available. Therefore, in keeping with the labor economics and sociology literatures, occupation and industry serve as proxies for wealth because these factors are related to an individual’s socioeconomic position (Easton-Brooks & Davis, 2007; Galobardes et al., 2006; King, 1974).

The data set and interpretation of the results are limited to announced major gifts. Still, scholars have analyzed major gift data despite such limitations. Taylor (2018) used quantitative content analysis to understand gift announcement language based on data limited to 150 flagship universities. Osili et al. (2017) used the Million Dollar List to consider temporal, geospatial, and topical trends in giving, but acknowledge that even comprehensive data on announced gifts has several limitations that include the over and under reporting of major gifts. In addition, Murray (2013) broadly addressed private philanthropy to STEM at academic institutions using the NSF’s Science and Engineering Statistics, VSE, and the Foundation Center data that only focused on the top 50 U.S. universities and colleges.

The database produced for this research is intended to help answer empirical questions with greater granularity at the donor and institutional levels. The coded data set is archived at the author’s university. The appendix details efforts to validate the comprehensiveness of the data.

**Method**

The empirical analysis uses the sample of 6,815 major gifts from the database previously discussed. The following linear regression model is estimated first:

$$\log(\text{MajorGift})_{ijt} = \alpha + \beta_1 \text{Donor}_i + \beta_2 \text{College}_j + \text{Time}_t + \epsilon_{ijt}.$$  

(1)
Ordinary least square (OLS) predicts the standard conditional mean relationships between variables. The change in the major gift amount, \( \text{Majorgift}_{ijt} \), is predicted by a vector of donor characteristics, \( \text{Donor}_i \), institutional characteristics, \( \text{College}_{jt} \), and time-fixed effects are included in the analysis to control for variation in time from macro-economic shocks.

The analysis is extended using the following quantile regression model (Koenker & Bassett, 1978):

\[
\text{Quant}_\theta (y_{it} | x_{it}) = x_{it} \beta_\theta.
\]  

(2)

In contrast to OLS, quantile regression can predict relationships throughout the distribution of the outcome variable, including measures of central tendency. Specifically, \( \text{Quant}_\theta (y_{it} | x_{it}) \) represents the \( \theta \)th conditional quantile with respect to \( y_{it} \) given \( x_{it} \). Quantile regression allows for an analysis of the similarity or dissimilarity of coefficients at any point on the distribution of the dependent variable. Intuitively, major gift amounts are different in scale and importance. Outliers are retained in the analysis, as they are accounted for within specific quantiles.

Incorporating the sample in quantiles seeks to avoid bias due to truncation (Heckman, 1979), but this study interprets results conservatively, given the data limitations previously discussed. The standard errors of quantile regression coefficients are estimated by bootstrapping to reduce sensitivity to heteroskedasticity (Rogers, 1993). In the next section, the results are considered in the order of the specified research questions.

**Results**

Table 1 provides summary statistics and \( t \)-test results of the mean differences in donor and institutional characteristics for the full and stratified sample of major gifts of US$1 million or more.

**STEM and Non-STEM Donors’ Giving Trends**

The average major gift for STEM is approximately US$13.4 million, as opposed to an average major gift size of approximately US$9.7 million to non-STEM. However, rural institutions receive smaller gifts for STEM disciplines. The trend of larger major gifts to STEM is present throughout almost all subcategories of major donors, with the exception of donors in the education, health and social services, and manufacturing industries. Notably, 51% of entrepreneurs in the sample support STEM disciplines and entrepreneurs give approximately US$5 million more to STEM than non-STEM disciplines. Major donors that identify as entrepreneurs or executives are most often in the finance, insurance, or the professional services industries.

Major donors’ giving to STEM varies among STEM disciplines, as seen in Table 2 and Figure 1.

As indicated in Table 2, nearly a quarter (24%) of major gifts within the 14 major gift designations are provided to STEM disciplines. Interdisciplinary STEM and the
Table 1. Descriptive Statistics of Full and Stratified Samples of STEM and Non-STEM Major Gifts.

| Independent variables | Full sample | Non-STEM | STEM | Mean diff. |
|-----------------------|-------------|----------|------|------------|
|                       | n           | M (US$ M)| n    | M (US$ M)| n      | M (US$ M) | p value |
| Donor characteristics |             |          |      |            |         |           |         |
| Sample                | 6,815       | 10.60    | 5,178| 9.71       | 1,637   | 13.40      | .00     |
| Female (only)         | 943         | 6.57     | 739  | 6.20       | 204     | 7.91       | .09     |
| Male (only)           | 2,991       | 11.80    | 2,274| 11.00      | 717     | 14.3       | .02     |
| Married/partners      | 2,149       | 10.50    | 1,578| 9.27       | 571     | 13.90      | .00     |
| Anonymous             | 721         | 10.90    | 583  | 10.00      | 138     | 14.00      | .13     |
| Alumni                | 2,521       | 13.40    | 1,860| 13.00      | 661     | 16.00      | .06     |
| Occupation            |             |          |      |            |         |           |         |
| Executive             | 1,859       | 9.31     | 1,446| 9.10       | 413     | 9.97       | .56     |
| Entrepreneur          | 2,889       | 13.70    | 2,050| 12.00      | 839     | 17.00      | .00     |
| Retired               | 1,592       | 9.29     | 1,203| 8.62       | 389     | 11.40      | .16     |
| Industry              |             |          |      |            |         |           |         |
| Arts and recreation   | 191         | 12.70    | 164  | 11.10      | 27      | 22.50      | .14     |
| Education             | 262         | 4.20     | 200  | 4.26       | 62      | 4.00       | .81     |
| Finance and insurance | 728         | 14.70    | 594  | 13.20      | 134     | 21.20      | .01     |
| Health and social services | 258       | 5.64     | 140  | 5.68       | 118     | 5.60       | .94     |
| Manufacturing         | 162         | 19.80    | 110  | 21.10      | 52      | 17.00      | .67     |
| Oil and mining        | 137         | 13.70    | 85   | 10.50      | 52      | 18.80      | .12     |
| Professional science and technology | 463       | 13.10    | 315  | 11.00      | 148     | 17.50      | .08     |
| Management enterprise | 1,435       | 10.20    | 1,116| 8.84       | 319     | 15.00      | .00     |
| Mixed industry        | 1,124       | 10.40    | 823  | 10.10      | 301     | 11.20      | .45     |
| Real estate           | 246         | 14.00    | 198  | 12.10      | 48      | 22.20      | .02     |
| Donor region          |             |          |      |            |         |           |         |
| Northeast             | 1,047       | 13.00    | 793  | 11.50      | 254     | 18.00      | .01     |
| Midwest               | 929         | 7.78     | 684  | 7.27       | 245     | 9.18       | .05     |
| South                 | 1,565       | 8.42     | 1,173| 8.57       | 392     | 7.96       | .69     |
| West                  | 1,128       | 14.80    | 770  | 12.70      | 358     | 19.30      | .01     |
| Institutional characteristics | | | | | | | |
| Private               | 3,805       | 11.80    | 3,017| 10.60      | 788     | 16.30      | .00     |
| Rural                 | 97          | 4.81     | 89   | 4.99       | 8       | 2.74       | .52     |
| Research intensive    | 2,492       | 10.10    | 1,738| 9.53       | 754     | 11.40      | .12     |
| Has a university hospital | 707       | 13.10    | 467  | 11.90      | 240     | 15.30      | .10     |

(continued)
social sciences are most often supported by major gifts within the STEM and non-STEM academic disciplines. However, as demonstrated in Figure 1, interdisciplinary STEM is the highest funded field among the 14 major gift designations, while the social sciences rank below health and medicine and the life sciences.

**Key Characteristics of STEM Donors**

Tables 3 and 4 present quantile regression estimates of the relationships between major donor characteristics and gift amounts across the distribution of major gifts to STEM and non-STEM, respectively.

**Gender and married status.** The results in both Tables 3 and 4 show female and married major donors have negative associations with major gift amount. The negative relationships for both variables become stronger at higher quantiles for STEM and non-STEM major gifts, especially for female donors. Additional wealth and income data for all donors is needed to fully explain such propensities for giving smaller major gifts.
Anonymous giving. A positive relationship between anonymous donors and gift amount is observed for gifts to STEM and non-STEM disciplines at the highest quantiles, except for the 99% quantile. Again, coefficients at the highest quantiles are twice as large for gifts to STEM. This suggests anonymous donors have the capacity to give large gifts and, although the donors are anonymous, have some preference for giving their largest gifts to STEM.

Alumni status. The relationship between alumni status and major gift amount for STEM major gifts contrasts that of non-STEM major gifts. In the case of non-STEM, a positive and significant relationship is observed for alumni status at nearly all quantiles. In contrast, the relationship between alumni status and major gift amount to STEM is typically smaller in magnitude and not significant. This result suggests alumni donors may prefer to support non-STEM disciplines at their alma maters. Non-alumni may be more inclined to support STEM.

Occupation and retirement status. Both executive and entrepreneur occupation statuses have positive associations with gift amount for STEM and non-STEM in the selected quantiles, which suggests these donors have a capacity and willingness to give across the distribution of major gifts. Notably, the relationship between being an entrepreneur and gift amount is positive and statistically significant for the 99th quantile of STEM major gifts only. This finding corresponds with the descriptive finding that entrepreneurs in the sample of major gift givers provide 61% of mega gifts (US$50 million or
### Table 3. Quantile Regressions Results for STEM Major Gift Amount by Donor Characteristics.

| Variables              | Q(10)     | Q(25)     | Q(50)     | Q(75)     | Q(90)     | Q(95)     | Q(99)     |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Female                 | 0.022     | 0.013     | −0.125    | −0.120    | −0.499**  | −0.542**  | −1.084**  |
| (0.690)                | (0.075)   | (0.125)   | (0.112)   | (0.168)   | (0.194)   | (0.263)   |           |
| Married/partners       | −0.001    | −0.007    | −0.159**  | −0.111    | −0.220    | −0.211    | 0.141     |
| (−0.030)               | (0.073)   | (0.090)   | (0.097)   | (0.159)   | (0.169)   | (0.280)   |           |
| Anonymous              | −0.006    | 0.0509    | 0.166     | 0.784**   | 0.909**   | 1.047**   | 0.594     |
| (−0.13)                | (0.141)   | (0.227)   | (0.248)   | (0.318)   | (0.396)   | (0.483)   |           |
| Alumni                 | 0.006     | −0.009    | 0.105     | 0.237**   | 0.173     | 0.221     | −0.026    |
| (0.33)                 | (0.059)   | (0.093)   | (0.086)   | (0.110)   | (0.145)   | (0.298)   |           |
| Executive              | 0.014     | 0.084     | 0.349**   | 0.486**   | 0.578**   | 0.634**   | 0.353     |
| (0.64)                 | (0.086)   | (0.108)   | (0.148)   | (0.211)   | (0.262)   | (0.340)   |           |
| Entrepreneur           | 0.033     | 0.233**   | 0.611**   | 0.711**   | 0.662**   | 0.804**   | 0.728**   |
| (0.81)                 | (0.076)   | (0.105)   | (0.138)   | (0.163)   | (0.257)   | (0.345)   |           |
| Retired                | −0.003    | −0.047    | −0.153    | −0.379**  | −0.226    | 0.350     | 0.384     |
| (−0.15)                | (0.085)   | (0.106)   | (0.130)   | (0.275)   | (0.242)   | (0.316)   |           |
| Arts and recreation    | 0.004     | −0.200    | −0.275    | −0.020    | 0.729     | 1.276     | 0.499     |
| (0.07)                 | (0.158)   | (0.357)   | (0.521)   | (0.933)   | (0.845)   | (0.712)   |           |
| Education              | 0.001     | −0.043    | −0.025    | −0.151    | −0.089    | −0.558    | 0.639     |
| (0.03)                 | (0.135)   | (0.151)   | (0.220)   | (0.265)   | (0.339)   | (0.781)   |           |
| Finance and insurance  | 0.332**   | 0.444**   | 0.463**   | 0.263     | 0.515**   | 0.392*    | 0.155     |
| (2.12)                 | (0.179)   | (0.134)   | (0.189)   | (0.209)   | (0.206)   | (0.420)   |           |
| Health and social services | −0.00910 | −0.120   | −0.237**  | −0.438**  | −0.352    | −0.380    | −0.254    |
| (−0.28)                | (0.0855)  | (0.123)   | (0.145)   | (0.222)   | (0.321)   | (0.362)   |           |
| Manufacturing          | 0.346**   | 0.068     | −0.157    | −0.142    | 0.144     | −0.023    | 0.942     |
| (2.10)                 | (0.136)   | (0.188)   | (0.290)   | (0.382)   | (0.733)   | (0.897)   |           |
| Oil and mining         | 0.183     | 0.412**   | 0.403     | 0.452**   | 0.587*    | 0.396     | 0.0842    |
| (0.61)                 | (0.182)   | (0.276)   | (0.223)   | (0.312)   | (0.359)   | (0.462)   |           |
| Professional services  | 0.015     | −0.019    | 0.176     | 0.284*    | 0.155     | 0.128     | 0.159     |
| (0.410)                | (0.099)   | (0.188)   | (0.155)   | (0.210)   | (0.294)   | (0.413)   |           |
| Real estate            | 0.495**   | 0.418     | 0.711**   | 0.892**   | 0.925**   | 0.997**   | 0.846*    |
| (2.30)                 | (0.286)   | (0.252)   | (0.335)   | (0.348)   | (0.386)   | (0.472)   |           |
| Northeast              | −0.020    | −0.057    | −0.053    | −0.018    | 0.130     | −0.0217   | 0.283     |
| (−0.50)                | (0.130)   | (0.162)   | (0.132)   | (0.210)   | (0.251)   | (0.424)   |           |
| South                  | −0.001    | −0.022    | −0.116    | −0.068    | −0.057    | −0.119    | −0.209    |
| (−0.06)                | (0.085)   | (0.119)   | (0.127)   | (0.182)   | (0.205)   | (0.319)   |           |
| West                   | 0.015     | 0.142     | 0.056     | 0.181     | 0.074     | 0.132     | −0.522    |
| (0.52)                 | (0.106)   | (0.136)   | (0.143)   | (0.185)   | (0.262)   | (0.451)   |           |
| Constant               | 54.82**   | 6.977     | 0.924     | 5.008     | 5.369     | 42.24**   | 108.1**   |
| (7.36)                 | (9.442)   | (15.13)   | (13.00)   | (19.41)   | (25.28)   | (42.81)   |           |
| Time effects           | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       |
| Institutional effects  | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       |
| Observations           | 1,637     | 1,637     | 1,637     | 1,637     | 1,637     | 1,637     | 1,637     |

Note. Quantile regressions report results for the 10th, 25th, 50th, 75th, 90th, 95th, and 99th quantiles. Time- and institution-fixed effects included in regression specifications. STEM = science, technology, engineering, and math.

*p < .1. **p < .05. ***p < .01.
### Table 4. Quantile Regressions Results for Non-STEM Major Gift Amount by Donor Characteristics.

| Variables                        | Q(10)  | Q(25)  | Q(50)  | Q(75)  | Q(90)  | Q(95)  | Q(99)  |
|----------------------------------|--------|--------|--------|--------|--------|--------|--------|
| Female                           | 0.000  | -0.016 | -0.063 | -0.179**| -0.218**| -0.402**| -0.424*|
|                                  | (0.15) | (0.034) | (0.054) | (0.079) | (0.095) | (0.137) | (0.249) |
| Married/partners                 | -0.003 | -0.048 | -0.110**| -0.104 | -0.183**| -0.287**| -0.397**|
|                                  | (-1.61)| (0.037) | (0.052) | (0.071) | (0.081) | (0.122) | (0.188) |
| Anonymous                        | -0.001 | 0.017  | 0.206*  | 0.326**| 0.342**| 0.517**| 0.366  |
|                                  | (-0.74)| (0.042) | (0.108) | (0.106) | (0.144) | (0.190) | (0.278) |
| Alumni                           | -0.004**| 0.054  | 0.237**| 0.390**| 0.458**| 0.377**| 0.170  |
|                                  | (-2.29)| (0.038) | (0.053) | (0.062) | (0.067) | (0.096) | (0.161) |
| Executive                        | 0.000  | 0.015  | 0.154**| 0.233**| 0.289**| 0.389**| 0.279  |
|                                  | (0.34) | (0.031) | (0.067) | (0.075) | (0.096) | (0.122) | (0.255) |
| Entrepreneur                     | 0.003* | 0.168**| 0.356**| 0.399**| 0.491**| 0.506**| 0.355  |
|                                  | (1.72) | (0.040) | (0.061) | (0.076) | (0.089) | (0.130) | (0.249) |
| Retired                          | -0.002 | -0.0290| -0.048 | -0.196**| -0.230**| -0.240**| -0.141  |
|                                  | (-1.30)| (0.031) | (0.068) | (0.077) | (0.087) | (0.122) | (0.280) |
| Arts and recreation              | -0.000 | 0.021  | 0.126  | -0.036 | 0.312  | 0.407  | 0.148  |
|                                  | (-0.18)| (0.080) | (0.114) | (0.181) | (0.208) | (0.214) | (0.627) |
| Education                        | 0.001  | -0.086 | -0.122 | -0.276**| -0.315**| -0.343**| -0.743**|
|                                  | (0.31) | (0.052) | (0.085) | (0.107) | (0.133) | (0.156) | (0.269) |
| Finance and insurance            | 0.0148 | 0.274**| 0.184**| 0.196* | 0.173* | 0.169  | 0.259  |
|                                  | (0.35) | (0.073) | (0.072) | (0.113) | (0.095) | (0.138) | (0.324) |
| Health and social services       | -0.005 | -0.057 | 0.129  | 0.006  | -0.054 | -0.032 | -0.531*|
|                                  | (-1.24)| (0.097) | (0.134) | (0.135) | (0.177) | (0.199) | (0.307) |
| Manufacturing                    | -0.007 | 0.148  | 0.341**| 0.250  | 0.654* | 0.921**| 0.491* |
|                                  | (0.06) | (0.143) | (0.164) | (0.256) | (0.374) | (0.292) | (0.283) |
| Oil and mining                   | 0.003  | 0.252  | 0.232* | 0.191  | -0.015 | -0.215 | -0.090 |
|                                  | (0.03) | (0.225) | (0.121) | (0.159) | (0.150) | (0.294) | (0.400) |
| Professional services            | 0.001  | 0.035  | -0.032 | -0.031 | 0.077  | 0.071  | -0.018 |
|                                  | (0.71) | (0.049) | (0.084) | (0.129) | (0.120) | (0.188) | (0.337) |
| Real estate                      | -0.005 | 0.118  | 0.066  | -0.015 | 0.105  | 0.376  | 0.356  |
|                                  | (-0.49)| (0.130) | (0.086) | (0.118) | (0.210) | (0.355) | (0.332) |
| Northeast                        | -0.001 | -0.086*| -0.195**| -0.248*| -0.250**| -0.195  | 0.469   |
|                                  | (-0.61)| (0.048) | (0.068) | (0.083) | (0.124) | (0.144) | (0.293) |
| South                            | 0.000  | 0.008  | 0.017  | -0.094 | -0.295*| -0.230*| -0.244 |
|                                  | (0.43) | (0.034) | (0.061) | (0.088) | (0.081) | (0.119) | (0.256) |
| West                             | -0.002 | 0.005  | -0.138*| -0.061 | -0.103 | -0.041 | 0.333  |
|                                  | (-0.93)| (0.048) | (0.076) | (0.104) | (0.112) | (0.150) | (0.276) |
| Constant                         | 60.89**| 14.79**| -4.786 | 3.521  | 12.16  | -1.951 | -44.63 |
|                                  | (135.48)| (5.527) | (7.608) | (9.247) | (11.49) | (15.42) | (28.28) |
| Time effects                     | Yes    | Yes    | Yes    | Yes    | Yes    | Yes    | Yes    |
| Institutional effects            | Yes    | Yes    | Yes    | Yes    | Yes    | Yes    | Yes    |
| Observations                     | 5,178  | 5,178  | 5,178  | 5,178  | 5,178  | 5,178  | 5,178  |

Note. Quantile regressions report results for the 10th, 25th, 50th, 75th, 90th, 95th, and 99th quantiles. Time- and institution-fixed effects included in regression specifications. STEM = science, technology, engineering, and math.

* p < .1. ** p < .05. *** p < .01.
However, in contrast to working major donors, retired donors are consistently associated with negative giving trends for STEM and non-STEM major gifts throughout the selected quantiles.

**Industry sectors.** The relationship between industry sector and major gift amount varies depending on industry sector. Quantile regression reveals a positive relationship between working in the finance and insurance industry sector and gift amount that is consistent and statistically significant for STEM and non-STEM major gifts. On the contrary, this trend for the health and social services sector shows a consistently negative relationship with gift amount.

The association between working in the real estate sector and gift amount for non-STEM major gifts has inconsistent coefficient signs but is not significant at any quantile. In contrast, this relationship is positive and significant at all the specified quantiles of STEM major gifts, except for the 25th quantile. It is unclear why the real estate sector has such a contrary trend in the donor groups. Future research might include deeper investigations of these industry differences.

**Donor region.** The Midwest was the reference group for donors’ regional locations in the quantile regressions. In regard to STEM and non-STEM major gifts, negative relationships are observed for the northeastern, western, and southern regional locations of donors for all the selected quantiles. However, these relationships are consistently not significant for STEM major gifts.

**Additional Specifications**

Table 5 presents an additional robustness check of the quantile regression models. The first column of Table 5 provides the full-sample OLS regression. The last column of Table 5 provides OLS results for the stratified samples of major gifts for STEM and non-STEM. The differences in the two stratified models are also tested simultaneously and confirmed to be statistically different.

The findings of the quantile regressions for STEM major gifts hold, with the exception of the regressions for the medical and social sciences. Quantile regression findings also hold when the model is limited to include fewer industry categories. In addition, interquantile regressions were conducted to understand the differences in quantiles specific to donors’ characteristics for STEM and non-STEM donors. Significant differences in the specified quantiles were observed across the characteristics of donors. Finally, the results of the ordered logistic regression, using the number of gifts as the dependent variable, are also robust.

**Limitations**

It is not possible to know the specific causal role of the predictor variables considered. Given the nature of the data, some donor groups may be lost within other donor groups.
For example, the giving participation of some single women in this sample of major donors may be hidden within the anonymous donor category, as single women have a higher likelihood of giving anonymously (Kamas et al., 2008). In addition, married/partnered major donors represent only 32% of donors in the sample of major gifts used for this analysis. This proportion of married/partnered donors who give to charity is lower than reported figures from prior studies (Holmes, 2009; Monks, 2003; Okunade & Berl, 1997, U.S. Trust & Indiana University–Purdue University Indianapolis, 2016). This is an indication that information on donors’ married/partnered status may not be consistently announced. Efforts were made to reconfirm donor information using the aforementioned sources and systematic online searches for additional donor information.

Discussion and Conclusion

Scholars of philanthropy have taken a closer look at the specific areas that individual donors, in general, choose to support, such as giving to women’s and girls’ issues (Dale et al., 2018) and international causes (Casale & Baumann, 2015). However, the findings of this study are unique to high-net-worth donors, specifically their support of academic STEM fields. This study has five key findings.
First, this work highlights the rarity of major gifts to fund academic STEM but finds that, on average, major gifts to STEM are larger than major gifts to non-STEM academic disciplines. This trend may signal larger gifts being given to support transformational philanthropy (Osili & Ackerman, 2013; Strickland, 2007). For example, the sample of major gifts is inclusive of gifts to establish scientific research centers and institutes that have grand missions, such as Dana and David Dornsife’s US$8 million gift in 2003 to create a Cognitive Neuroscience Imaging Center at the University of Southern California.

As depicted in Figure 1, the top three disciplines receiving the most philanthropic dollars are all STEM disciplines. Interdisciplinary science received the most and the largest major gifts. This is an important finding, as interdisciplinary science may help to propel innovation to address complex problems (Lyall et al., 2013; Rhoten & Parker, 2004). Murray (2013) found that interdisciplinary science is a highly funded STEM discipline, but philanthropic funders’ preference for applied medical research yielded more than 57% of gifts to STEM. In addition, Murray found that the life sciences are one of the least supported fields of STEM, while this study finds the life sciences to be a top-funded academic discipline. This contrast may be due to this study broadly considering donor support of STEM disciplines and not just STEM research.

An analysis of industry and occupational trends between STEM and non-STEM donors led to the third major finding, which is that there exists a higher prevalence of entrepreneurs among STEM donors than among non-STEM donors. This trend is important, as it corresponds with entrepreneurs’ philanthropic activities and objectives becoming more relevant to philanthropy (Shaw et al., 2013). The “new donor” is thought to be inclusive of donors with an entrepreneurial mind-set toward philanthropy, such as high-tech entrepreneurs, social entrepreneurs, and engaged grant makers or investors (Wagner, 2002). Psychosocial motives may drive wealthy entrepreneurs to be philanthropic toward education (Coombs et al., 2008). In addition, the philanthropic activities of self-made entrepreneurs (Schervish et al., 2001; Shaw et al., 2013) and individuals who inherited wealth (Schervish, 2000) may also differ in giving, in general, and to STEM specifically. Further research is needed to understand how entrepreneurs’ distinctions in wealth affect giving, especially as findings suggest entrepreneurial status matters at the highest quantiles of STEM major gifts.

Fourth, approximately 40% of STEM donors in this study are alumni of the recipient institution. This proportion is higher than the proportion of alumni giving to higher education (20% or more depending on the institutional comparison group) reported by the VSE survey (CASE, 2018). In contrast, Taylor (2018) reviewed gift announcements to public flagship universities and found that 55% of major gift donors are alumni and most often support student scholarships. In the case of STEM, a fundraiser might regard 40% of STEM donors being alumni as a signal that alumni donors are a narrower pool of potential STEM donors. In contrast, the positive and consistent relationship between alumni status and major gift amount for non-STEM gifts may signal a broader alumni donor pool for such academic disciplines.

Finally, the findings demonstrate STEM donors are less likely to be alumni of the institutions they support and more likely to be entrepreneurs. This characterization
presents an opportunity for university fundraisers to further study this donor group, especially as this donor group offers preferential support of STEM disciplines, which may pose a challenge for spreading the wealth among the STEM fields. Irrespective of a donor’s gift preference, the majority of STEM and non-STEM donors, 82% and 84%, respectively, gave only one announced major gift between 1995 and 2017, meaning major donors to academic STEM are unlikely to surpass the federal government as the dominant funding source for academic science.

Individual donors have the potential to help fill science funding gaps, especially for riskier science, that industry and government are unlikely to fill (Murray, 2013). The process of attracting major donors to support academic STEM may be better understood when the characteristics of these donors are critically analyzed. How academic institutions leverage major donors as an alternative source of funding for STEM disciplines is likely to be institution-specific, but the uncovered distinctions between STEM and non-STEM donors can inform institutional fundraising efforts.

Appendix

Data Verification

The Chronicle of Higher Education and the Chronicle of Philanthropy were contacted to verify their data collection methodology. These publications, which are under the same parent company, collect large amounts of media-based data on major gifts. National variations within gift announcements exist, as reports of major gifts compete with other topics for news coverage.

To check data quality, I attempted to match gift announcement data from my database to the VSE’s top three annual gifts from living individual donors and donor bequests from 1995 to 2017. Matching efforts rely on gift amount, institution name, and academic year. Low rates of data matching, less than 50%, are observed because the VSE survey does not provide details about donor characteristics and the intended purpose of specific gifts, and the VSE only reports paid gift amounts. Typically, gift announcements make no mention of how and when a donor pays off the publicized gift amount. I am unable to correct for this missing data. Furthermore, the VSE survey does not indicate whether a major gift was ever announced. For these reasons, I attempted subanalyses of the top 10 public and top 10 private universities, as ranked by the U.S. News and World Report, but this also yielded low matching rates for the reasons discussed above. The full list of public and private universities is available upon request.

To further strengthen my understanding of the comprehensiveness of the data, I consulted with four seasoned development (fundraising) officers who offered insight into academic institutions incentives to announce major gifts, when possible, as a sign of their quality. The development officers’ statements are consistent with the literature on institutions’ inclination to announce the receipt of a gift (Andreoni & Petrie, 2004; Vesterlund, 2003; Yildirim, 2006). This further suggests the database is indeed likely to capture a large proportion of major gifts to institutions that received large gifts and
announced large gifts, as captured by media sources. Given the nature of major gift announcements, the study estimates are interpreted conservatively.

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