Endowment Spending Rules*

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I. Introduction

We study historical endowment spending by colleges in the U.S., focusing on how those institutions respond to fluctuations in the size of their endowment. Using data reported by private, non-profit colleges and universities (IRS 990 tax filings, including Schedule D) we explore spending from endowments and the extent to which institutions follow specific rules or exercise greater discretion. Our data allow us to estimate the spending rules followed by institutions and examine deviations from these rules and what might explain them. Institutions can deviate from their spending rules by distributing an amount from the endowment that differs from the amount called for by their rule. These differences may result in greater or less smoothing than the rule implies and may also be asymmetric in response to increases and decreases in returns or to other variables. It is also the case that distributing resources from the endowment to units on campus may not actually lead to increased spending, because these units may not actually spend them but accumulate them as reserves, or these distributions may substitute for otherwise unrestricted funds, which can then be saved. Actual spending from the endowment depends on this as well as the amount distributed.

The IRS 990 data allows us to gain insight into the importance of this behavior by examining the behavior of discretionary reinvestment in the endowment in the form of funds functioning as endowment, also known as quasi-endowment. We estimate the spending rules of institutions looking at actual distributions but then also take into account funds returning to the endowment in the form of funds functioning as endowment (FFE), to get an estimate of "net spending" from the endowment over time. By netting out changes in the endowment in the form of funds functioning as endowment, we can examine the true net spending from the endowment, with the change in funds functioning affecting the actual distribution from the endowment.

Our paper is distinguished from previous studies of endowment spending both because of the nature and time period of our analysis. Previous studies (such as K. Brown and Tiu (2013), J. Brown et al. (2014), and Bulman (2022)) primarily utilized a combination of IPEDS and NACUBO ("National Association of College and University Business Officers") survey data. The NACUBO data are self-reported and do not include all institutions with endowments, although both private and public institutions participate. By rule, our data is comprehensive and

since it consists of official tax filings, it is presumably more accurate than the survey data compiled by NACUBO. Recent papers by Dehiya and Yermack (2021) and Lo, Matveyev, and Zeume (2022) use 990 filings to analyze returns and spending for a broader set of non-profit organizations but do not focus on colleges or other subgroups of those organizations.

Our paper is distinct from two other active strains of the literature in objective as our primary goal is to use tax filings to reconstruct the spending rules used by universities, and to examine whether these rules actually lead to spending. One other set of papers studies university asset allocation with an eye towards assessing whether they are choosing optimal risk levels in their investments (see for example Dimmock (2012), Blanchett (2014), Gilbert and Hrdlicka (2015), Ang, Ayala, and Goetzmann (2018), Campbell and Sigalov (2021), Cejnek, Franz, and Stoughton (2023)). Similarly, Filosa (2023) considers endowment levels and spending relative to university debt levels. A second set of papers considers the implications of sustainability on optimal spending from an endowment (D. Brown and Scholz (2019), Dybvig and Qin (2021), Campbell and Martin (2023)). Our paper is mostly closely related to Halem, Lo, Matveyev, and Quraishi (2022), who assess the interaction between stated spending rules and current asset allocations for Harvard, MIT, Stanford, and Yale and project the trajectories of their endowment levels across a variety of different scenarios.[1]

Our paper makes the following contributions to the literature. Anecdotally, many faculty appear to have a poor understanding of both what is possible (e.g. restricted vs. unrestricted spending) and what the long-term drawbacks are to increased endowment spending. On the other hand, institutions often lack transparency in the manner in which they spend their endowment, even when they state an explicit endowment spending rule. Money is fungible, and endowment spending nominally directed toward financial aid may not functionally be spent on that category if money from a different institutional source is reduced. In order to shed some light on the above questions, we first empirically estimate the spending rules for each school in our sample. Using a small set of assumptions and a simple empirical model, we are able to closely (within 10%) approximate the spending rules of 80 percent of the sample. We examine deviations in

[1] Cejnek,et al. (2014) provides a broader survey of past research on university endowments, while Chambers, Dimson, and Kaffe (2020) studies endowment spending of 12 institutions over a longer period of 75 years.

distributions from the estimated spending rules, to see if there are systematic changes in distributions that shed light on the actual management of endowment spending. Finally, we also examine the impact of institutions investing in quasi-endowment or funds functioning as endowment as a way of estimating "net spending" from endowments, netting out from distributions any reinvestment in the endowment through funds functioning as endowment, which is essentially an offset to the distribution resulting from the original spending rule.

The paper proceeds as follows. Section II provides formal definitions and conceptual background on university endowments and endowment spending. Section III describes the data and the sample of institutions that we study. Section IV provides descriptive statistics. Section V analyzes the properties of the spending rules adopted by many colleges. Section VI presents the results of simulations designed to reverse engineer the specific spending rules utilized by each of the colleges. Section VII discusses the relationship between changes in funds functioning as endowment and the spending rules of institutions, to examine the actual net spending from the endowment. Section VII also examines the relationship between endowment distributions and spending in the operating budget on several categories of expenditures. Section VIII analyzes changes in different types of spending over time by these institutions. Section IX concludes.

II. Conceptual Discussion of Endowments

Endowments consist of restricted and unrestricted funds. The restricted portion usually comprises about two-thirds of the entire endowment and can only be spent for predesignated purposes. From the institution's perspective, unrestricted funds are the most valuable, as they can be allocated to the areas of greatest need. However, money is fungible, and restricted funds can often replace/free up other sources of funding. For instance, a newly endowed faculty line can replace a planned future additional line to a given department (or could replace a retiring faculty member whose salary was paid from the general fund).

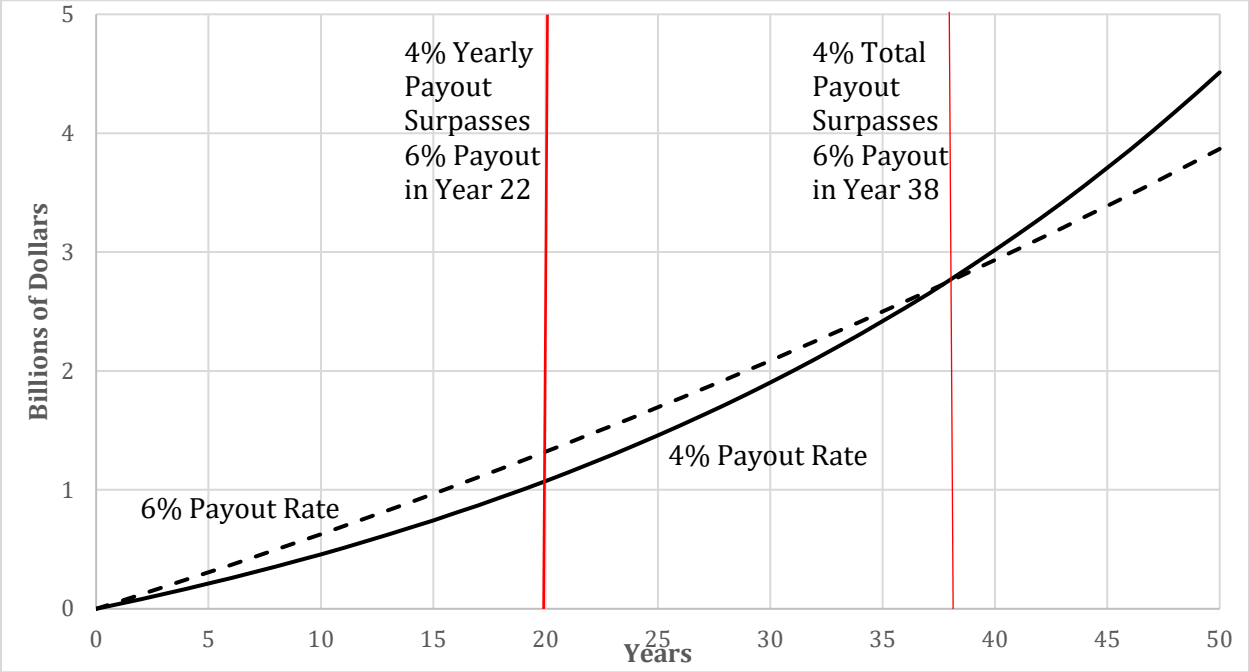
At the core, an endowment brings value to an institution in two main ways. First, the strategic endowment spending can provide insurance. Since many institutions are heavily dependent on tuition to fund operations, an unexpected drop in enrollment could necessitate layoffs even if that decline is anticipated to be transitory. One potential way that Trustees could use the endowment then would be to distribute more during bad times but distribute less during good times, thus mitigating the need for layoffs in response to revenue declines. It is tricky to enact this type of strategic spending because investment returns can fluctuate considerably from year to year, and further that negative shocks may pertain to both tuition revenues and investment returns. On the other hand, it is no secret that academic budgets can become bloated over time. An alternative approach is to use downturns as a way to right-size budgets, which might be termed the "never waste a good crisis" strategy. (J. Brown and Weisbenner, 2014)

Second, the endowment can fund projects that advance the mission of the school. A challenge is for a university to determine whether to use endowment funds in the present or to use the endowment as a savings vehicle to promote future spending opportunities. These options are in conflict because spending an additional dollar today means that this dollar and its investment return cannot be spent on future students.

Figure 1 compares undiscounted cumulative expenditures for a present-oriented (4% payout) and a future-oriented spending rule (6% payout rate) for a hypothetical institution with a $1 billion endowment and 7 percent annual return on investments. Although spending is initially higher with the higher yearly payout rule, the alternative lower payout increases the ongoing endowment balance. The vertical bars represent two key points in time where the lower rate yields higher payouts than the higher one. First, in year 22, annual endowment spending with

the 4 percent rule exceeds that of the 6 percent rule (as additional investment returns now outweigh the higher proportional spending). Second, in year 38, cumulative lifetime spending from the endowment with the 4 percent rule exceeds that from the 6 percent rule. This highlights a central tension that Trustee Boards face.

Figure 1: Total Endowment Spending for a Hypothetical Institution



Spending rules only explain a small part of the evolution of endowments over time. They are designed to sustain the real value of endowment gifts, so that the activity to which the gift is restricted can be supported financially in perpetuity, but endowment spending accounts for only a small part of total institutional spending. To the extent that growth in the total endowment is the outcome of an institution's maximizing some objective function over time, the endowment needs to be evaluated within the overall finances of the institution.

III. Data and the Sample

Our sample period begins in 2008-2009, which is the first year that colleges filed Schedule D, as part of their 990 tax returns and continues to 2021-2022, the most recent fiscal year for which colleges have filed returns. Schedule D is essential to our analysis because it reports endowment levels along with revenues or additions to the endowment (1. investment returns; 2. contributions to the endowment) and distributions or costs (3. grants and scholarships; 4. administrative costs; 5. other costs) in a cleaner fashion than in previous 990 returns. This sample period is of interest because it includes a prolonged positive period from the end of the Great Recession to the start of the pandemic as well as the unexpectedly positive year for stock market investment returns during the first full fiscal year of the pandemic in 2020-21. At the same time, this sample period has limitations, and in particular, we are unable to study the reaction of colleges to downturns (the focus of J. Brown and Weisbenner (2014)), as the two primary negative years for endowment returns occurred during the first (2008-09) and last (2021-22) years of this period.

Our sample of four-year institutions includes the 187 private, non-profit colleges and universities with highest endowments per full-time equivalent (FTE) student in 2021. We excluded public institutions because they are not required to file 990 tax returns. We also excluded three institutions that would otherwise qualify for our sample: (1) Salem College because its returns combine the financial information for a college and an associated high school; (2-3) Cedarville University and Earlham College, whose 990 forms include one year with a large negative value for "Other expenditures", as that entry disrupts our ability to assess their spending rules.

College 990 filings are public information and are collected and made available by ProPublica and other organizations. We used data files compiled by the Federal Reserve Bank for nine of the fourteen years in the sample period and filled out the data set by manual entry of data found on the ProPublica website. We checked the data for all anomalies and corrected a number of errors in either initial data entry or in the original 990 files.[2] Our data includes 14 years of 990

[2] In many cases, an error in the initial data entry by a college was straightforward to correct because the college fixed the error in reports provided in subsequent years. As shown in the Schedule D provided for Amherst, each filing provides information from the current year and four most recent years. Except in cases of obvious mistakes, we use the report for a given year for each year's filing rather than the information provided for that year in subsequent 990 filings, primarily because the Federal Reserve Bank files only contain entries for the current year.

filings for each of the colleges in the sample with the single exception of the filing for one year for Illinois Wesleyan where the publicly available version of the 990 file is incomplete. We added data compiled from the Integrated Postsecondary Education Data System (IPEDS) for these 187 institutions for this sample period.

Figure 2 presents a snapshot of the relevant portion of the Amherst College 2021-2022 Schedule D form. The entries in lines 1b and 1c represent inflows or endowment revenues. The entries in lines 1d, 1e, and 1f represent distributions or endowment payouts. By accounting rule, the balance at the end of the year is determined by initial balance adjusted for the difference of yearly revenues and distributions or payouts:

End Balance (1g) = Starting Balance (1a) + Inflows (1b, 1c) – Distributions (1d, 1e, 1f)

Figure 2: 2021-2022 Schedule D from 990 Filing from Amherst College

Part V Endowment Funds.
Complete if the organization answered "Yes" on Form 990, Part IV, line 10.

	(a) Current year	(b) Prior year	(c) Two years back	(d) Three years back	(e) Four years back
1a Beginning of year balance	4,300,531,130	2,920,494,006	2,834,560,524	2,730,457,710	2,582,167,326
b Contributions	27,637,614	22,710,434	40,108,241	36,374,365	9,539,445
c Net investment earnings, gains, and losses	-366,559,937	1,558,216,605	241,101,788	266,451,383	318,881,870
d Grants or scholarships	31,438,697	29,170,697	29,175,071	27,017,069	25,705,466
e Other expenditures for facilities and programs	123,858,319	107,047,350	113,544,782	126,559,026	113,534,651
f Administrative expenses	47,499,119	64,671,868	52,556,694	45,146,839	40,890,814
g End of year balance	3,758,812,672	4,300,531,130	2,920,494,006	2,834,560,524	2,730,457,710

2 Provide the estimated percentage of the current year end balance (line 1g, column (a)) held as:

a Board designated or quasi-endowment ▶ 25.680

b Permanent endowment ▶ 74.320

c Term endowment ▶

The percentages on lines 2a, 2b, and 2c should equal 100%.

Line 2a in Schedule D reports the current percentage of the endowment designated as "Funds Functioning as Endowment", which is sometimes described as "quasi-endowment". This is essentially another version of savings; increases in the corresponding value from year to year in this category may be indicative of hoarding, whereby the college payout or other sources of revenue, such as a surplus in the operating budget, are saved and invested in the endowment at the discretion of the Board of Trustees. We divide the sample of colleges into five groups based on their initial endowment values at the start of the sample period, July 1, 2008. Table 1 provides the criteria for each of these groups as well as a selection of colleges from each group.

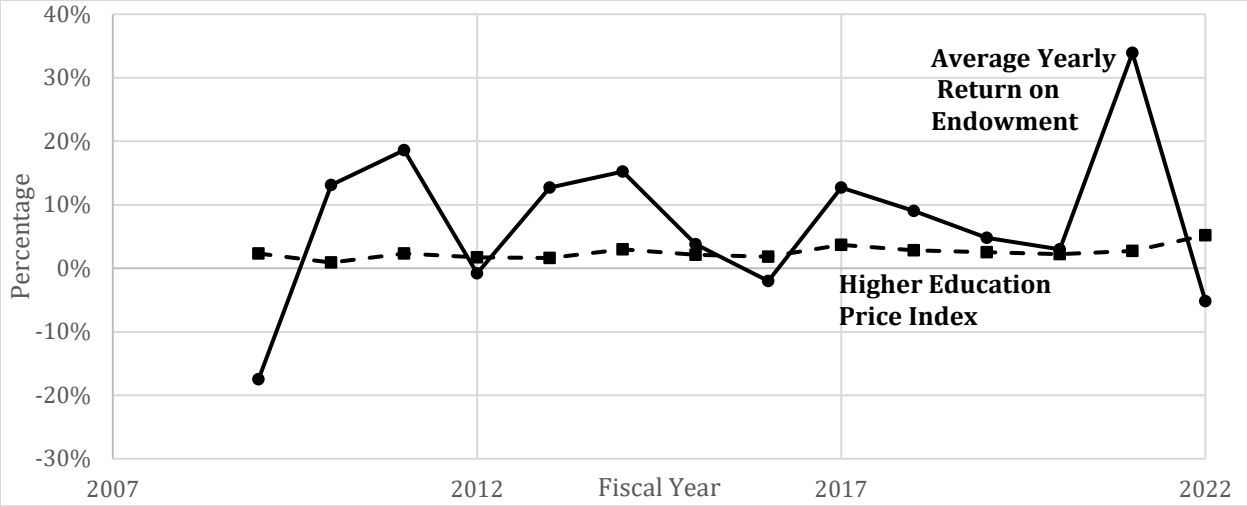
Table 1: Subgroups of Colleges by Initial Endowment Levels

GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5
Ivy League	Amherst	Bowdoin	American	Belmont
Chicago	Baylor	Brandeis	Babson	Bennington
Duke	Boston College	Carleton	Bates	Univ. of Dallas
Emory	Boston U	Davidson	Fordham	Elon
Johns Hopkins	Cal Tech	Haverford	Franklin Marshall	Emerson
MIT	Carnegie Mellon	Macalester	Gonzaga	Endicott
Northwestern	Case Western	Middlebury	Lewis and Clark	Evansville
Notre Dame	George Wash.	Northeastern	Loyola Marymt.	Hampshire
NYU	Smith	Oberlin	Marquette	Knox
Pittsburgh	Swarthmore	RPI	Providence	Lake Forest
Rice	TCU	Syracuse	Quinnipiac	Millsaps
Stanford	Tufts	Vanderbilt	Reed	Mt. St. Mary's
USC	Tulane	Vassar	St. Lawrence	Sarah Lawrence
Vanderbilt	Wellesley	Wake Forest	Tulsa	Thomas Aquinas
Washington U	Williams	Wesleyan	Villanova	Westmont
22 colleges	**24 colleges**	**33 colleges**	**78 colleges**	**29 colleges**
START BALANCE	START BALANCE	START BALANCE	START BALANCE	START BALANCE
2 x 10^9 or more	1 x 10^9 to 2 x 10^9	5 x 10^8 to 1 x 10^9	1 x 10^8 to 5 x 10^8	0 to 10^8

IV. Descriptive Statistics for Endowment Returns

The fifteen or so years since the end of the Great Recession have provided an unusual period of nearly consistently positive stock returns and minimal inflation. As suggested by Ehrenberg (2000), Figure 3 compares yearly endowment returns to the percentage change in the Higher Education Price Index (HEPI) compiled by the Commonfund Institute during the sample period.

Figure 3: Endowment Returns and Inflation: 2008-09 to 2021-22



As shown in Table 2, the universities in our sample accrued average endowment revenues at a yearly rate of 10.5%, which was well more than their yearly average endowment spending of 5.1%. There was relatively little difference in nominal yearly endowment growth by size of initial endowment: increases in endowment for colleges in each group outpaced increases in the HEPI by at least an average of 2.35 percentage points per year over the sample period.

Table 2: Average Yearly Revenues and Distributions as % of Endowment

	All	Group 1	Group 2	Group 3	Group 4	Group 5
Invest Return	7.28%	8.74%	7.77%	7.43%	7.04%	6.23%
Contributions	3.27%	3.00%	2.32%	2.46%	3.14%	5.54%
Grants	1.60%	1.03%	1.35%	1.79%	1.79%	1.54%
Other Cost	3.16%	3.82%	3.50%	3.02%	2.87%	3.35%
Admin Cost	0.30%	0.27%	0.35%	0.32%	0.35%	0.14%
Revenues	10.54%	11.74%	10.09%	9.89%	10.18%	11.77%
Total Cost	5.07%	5.12%	5.19%	5.13%	5.00%	5.03%
Change in HEPI	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%

Table 3 divides the sample period into four subperiods. During the first four years from 2008-09 to 2011-12, these colleges were still recovering from the Great Recession; with most using the initial period of stock market recovery to recoup losses from 2008-09. In the next two sets of four years, colleges in each group expanded their endowments despite somewhat lower return years in 2015-16 and 2019-20. Finally, colleges in each group benefited from the extraordinary positive stock market year of 2020-21 though this was followed by average losses in 2021-22.

Table 3: Cumulative Change in Endowment by Time Period

	Group 1	Group 2	Group 3	Group 4	Group 5
2008-09 to 2012-13	-1.75%	-4.72%	-3.91%	-2.13%	10.33%
2012-13 to 2016-17	25.74%	18.12%	20.73%	25.07%	43.81%
2016-17 to 2020-21	32.67%	22.14%	20.18%	20.43%	28.98%
2020-21 to 2021-22	31.20%	29.70%	24.92%	22.20%	12.48%
July 2008 to June 2022	116.12%	82.39%	75.98%	84.31%	134.25%
Initial Balance 2009	$8.17 B (8.09 B)	$1.38 B (303 M)	$676 M (101 M)	$248 M (94.4 M)	$51.4 M (26.9 M)
End Balance 2022	$16.2 B (12.9 B)	$2.51 B (781 M)	$1.19 B (339 M)	$451 M (224 M)	$105 M (81.1 M)
# of Institutions	22	24	34	78	29

In all, on a nominal basis, the colleges in each group doubled or nearly doubled their average endowment levels during the sample period. Figure 4 highlights the extraordinary nature of the conditions in 2021-22. After the colleges in Group 1 increased their endowment levels by an average of 60% from January 2008 to December 2020, they further increased their endowments by an average of nearly 40% in 2020-2021. There was considerable positive correlation between endowment size and investment return in that year: colleges in Group 1 had investment gains of more than 40% of endowment levels by comparison to investment gains of 33% to 38% for colleges in Groups 2 to 4 and 25% for colleges in Group 5 for that year..

Figure 4: Endowment Changes by Group and Year

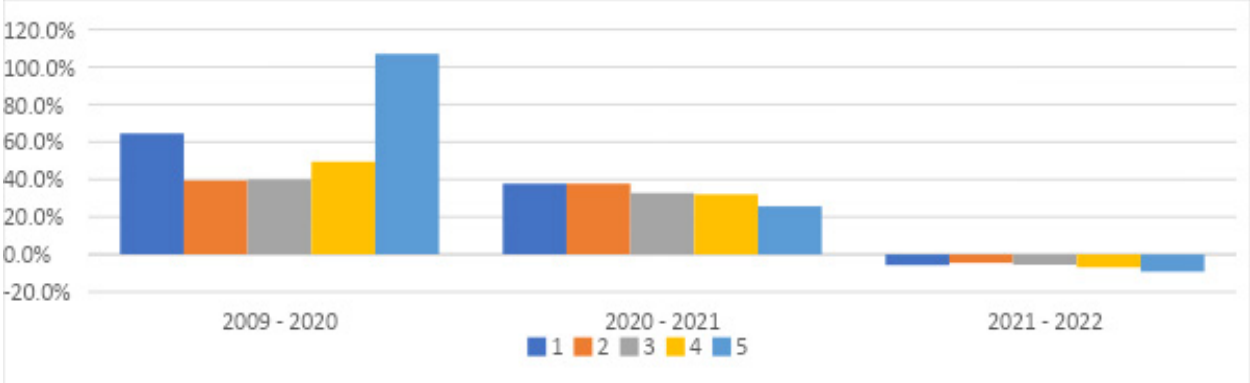
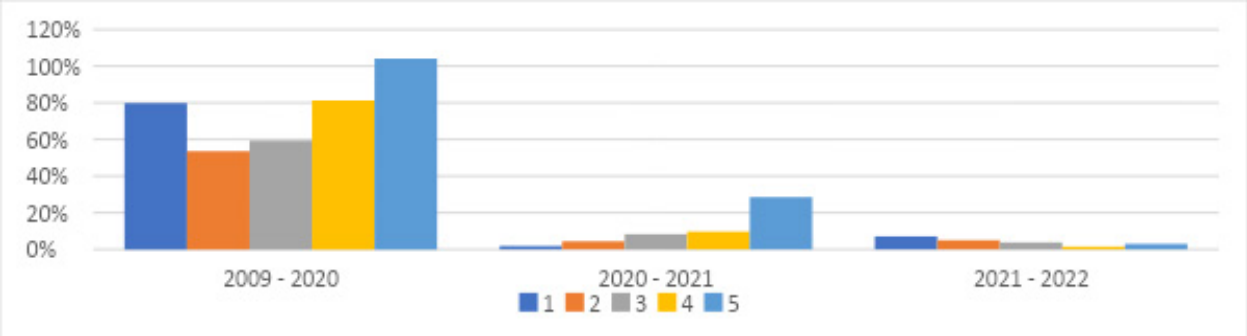


Figure 5 compares the change in distributions from the endowments reported in Schedule D, once again highlighting the last two years of the sample period.[3] On a percentage basis, the institutions in the sample increased their endowment distributions at a faster rate than inflation for 2008-09 to 2019-20. With the exception of colleges in Group 5, the colleges in the sample increased distributions per year by an average of nearly 50% during the first twelve years of the sample from 2008-09 to 2019-20 above inflation.

The colleges in Group 5 increased distributions by the greatest proportional amount in 2020-21, the unusually positive year for investments, then had a much lower rate of increase the following year, which was an unusually negative year for investments. By contrast, colleges in Group 1 had little change in 2020-21 but a substantial increase of 7.1% in Schedule D distributions in 2021-22. These findings suggest that the colleges in Group 5 respond quickly whereas colleges in Group 1 respond slowly but fairly decisively to changes in economic conditions.

[3] We exclude Williamette University (in group 4) from the computations for Figure 5 SHOULD BE FIGURE 5 because it reported substantial grants for most years and 0 expenditures on grants for 2020-2021.

Figure 5: Changes in Reported Distributions (Schedule D) by Group and Year



V. Spending Rules and Their Properties

Endowment spending rules provide specific guidance about the distribution (payout) of revenues over time from the endowment. Sedlacek and Jarvis (2010) identify four categories of these rules based on institutional responses to the NACUBO survey: about 75% report a Moving Average Rule that applies a target annual spending rate to the average of past endowment levels (usually on a quarterly basis for a three-year period). Sedlacek and Jarvis further observe 12 to 15% of institutions with the largest endowment levels use a Hybrid Rule based on a weighted sum of recent endowment levels and previous year's endowment spending. K. Brown and Tiu (2013) tracked the policies reported by institutions in their 2003 to 2011 survey responses. Surprisingly, only half of the institutions maintained a single rule through those nine years and on average, 25% of respondents reported a change in approach or target spending rate in each given year.

In this section, we provide a brief accounting-based overview of the relationship of the Moving Average and Hybrid rules as a precursor to using them to simulate and estimate the spending rules that we observe in the IRA 990 tax data. We examine the impact on distributions from the endowment of an additional inflow of revenue, as a way of comparing the properties of these alternative rules. We conclude that in fact they are very similar, and when we turn to simulating and estimating the actual rules from the IRS data, it is difficult to distinguish them with any precision. At the same time, we demonstrate later that both rules are to some extent misleading on the contributions of the endowment to spending, because they do not take into account reinvestments in the endowment through funds functioning as endowment, which may be offsetting the impact of the gross distributions resulting from the rules on actual spending.

A. Accounting Properties of Spending Rules

Endowment spending rules provide specific guidance about the dispersion of revenues over time. Sedlacek and Jarvis (2010) identify four categories of these rules based on institutional responses to the NACUBO survey: about 75% report a Moving Average Rule that applies a target annual spending rate to the average of past endowment levels (usually on a quarterly basis for a three-year period). Sedlacek and Jarvis further observe 12 to 15% of institutions with largest endowment levels use a Hybrid Rule based on a weighted sum of recent endowment level and previous year's endowment spending.

B. Basic Framework and Spending Rules

We define $\mathbf{X_t}$ as the endowment level, $\mathbf{R_t}$ as revenue or inflows to the endowment, and $\mathbf{S_t}$ as spending or distributions from the endowment in year (or period) **t** and assume initially that there is no inflation and no return on endowment investments. The endowment changes over time according to the accounting rule (i.e. "*The Law of Motion*")

$$\mathbf{X_{t+1}} = \mathbf{X_t} + \mathbf{R_t} - \mathbf{S_t}. \quad (1)$$

Simple Proportional Spending Rule

The simplest spending rule sets a yearly endowment payout as a fixed proportion of current endowment based on payout rate $\boldsymbol{\alpha}$, which is often .05 for non-profit organizations. We begin discussion with this rule – which is simpler than the rules used by most institutions in our sample – because its properties are so clear.

$$\mathbf{S_t} = \boldsymbol{\alpha}\, \mathbf{X_t} \quad (2)$$

Using (1) to substitute for $\mathbf{X_t}$ and then using (2) to substitute for $\mathbf{S_{t-1}}$ as a function of $\mathbf{X_{t-1}}$ gives

$$\mathbf{S_t} = \boldsymbol{\alpha}\, (\mathbf{X_{t-1}} + \mathbf{R_{t-1}} - \mathbf{S_{t-1}}) \quad (3)$$

$$\mathbf{S_t} = \boldsymbol{\alpha}\, (\mathbf{X_{t-1}} + \mathbf{R_{t-1}} - \boldsymbol{\alpha}\, \mathbf{X_{t-1}}) = \boldsymbol{\alpha}(1- \boldsymbol{\alpha})\, \mathbf{X_{t-1}} + \boldsymbol{\alpha}\, \mathbf{R_{t-1}} \quad (4)$$

Iterating this pair of steps, we can replace $\mathbf{X_{t-1}}$ with linear terms for $\mathbf{X_{t-2}}$ and $\mathbf{R_{t-2}}$ and then gradually expand the expression to include further terms for past revenues with the result that St is ultimately a weighted sum of past revenues where those weights form a geometric series.

$$\mathbf{S_t} = \boldsymbol{\alpha}\, \mathbf{R_{t-1}} + \boldsymbol{\alpha}(1- \boldsymbol{\alpha})\, \mathbf{R_{t-1}} + \boldsymbol{\alpha}(\mathbf{1-\alpha})\, \mathbf{R_{t-2}} + \ldots \quad (5)$$

If we assume that the college's endowment was initiated with at time 0 with revenue $\mathbf{R_0}$, then we can express $\mathbf{S_t}$ in summation form as a weighted sum of revenues $\mathbf{R_j}$ from periods 0 to t-1.

$$\mathbf{S_t} = \sum_{j=0}^{t-1} \boldsymbol{\alpha}(\mathbf{1} - \boldsymbol{\alpha})^j \boldsymbol{R_{t-j-1}}. \quad (6)$$

Equation (6) also shows that revenue in period **t** first influences endowment spending at period **t+1**. In each subsequent period, proportion **α** of the remaining value of revenue $\mathbf{R_t}$ is designated for payout but that remaining value declines over time. Specifically, each additional dollar of revenue in period **t** yields additional payout $\boldsymbol{\alpha}(\mathbf{1-}\boldsymbol{\alpha})^{k-1}$ in period **k**.[4]

Following similar logic, the Hybrid spending rules discussed below can also be expressed as weighted linear sums of past revenue values. We explain the relationship of the rules and the minor mechanical differences between them in the Appendix. For expositional simplicity, we focus on the Hybrid rule in the main text; our simulated reconstructions from the 990 data are also slightly more accurate for the Hybrid than for the Moving Average spending rule.

Hybrid Spending Rule

Sedlacek and Jarvis (2010) explain that hybrid spending was introduced by Stanford and is known interchangeably as the Stanford and Yale rules depending on the weights. Yale University currently describes this policy on its website as follows:

> *The payout under the Spending Policy is equal to 80% of the prior year's spending plus 20% of the long-term spending rate applied to the previous year's beginning endowment market value, with the sum adjusted for inflation.*
> https://your.yale.edu/policies-procedures/policies/2202-endowment-spending-and-distributions

One important element of Yale's policy is that spending in a given year is a function of lagged values of both the endowment level and spending, so that revenues in year **t** influence the endowment level in year **t+1** but do not affect endowment spending until year **t+2**. With this in mind, an endowment spending rule of this form is defined by parameters **α** and **β** where **α** represents the targeted long-term spending rate (once again, this is commonly set to .05) and **β** is the proportional weight on the endowment level. That is,

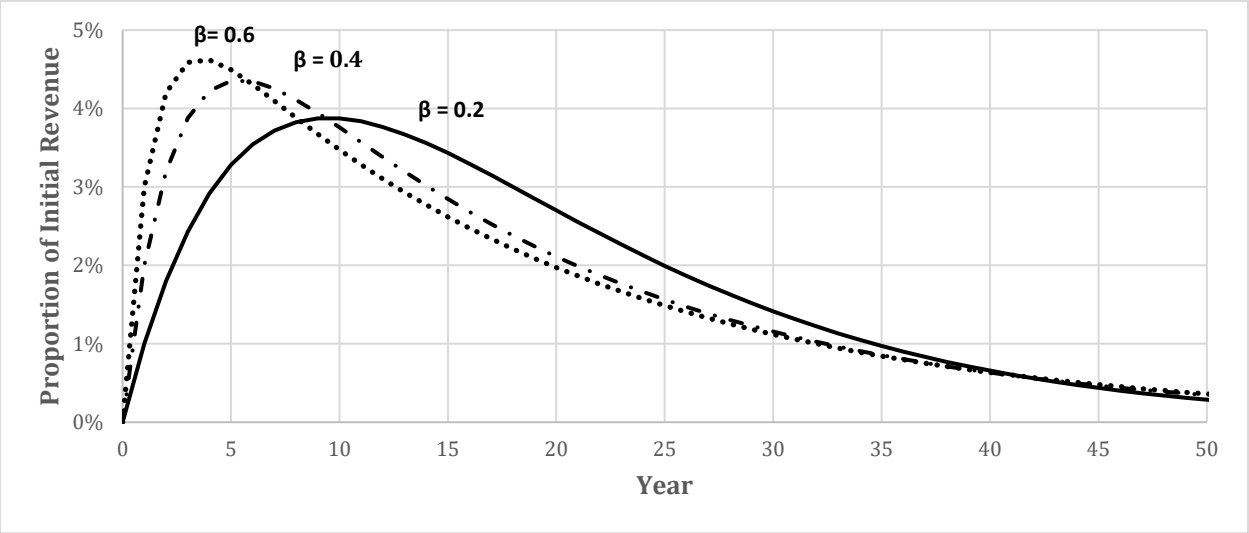
$$\mathbf{S_t} = \boldsymbol{\beta}\,(\boldsymbol{\alpha}\,\mathbf{X_{t-1}}) + (1-\boldsymbol{\beta})\,\mathbf{S_{t-1}}. \quad (7)$$

In period **t+1**, revenue $\mathbf{R_t}$ in period **t** affects the endowment value but not the spending level. Starting in period **t+2**, those revenues $\mathbf{R_t}$ in period **t** influence both the spending level and the

[4] That is, the dispersion of revenue $\mathbf{R_t}$ follows a geometric series forward from period **t+1** with initial value $\boldsymbol{\alpha}\mathbf{R_t}$ and multiplier (1-**α**) so by the geometric series rule, the eventual sum of revenue payouts over time is $\frac{\alpha R_t}{1-(1-\alpha)} = R_t$.

endowment level, so the effect of each increase in revenue on future spending gradually increases over an initial phase-in period. Figure 5 compares payout rates over time for different values of **β**, the weight for the endowment level, holding fixed the target payout rate **α** = .05 and excluding the effects of compound interest and inflation to simplify initial discussion.

Figure 6: Spending of Endowment Revenue Over Time with a Hybrid Rule



We highlight several features of the spending patterns that are evident in Figure 6.

- Increasing **β** shifts the distribution or payout of revenue from year 0 earlier in time because new revenues have an immediate effect on endowment level and only a gradual effect on spending levels.
- The payout of revenues from year 0 are always less than the target payout rate **α** = .05 with maximum payout decreasing in **β**.
- Yearly payouts initially increase and reach a maximum value between years 5 and 10.
- Yearly payouts for lower values of **β** eventually catch up and surpass payouts for higher values of **β**.

Amherst uses a variant of the hybrid rule that relies on a moving average of past endowments.

> *the … spending rule … combines a three-year smoothed historical endowment value (30%) with a modest increase (inflation) in last year's spending value (70%).*

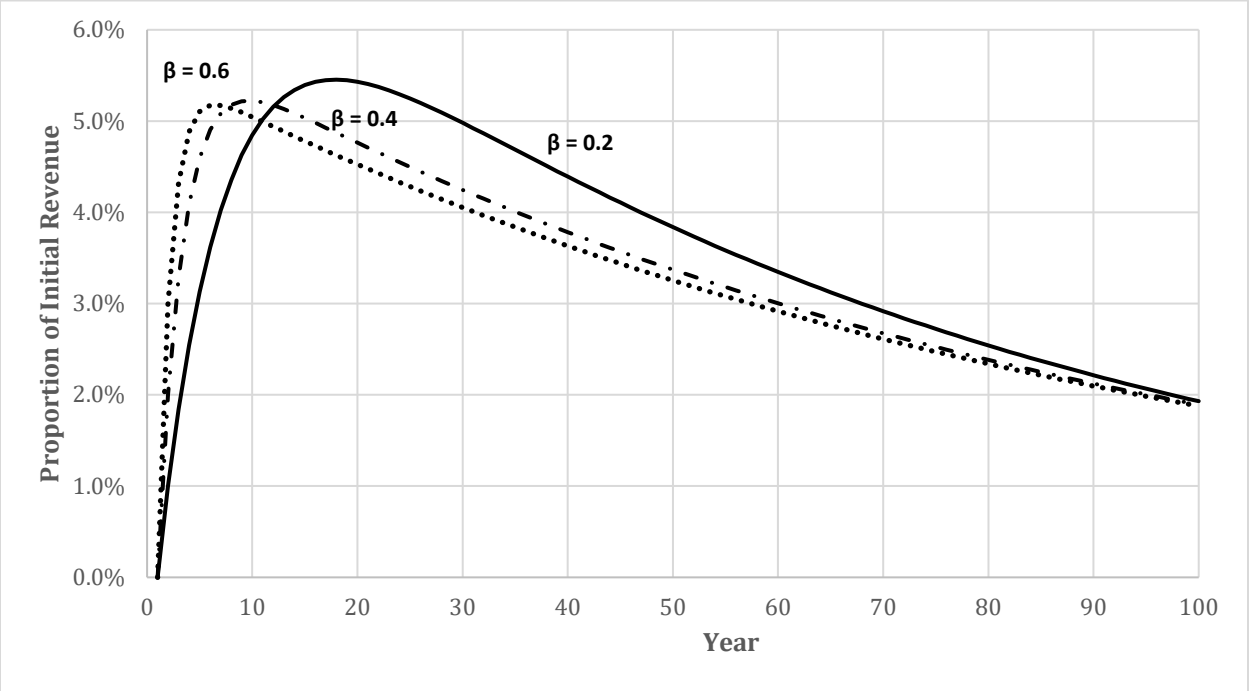
This formulation combines properties of the Moving Average and Hybrid rules and thereby reduces the influence of recent changes in the endowment. As Ehrenberg (2009) summarizes,

wide fluctuation in endowment values may suggest the need to base spending on a longer period of endowment values to provide less variability in the flow of spending. …The downside of basing spending rules on longer historical periods is that during prolonged upswings in market valuations (such as that experienced during most of the past 20 years), spending as a share of the current value of the endowment will fall below the target percentage share.

Figure 7 shows how the distribution of revenues is affected by investment returns. In this case, we assume a 4% annual return on investments; since this is less than the target payout rate, the endowment does not grow forever and new revenues are still dispersed over time.

- As in Figure 1, spending increases over time and is initially larger for larger values of **β**.
- The endowment is initially growing because the investment return is initially higher than the effective payout rate for the new revenue.
- The peak payout rate goes above the target rate of .05.
- Distribution of new revenues is quite elongated. After 100 years, 35% of the initial revenue still remains in the endowment for each of these three weighting schemes.

Figure 7: Spending of New Revenue with Hybrid Rule and Investment Returns



V. Spending Rule Simulations

We conducted simulation exercises to attempt to reverse engineer the spending rules of the institutions in the sample using a one-step lagged rule given by (16) for the Hybrid model.

$$S_{j,t} = W_E X_{t-1} + W_S S_{t-1} \quad (16)$$

As an initial background step for our simulations, we ran a separate OLS regression for each college (13 observations per college using the first year of data as the baseline values) with spending $\mathbf{S_t}$ as the dependent variable in (17).

$$S_{j,t} = \beta_E X_{t-1} + \beta_S S_{t-1} + \varepsilon_{j,t} \quad (17)$$

We excluded a constant term in these regression specifications, so the OLS model does not incorporate a target spending level or restrict the values of the coefficients or their sums, thereby allowing for average per-year spending levels other than 5% of endowment level. We also restricted the coefficients based on the rules $0 \leq \hat{\beta}_E \leq 0.06$ and $0 \leq \hat{\beta}_S \leq 1.2$, so that each components contributes a positive amount, but not too large an amount to estimated spending. When these conditions held, which occurred for 80.7% of cases with the Hybrid rule, we apply the regression coefficients directly as weights so that $W_E = \hat{\beta}_E, W_S = \hat{\beta}_S$. Where the regression coefficients did not meet these conditions, we reverted to a default choice of parameters $W_E = 0.03, W_S = 0.4$.[5]

B. Detailed Rules for the Simulations

With the general form of the one-step spending rule equations and the weights for the spending rules in place, we made the following further assumptions to carry out the simulations.

- We assume that college **j** generates the same proportion $\gamma_{j.t}$ of revenue in year **t** as in the observed data for that year. That is, the ratio of the sum of (1) investment earnings and (2) contribution to endowment value at the start of the fiscal year as reported in Schedule D is the same in the simulations as in practice.
- We work in terms of nominal values with no adjustments for inflation.
- We take the actual endowment and spending values as given for the first year (2009) for the Hybrid rule since (16) includes one lagged observation.

[5] These default parameters correspond to a 5% target rule for contributions. For instance, weights of 60% on past endowment and 40% on past cost with a 5% target rule yield a weight of 0.6 * 0.05 = 0.03 on past endowment.

To carry out the simulation for a given college for the Hybrid rule, we used equation (16) to compute spending $\hat{S}_{j,t}$, computed revenue in year **t** as proportion $\gamma_{j.t}$ of the starting endowment in that year ($\hat{R}_{j,t} = \gamma_{j.t}\,\hat{X}_{j,t}$) and applied the accounting rule for the law of motion (originally listed in equation (1)) to compute simulated endowment for the next year:

$$\hat{X}_{j,t+1} = \hat{X}_{j,t} + \hat{R}_{j,t} - \hat{S}_{j,t}. \qquad (18)$$

By iterating this series of steps, applying (18) once for each year, we filled out a complete time series of estimated endowment, revenue, and spending values ($\hat{X}_{j,t}, \hat{R}_{j,t}, \hat{S}_{j,t}$) for each college **j** and years **t** from 2010 to 2022.

C. Results of the Simulations

Once the simulated spending patterns were generated, we compared the simulated and actual endowment values at the end of the sample period in July 2022 according to the absolute value for the percentage difference between simulated $\hat{X}_{2022}$ and actual final endowment level X_{2022}.

$$\text{Error Rate} \quad = \quad \left| \frac{\hat{X}_{2022} - X_{2022}}{X_{2022}} \right|$$

We classify the simulation results into three categories: (1) Error Rate < 5%; (2) Error Rate between 5 and 10%; (3) Error Rate greater than 10 %. As shown in Table 4, our simulations produce error rates of less than 5% for more than 70% of the colleges and error rates of less than 10% in approximately 83% of them. Further, the simulations had slightly lower error rates for colleges with larger endowments, with error rates less than 10% for nearly 90% of the colleges.

Table 4: Accuracy of Simulated Spending Patterns

Hybrid Model	ALL	Groups 1 and 2	Groups 3 to 5
0 to 5% Absolute Error	132 (70.6%)	34 (73.9%)	98 (69.5%)
5.1 to 10% Absolute Error	23 (12.3%)	7 (15.2%)	16 (11.3%)
10.1 or more Absolute Error	32 (17.1%)	5 (10.9%)	27 (19.1%)
TOTAL	187 (100%)	46	141

Figure 8a depicts the simulated and actual distributions or costs for Yale University where these relationships are fairly typical of cases where the simulation produced an error rate less than 5%. Here, the simulated values given repeated application of (20) produced results close to but clearly distinct from actual spending, with both periods of underestimating (about 2011 to 2014) and overestimating (about 2015 through 2019) actual reported costs.

Figure 8a: Simulated and Actual Spending from the Endowment for Yale University

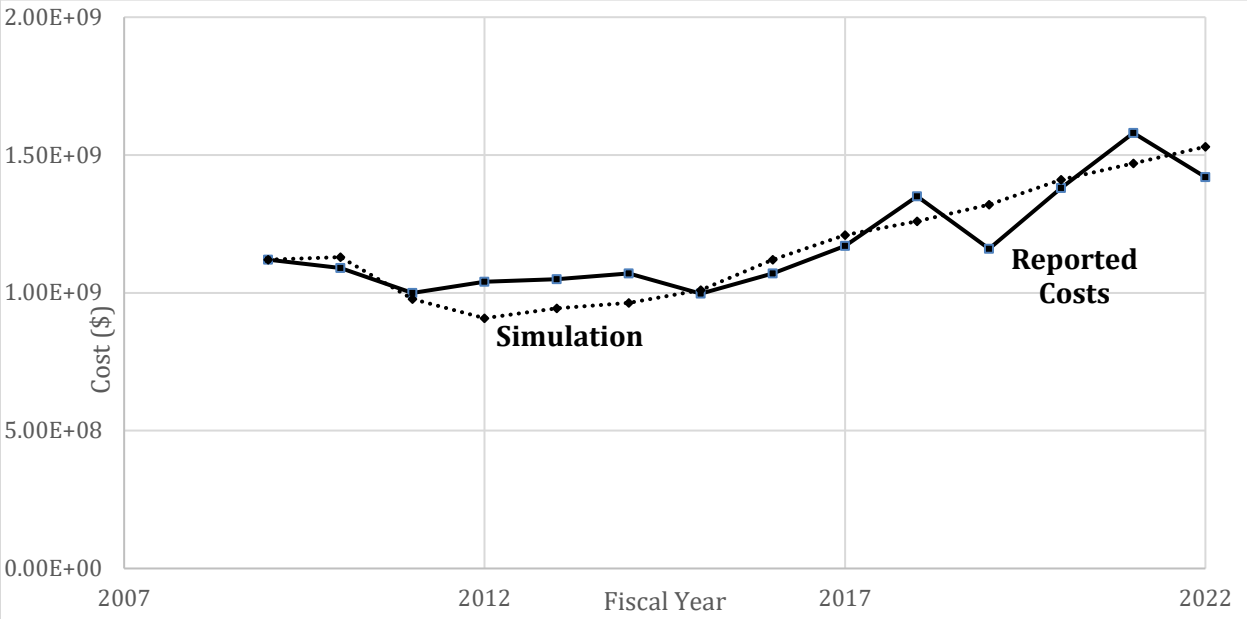
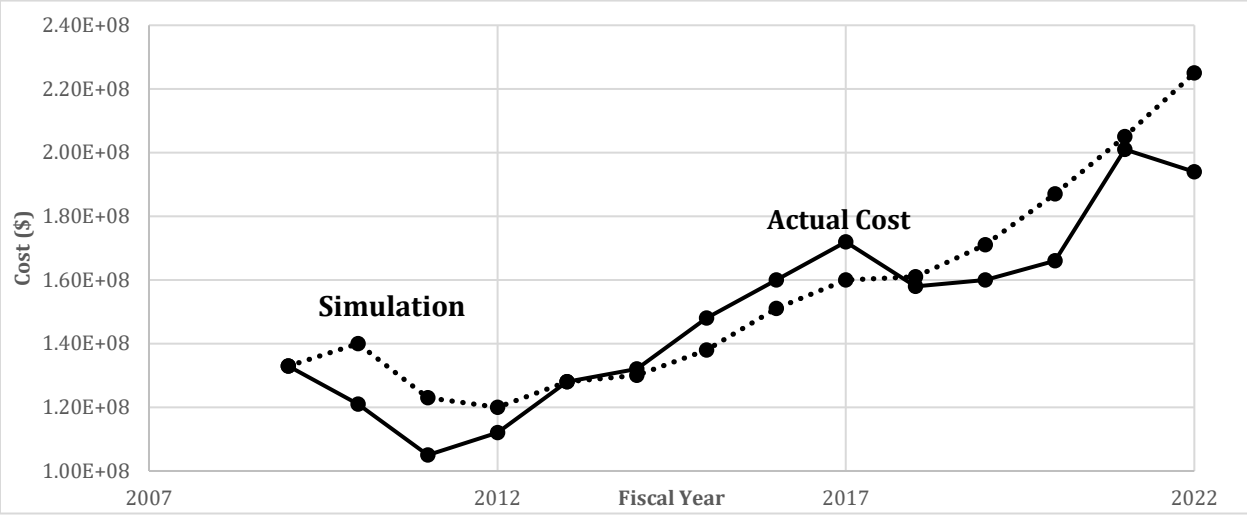


Figure 8b shows the results for Brown University, where the simulation produces an error rate above 5%. In this case, the simulated values include relatively large overestimates of endowment spending at both the beginning and end of the sample period.

Figure 8b: Simulated and Actual Spending from the Endowment for Brown University



As these examples suggest, institutional spending tends to be less predictable than these spending rules suggest. The projected distributions in the simulations are most inaccurate when the Hybrid rule cannot reproduce relatively complicated spending patterns of individual colleges. While our method is clearly ad hoc and we are only judging the accuracy of the simulation based on the end result in terms of endowment level, these results suggest that the spending patterns of the colleges are at least reasonably described by a weighted average spending rule. For this reason, we focus attention on the projected weights for the 85% of cases where the Hybrid Rule produces a simulated final endowment within 10% of the true value.

Equation (17) ($S_{j,t} = W_E X_{t-1} + W_S S_{t-1}$) for simulations of the Hybrid Spending Rule corresponds to a target spending rate α when $\frac{W_E}{\alpha} + W_S = 1$ which means $\alpha = \frac{W_E}{1-W_S}$. Table 5 reports the average weights for simulations of the Hybrid Rule for the 151 institutions with final projected endowment levels within 10% of the actual value. The given average weights in each category correspond to target spending rates between 5.2 and 5.7%, which seems broadly plausible. Institutions in Groups 1 to 4 are estimated to use average weights of 50 to 65% on previous spending, which imposes considerable smoothness on the spending pattern, though not as much as with the 80% weight on prior spending from the Yale Rule.

Table 5: Average Weights for Successful Simulations

	All	Group 1	Group 2	Group 3	Group 4	Group 5
Endowment Weight	.025 (.015)	.028 (.015)	.018 (.012)	.021 (.014)	.025 (.014)	.032 (.018)
Lagged Cost Weight	.546 (.268)	.508 (.273)	.680 (.234)	.628 (.253)	.538 (.254)	.374 (.267)
Target Spending*	5.51%	5.73%	5.59%	5.73%	5.50%	5.19%
Colleges	151	17	20	29	63	22

* The standard deviation for each reported value is reported in parentheses. The target spending level is computed at the average weights listed in each column.

It is notable that the implied target spending rates listed in Table 5 are somewhat greater than 5% even though the descriptive statistics in Table 2 showed that average spending was close to 5% of current endowment levels for each group of colleges. These results are actually consistent with each other in a period of rising endowments since then a spending rule designed for target

spending equal to proportion **α** of recent past endowment levels will produce endowment payout of less than that proportion **α** of the current endowment level.

There are several possible explanations for the common finding in Table 6 of target spending levels higher than the reported standard level of 5%.

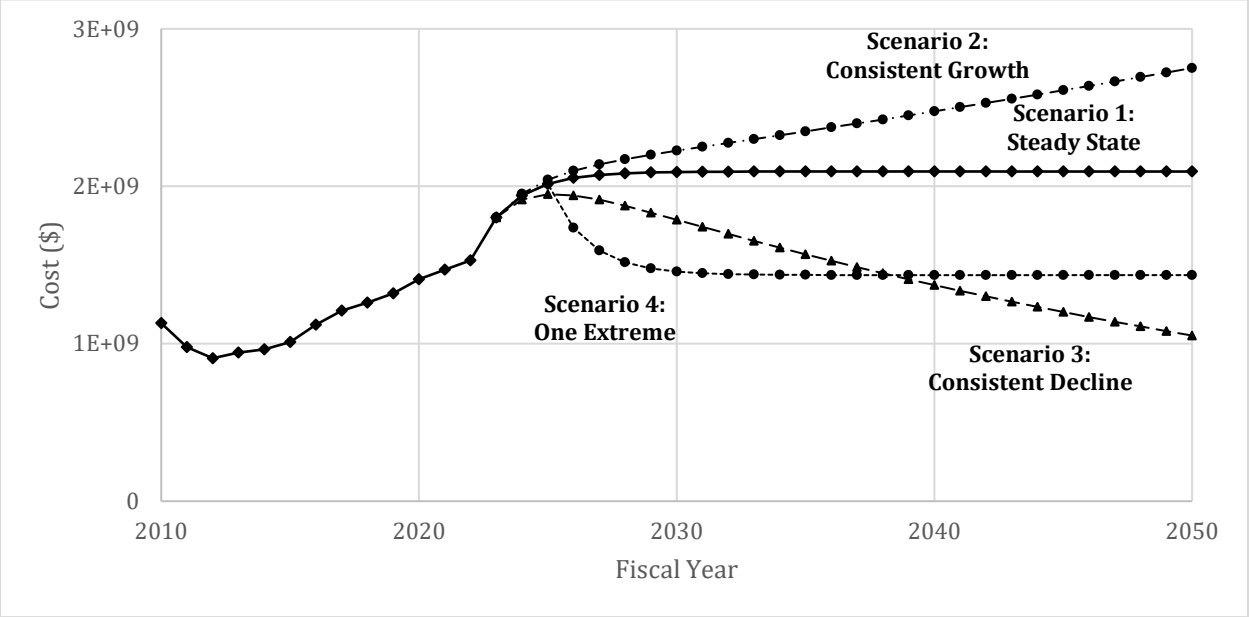
- Some institutions may use higher target spending levels. For example, Yale reports a target level of 5.25% as part of the policy described in Section IV.
- Our computations don't include inflation and a 5% real target spending rate corresponds to a higher nominal rate.
- Our results in Table 7 below finds that contributions are spent relatively rapidly, which may result in greater spending than would be suggested by a 5% target rate.

The Hybrid Rule is conducive to simulations of future endowment paths because it requires so little information and is straightforward to apply. Figure 9 projects the results of simulations of four scenarios for the trajectory of the endowment path for Yale University through 2050 using the estimated Hybrid Rule weights for Yale as described above. Scenarios 1 through 3 assume that Yale receives revenue each year (starting in 2022-23) equal to a fixed proportion of its current endowment, where that proportion is equal to the yearly payout rate in Scenario 1, 6% in Scenario 2 (approximately one percentage point higher than the yearly payout rate) in Scenario 2, and 2.5% in Scenario 3 (approximately half the yearly payout rate). Scenario 4 makes one adjustment to Scenario 1, assuming a one-time negative event that causes a 25% loss of the endowment in investment returns in 2024-25.

As shown in Figure 9, total distributions stabilize relatively quickly in Scenarios 1 and 4, indicating that the endowment level also stabilizes in those cases, though at a much lower level in Scenario 4 than in Scenario 1. By contrast, we project steady increases in Scenario 2 and steady reductions in Scenario 3 for both total distributions and endowment level. These results indicate that the Hybrid Rule is an especially good match for relatively stable conditions but that

it will result in consistent under- or over-spending if the target payout rate is different than the rate of revenue generation.[6]

Figure 9: Projected Future Endowment Expenditures for Yale University



+

[6] These scenarios assume a spending rate equal to the long-term real return on the endowment. We assume no inflation and no change in the long-term spending rule, although a significant change in the expected long-term return as in scenarios 2 and 3 would lead to a change the spending rule.

D. Descriptive Regression Analysis of Spending

Our simulations implicitly give equal weight to contributions and investment returns. To distinguish between these two sources of revenue, we conduct descriptive regressions to predict current spending levels as a function of past investment returns, contributions, and prior endowment level. As shown in Table 6, investment gains and contributions have estimated positive and generally significant effects on future endowment spending, but there are apparent distinctions in the effects of these two separate sources of funds.

- Contributions have largest effect in the first year after realization and estimated substantially diminishing effect beyond that to the point where they have no discernible effect in year 3 for the institutions in Groups 1 and 2 (those with highest endowments).
- Investment gains have relatively small initial effect and then growing effect over time, consistent with the properties of one-step spending rules.

Table 6: Regression Results for Spending as Function of Investment Returns and Contributions

	All	All	Group 1-2	Group 1-2	Group 3-5	Group 3-5
Balance Lag 3	.046**	.043**	.046**	.043**	.053**	.053**
	(.0004)	(.0008)	(.0008)	(.002)	(.001)	(.002)
Invest Gains Lag 1	.006**	.008**	.006*	.008**	-.004	-.005*
	(.001)	(.001)	(.003)	(.002)	(.003)	(.003)
Invest Gains Lag 2	.036**	.027**	.036**	.027**	.027**	.022**
	(.003)	(.003)	(.005)	(.005)	(.005)	(.005)
Invest Gains Lag 3	.039**	.038**	.039**	.038**	.021**	.020**
	(.002)	(.001)	(.003)	(.002)	(.003)	(.003)
Contributions Lag 1	.120**	.098**	.119**	.099**	.029*	.051**
	(.008)	(.007)	(.017)	(.015)	(.011)	(.010)
Contributions Lag 2	.037**	.024**	.035	.023	.016	.039**
	(.009)	(.008)	(.019)	(.016)	(.011)	(.010)
Contributions Lag 3	.027**	-.001	.025	-.002	.019	.041**
	(.009)	(.008)	(0.18)	(0.16)	(0.12)	(0.10)
Constant	6.31M**	8.18M**	4.81 M	28.8 M	-0.10 M	-0.70 M
	(0.66 M)	(1.30M)	(3.19 M)	(8.329 M)	(0.24 M)	(0.63 M)
Fixed Effects By Institution	NO	YES	NO	YES	NO	YES
R^2	.9839	.9902	.9782	.9866	.8731	.9230
Colleges	187	187	44	44	143	143
Observations	2,057	2,057	506	506	1,551	1,551

* = significant at .05, ** = significant at .01 level.

VII. Quasi-Endowments and Net Spending

As part of their 990 Schedule D filings, colleges and universities report the division of the endowment into three categories defined by the Financial Accounting Standards Board (FASB): (1) **quasi-endowment**, often known as "**Funds Functioning as Endowment**"; (2) permanent endowment; (3) term or restricted endowment.[7] In essence, quasi-endowments serve as unrestricted funds, as indicated by the instructions for Schedule D from The Internal Revenue Service: "**Board-designated endowments or quasi-endowments** result from an internal designation and are generally not donor-restricted and are classified as net assets without donor restrictions. The governing board has the right to decide at any time to expend such funds."

When a donor makes an endowment gift for a specific purpose, spending rules are designed to protect the real value of the gift and support that activity in perpetuity. The real value of the endowment over time depends on the value of inflows from new gifts, investment returns in excess of the amount needed to maintain the real value of the endowment, and reinvestment of operating surpluses. The Board of Trustees may choose to designate discretionary funds to the quasi-endowment to take advantage of the higher return on the endowment investments compared to other possible investment options. The quasi-endowment then serves to increase the overall value of the endowment, and the spending it supports, or to save for some specific lumpy expenditure in the future.

Figure 10 shows that the average proportion of endowments in the term endowment category approximately doubled from 2008-09 to 2013-14 and then remained fairly steady after that. This increase in the proportion held as term endowments appears to be explained almost entirely by a corresponding decline in the proportion of funds held in the permanent endowment. These changes may be explained at least partly by an initial period of limited donations and solid investment returns in the aftermath of the Great Recession. It is also interesting to see that the proportion held as quasi-endowment remained relatively close to 30% throughout the sample period, which suggests that the spending power of these institutions grew in proportion to the increase in real endowment level.

[7] New donations are classified in the second category as "permanent endowment" but investment earnings on funds in the permanent endowment are typically moved into term endowment.

Figure 10: Average Division of Endowments by Category

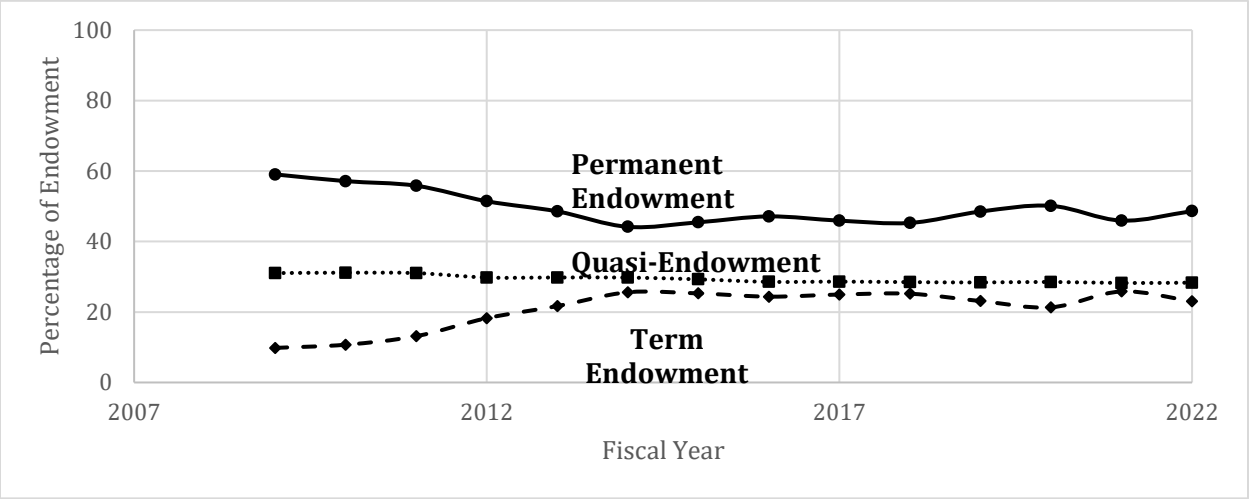


Figure 11a graphs investment returns and the change in quasi-endowment value as a percentage of start-of-year endowment balance. The two curves take quite similar shape, suggesting that quasi-endowment balance moves in the same direction as investment returns, though on a much smaller proportional scale. In the years with the lowest observed investment returns, quasi-endowment values remained relatively flat or experienced modest declines. By contrast, in years with investment returns greater than 10%, quasi-endowments levels tended to grow, with five years in the sample period of gains of the order of 5% of endowment balance and much more than that in the unusual year of 2020-21.

Figure 11a: Investment Returns and Changes in Quasi-Endowment Value

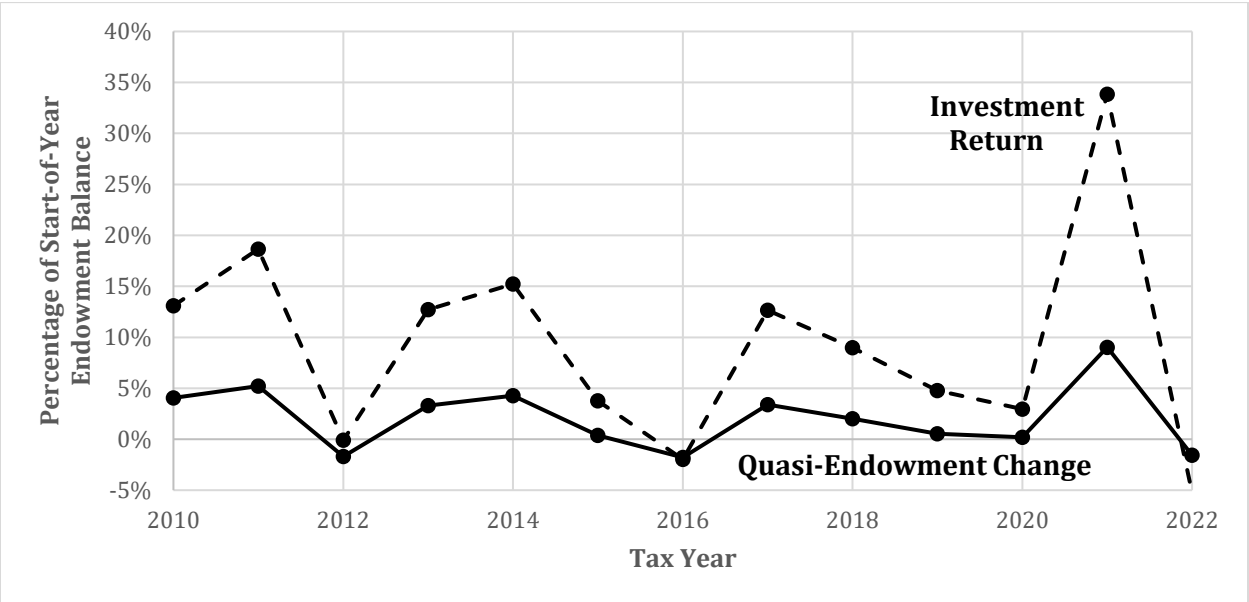
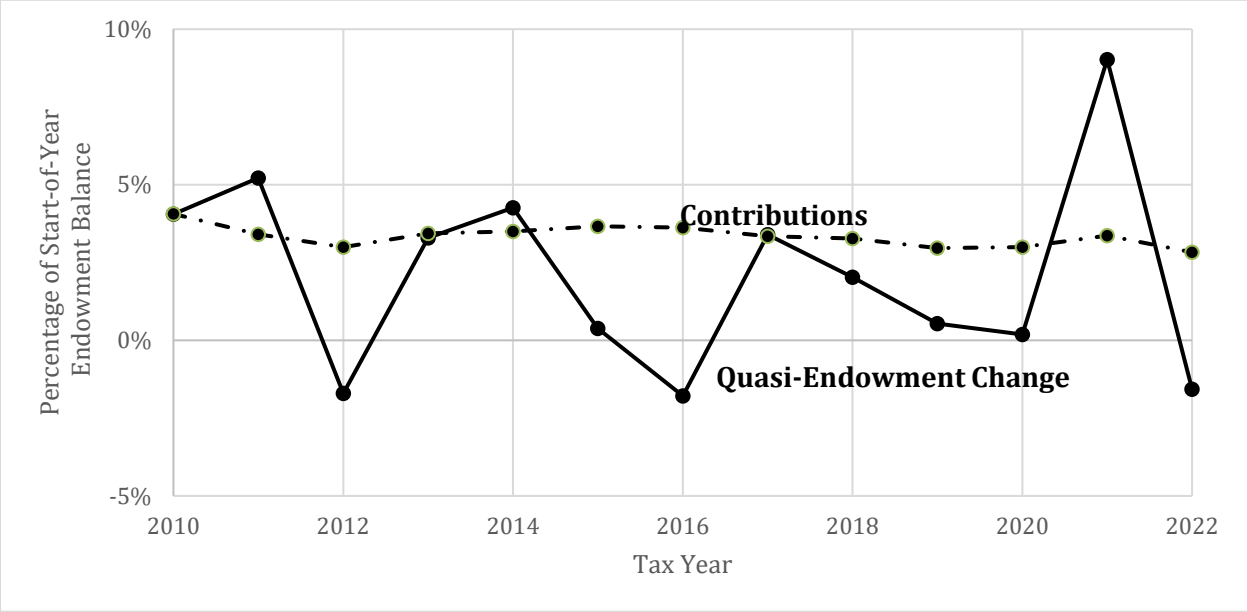


Figure 11b provides a similar graph of contributions and the change in quasi-endowment value as a percentage of start-of-year endowment balance. While there is some suggestion of positive correlation between the two values, there is much less variation in contributions than in investment returns on a year-by-year basis.

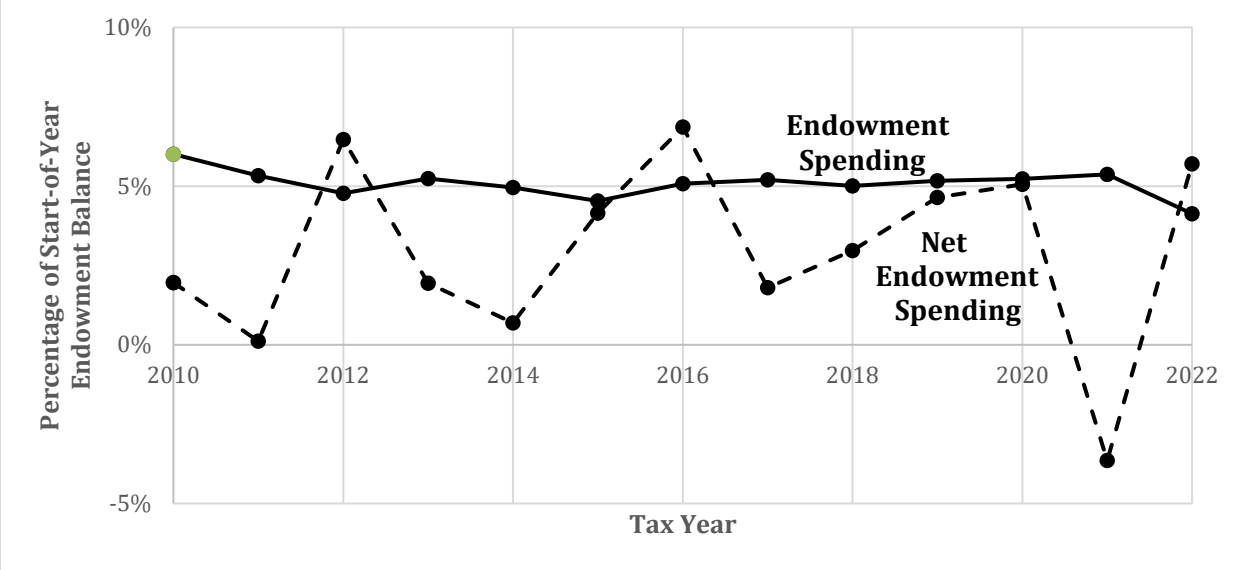
Figure 11b: Contributions and Changes in Quasi-Endowment Value



We represent the values in Figures 11a and 11b as percentages of the endowment balance at the start of the tax year so that these values are in comparable unit. Since increases in the quasi-endowment offset endowment spending, we define "Net Endowment Spending endowment spending as the distribution from the endowment as recorded in the 990, minus any reinvestment in the endowment in the form of funds functioning as endowment. Distributions represent funds allocated to support spending, while reinvestment of funds in the endowment as funds functioning represent unrestricted income or revenues that are not spent and instead invested in the endowment. Net endowment spending represents the impact on spending of these two activities.

Figure 12 graphs net endowment spending by tax year in the sample period. Ordinary endowment spending (the sum of all expenses reported in Schedule D of the 990 tax return) is fairly consistent at slightly above 5% for most years in the sample period. By contrast, Net Endowment Spending varies considerably by year with values near to or less than 0% in several years and values of 5% or above in six other years.

Figure 12: Endowment and Net Endowment Spending



As expected, the correlation between investment returns and changes in the quasi-endowment from Figure 11a carries over to Figure 12. The five years with lowest Net Endowment Spending rates were each characterized by unusually positive (greater than 10%) average investment returns. Similarly, the years with New Endowment Spending at approximately 5% or higher were the ones in the sample period with lowest average investment returns.

Table 7 provides results of descriptive regression specifications with "Change in Quasi-endowment" (in % of start-of-year endowment value) as the dependent variable and investment returns and contributions (also in % of start-of-year endowment value) as independent variables. Consistent with our observations of Figures 9a, 9b, and 10, contemporaneous investment returns and contributions are significant predictors of changes in the Quasi-Endowment. Each percentage point increase in investment returns is predicted to increase the Quasi-Endowment by 0.3 percentage points while each percentage point increase in investment returns is predicted to increase the Quasi-Endowment by 0.4 to 0.45 percentage points. To some degree, we might view these relationships as mechanical implications of accounting rules because unexpected

financial windfalls in a given year necessarily translate into increases in balances in each part of the endowment if those windfalls are not immediately dispersed. From this perspective, perhaps the most interesting result is that lagged investment returns and contributions do not have a significant effect on current year changes in the quasi-endowment value and in some cases, such as lag 2 investment returns, the regression coefficients for lagged returns event take negative signs.

Table 7: Regression Results for Net Endowment Change as Function of Investment Returns and Contributions

	All	All	Group 1-2	Group 1-2	Group 3-5	Group 3-5
Investment Returns	.308** (.013)	.300** (.014)	.367** (.023)	.361** (0.24)	.281** (.016)	.277** (.017)
Invest Returns Lag 1	.021 (.014)	.012 (.014)	.016 (.023)	.011 (.024)	.018 (.017)	.013 (.018)
Invest Returns Lag 2	-.010 (.012)	-.015 (.012)	.021 (.024)	.016 (.025)	.-.021 (.014)	-.023 (.014)
Contributions	.438** (.023)	.461** (.025)	.428** (.072)	.464** (.078)	.445** (.025)	.462** (.026)
Contributions Lag 1	.013 (.022)	.024 (.023)	.025 (.081)	.051 (.085)	.015 (.023)	.022 (.024)
Contributions Lag 2	.002** (.022)	.010 (.024)	-.068 (.078)	-.026 (.085	.007 (.024)	.008 (.025)
Constant	-.024** (.003)	-.024** (.003)	-.024** (.006)	-.026** (.007)	-0.024 (0.004)	-.024** (.004)
Fixed Effects By Institution	NO	YES	NO	YES	NO	YES
R^2	.3350	.4205	.4032	.4696	.3192	.4077
Colleges	187	187	46	46	141	141
Observations	2,238	2,238	552	552	1,551	1.686

* = significant at .05, ** = significant at .01 level.

VIII. Analysis of IPEDS Spending Data

We utilize IPEDS data to look at specific changes in expenditures by institutions, focusing on four categories (Academic Support, Institutional Support, Instruction, Student Support) that were consistently reported in our sample. Webber and Ehrenberg (2010) and Deming and Walters (2017) establish a particular connection between funding for Student Support and student success in terms of persistence and degree completion, so we focus on that category in our analysis.[8]

Figure 13a shows overall increases of 40 to 50% in total IPEDS costs (the sum of expenses reported in the four categories listed above) from 2008-09 to 2019-20, with modest decline followed by subsequent increases in the next two years.

Figure 13a: % Increases in IPEDS Reported Costs

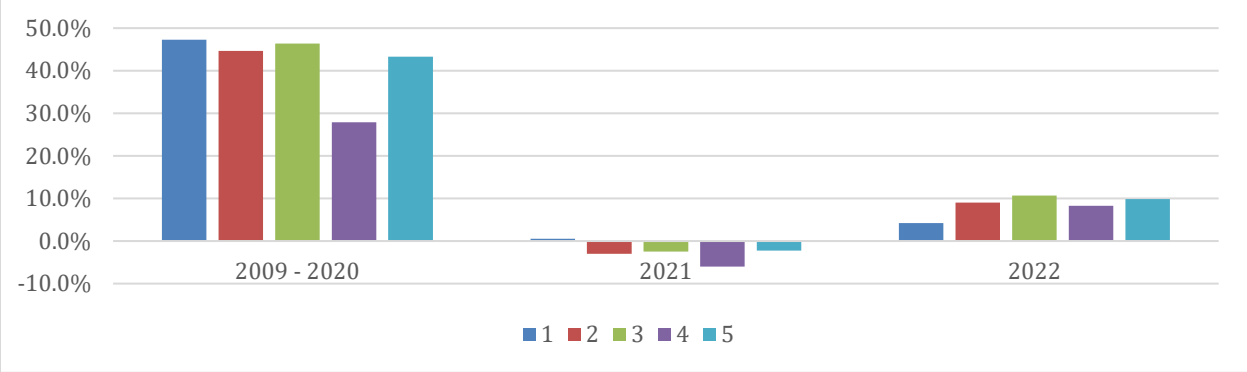
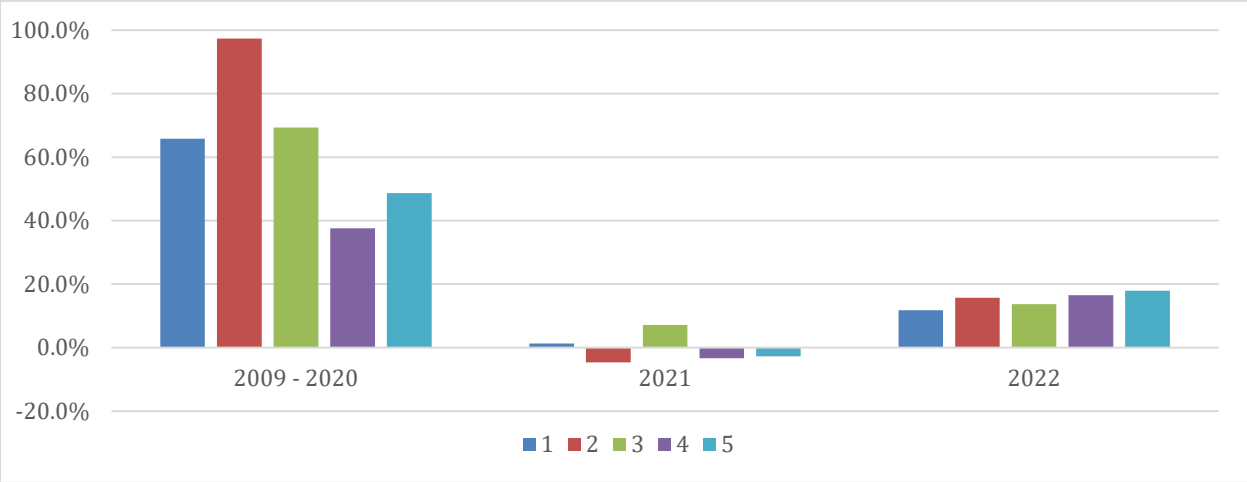


Figure 13b shows larger proportional increases in spending on student support both during the first 12 years of the sample period and in 2021-22 where spending increased by an average between 12% and 18% in each of the five groups of colleges. Investment in health and specifically mental health services for students likely contribute to the cost increases observed in student services for 2021-22; a total of 77% of institutions reported expansions of mental health service during 2022 in a separate survey.[9]

[8] "Student services" includes admissions, registrar activities, and activities for which the primary purpose is to contribute to students' emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program. Intercollegiate athletics and student health services may also be included except when operated as self-supporting auxiliary enterprises. https://nces.ed.gov/programs/coe/indicator/cue/postsecondary-institution-expense

[9] https://www.chronicle.com/article/colleges-are-investing-in-student-mental-health-but-theres-still-a-long-way-to-go-survey-finds

Figure 13b: % Change in Yearly Spending on Student Support



To understand the impact of endowments and endowment distributions on spending and savings, more work is needed on the relationship of distributions from the endowment, reinvestment in funds functioning as endowment, and spending in the operating budget on different categories. The IPEDs data reported here, for example, suggest endowment growth exceeded expenditure growth on these categories, but also that endowment growth in 2020-21 may have supported increased spending in 2022.

IX. Discussion and Conclusion

Previous papers by Tobin (1974), Hansmann (1990), Merton (1993), and Hoxby (2013), among others, discussed the conceptual basis for university endowments. Hoxby conceptualizes universities as organizations that promote increases in intellectual capital through research and teaching, using endowments to fund both current and future productive activity. Hoxby further suggests that long periods of real endowment growth may suggest suboptimal spending rules:

> *the financial side should only grow persistently as a share of the total portfolio if (i) the returns on future intellectual capital projects are substantially higher than those of today's intellectual capital projects and (ii) adjustment costs are such that when those future days arrive, the cost of suddenly needing to provide infrastructure and expertise to them will not be exorbitant. … Since circumstances (i) and (ii) probably do not often arise in conjunction, a university should examine itself if its financial market portfolio's share of its total portfolio rises very persistently. The likely answer is that the university is not solving its investment problem correctly.*

From this perspective, the optimal payout rate for endowments should equate the marginal value of present and expected future activities at the university that create intellectual capital, taking all revenue streams into account. Universities have other revenue streams beyond earnings on the endowment, and their optimization of spending over time should depend on all these revenue streams, which would then have implications for optimal real endowment growth.

Ehrenberg (2009) in contrast suggests a rule of thumb for spending that maintains the university's endowment level in real terms over time:

> *To provide future generations with protection against inflation, the endowment for a specific funded activity must grow over time by the average rate of inflation faced by the university.*

This prescription protects the activities funded by donors with restrictions but does not really address the optimality of the consistent growth of the university endowments that we study, and especially the growth of quasi-endowments during the sample period. Table 8 shows that 80.2% of the institutions in our sample and almost all of the initially wealthiest institutions produced endowment growth greater than the cumulative inflation rate of 40.9% from 2008-09 to 2021-22. Similarly, Lerner, Schoar, and Wang (2008) observed median annual endowment growth rates of

7.4% during the thirteen-year period from 1992 to 2005 when the average annual inflation rate was 2.6%; they also identified positive correlation between endowment size and endowment growth, primarily because institutions with the largest endowments had superior average returns on investments during those 13 years.[10]

Table 8: Endowment Growth Relative to Inflation

Group	Endowment Growth > Inflation	Endowment Growth < Inflation	Total
1	21 (95.5%)	1 (4.6%)	22
2	22 (91.7%)	3 (12.5%)	24
3	30 (88.2%)	4 (11.8%)	34
4	58 (74.4%)	15 (25.6%)	78
5	20 (69.0.4%)	9 (31.0%)	29
TOTAL	150 (80.2%)	37 (19.8%)	187

One subtlety in the interpretation of endowment growth is that universities generally report that 70% or more of their endowment funds are restricted in their use, which opens the possibility that a university could experience long-lasting endowment growth on paper and yet still face ongoing financial stress. Ehrenberg's rule of thumb accounts for this possibility by stipulating a comparison of the endowment return *for a "**specific funded activity***" to the inflation rate, implicitly suggesting that contributions may be extraneous to the comparison because they are often targeted for new rather than for existed funded activities.[11]

On the other hand, many restrictions on the endowment direct funds towards uses, such as financial aid, that the university would choose on its own. From the outside, however, it is not easy to determine the degree to which restrictions on endowment spending do or don't align with university priorities. As Baum, Hill, and Schwartz (2018) conclude, "*The available data do not*

[10] Piketty (2014) summarized results from the longer period from 1980 to 2010 and found in his analysis of 850 institutions that "U.S. universities earned an average real return of 8.2% on their capital endowments, and all the more so for higher endowments."

[11] Ehrenberg observed that the average yearly rate of return on endowment investments over the forty-year period from 1956 to 1997 was 9.8% and that inflation as measured by the Higher Education Price Index (HEPI) was 5.2% per year for that same period. Allowing for estimated administrative costs of 0.7% per year for managing the endowment, Ehrenberg suggested an annual payout rate of 9.8% - 5.2% - 0.7% = 3.9%, quite close to the 4.1% median and 4.3% mean payout observed for universities during that period of time. One notable feature of this computation is that it implicitly assumes that contributions have negligible value for addressing existing needs.

make it possible to determine to what extent these restrictions in fact constrain the spending decisions of colleges and universities."

Our results from Table 7 in Section VII offer a middle ground interpretation since we estimate that 40% of each increase in contributions translates into an increase in university spending power as measured by the size of the quasi-endowment. From this perspective, our findings indicate that our sample period was characterized by growth in endowment spending power for both existing and new activities.

A second justification that endowment growth need not be suboptimal is that increased universities may already be overcommitted in their spending plans. Campbell, Stein, and Wu (2024) in this volume estimate that the Harvard Faculty of Arts and Sciences has been running a 21% structural budget deficit even with the increased payouts that have resulted from the long-term growth of the endowment. Based on IPEDS reporting, the institutions in our sample have yearly expenses of approximately 35% of their endowment values, so they are much more dependent on revenues from other sources than from endowment payouts. Further, the findings of J. Brown and Weissbenner (2014) that universities cut expenses beyond the level called for by their existing spending rules suggest that the financial situations of these institutions may be surprisingly precarious. The increase in quasi-endowments that we observe may be an optimal response to expectations of declines in future revenue, for example from mean reversion in endowment returns, declines in net tuition revenue given projected student demographics, or even concerns about increases in the recently instituted endowment tax.

To the degree that the growth of university endowments has expanded their spending power, the standard model of sustainable spending (Campbell and Sigalov, 2022)) calls for a smoothed increase in future spending and incremental expansion of funded activities, as would be suggested by a fixed payout rate for a stable endowment level after adjusting for inflation.[12] From this perspective, the increase in average endowment payout rate from 4.3% from the period (1956-1997) observed by Ehrenberg to more than 5% per year at present suggests that

[12] Campbell and Martin (2023) provides a different perspective on sustainable spending based on the concept from environmental economics of maintaining equal utility levels for individuals in different generations.

universities have increased endowment spending given an assessment that their continuing strong investment returns increase the level of spending that is sustainable. The increase in quasi-endowment suggests that the higher spending rate has not led one for one to higher spending, but in fact a reallocation from restricted to unrestricted endowments, as savings in the budget are reallocated as funds functioning without restrictions. This increases the institution's flexibility to respond to future events. The increase in quasi-endowments may be a rational response to the possibility of mean reversion in financial returns with the implication that universities might have to be less optimistic about future financial returns after the ahistorical rise in stock market values in 2020-2021.

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An alternative to the guidance of smoothed spending over time is for institutions to proceed with larger investments (that were presumably not previously feasible) with potentially outsize benefit-cost returns in response to long-term increases in endowment level. Given such an unexpected surplus of funds, an institution could consider one-time investments, such as a new building or the start-up costs for a new academic program or longer-term investments based on discrete increases in endowment payouts. But, as highlighted by Figure 1 earlier in the paper, increases in spending or commitments to spending in the present and in the near-future implicitly reflect the view that marginal increases in spending will produce greater value now than in the future, constituting a bet that may be uncomfortable for many Boards of Trustees.

One possible use of endowment funds would be to provide additional financial aid. Baum and Lee (2019) suggest that it is paradoxical that some institutions with outsize endowments practice need-aware admissions, meaning that they have a systematic policy of rejecting some well-qualified students solely on the basis of financial need. Bulman (2022) studies the effects of investment returns on future spending and concludes that plausibly exogenous increases in endowments lead to more spending, but do not appear to increase diversity or the number of low-income students who enroll. Similarly, Baum, Hill, and Schwartz (2018) find that "*Institutions with high endowments per student do use these resources to lower net prices for students, but not necessarily to enroll greater shares of students with financial need compared to other institutions*." These authors emphasize that since most institutions with very large endowments are need-blind and offer generous financial aid programs to students who are admitted, it would

only make sense to direct additional funds to financial aid in tandem with substantive changes in recruiting and admission practices. If is optimal to increase spending on need-based aid, it would most likely need to be a sustainable long-term rather than a one-time or short-term increase, which may explain why Bulman (2022) finds that exogenous increases in endowment returns do not lead to observable increases in financial aid.

The cliche "A rising tide lifts all boats" applies both to restricted and unrestricted endowment funds; a period of unusually large investment returns would necessarily open new possibilities for unrestricted spending for any institution that was not initially dramatically underwater. The last two years of our sample period and the nearly two years since the end of our sample period may meet this definition. Our sample data indicated nominal endowment increases averaging 30% in 2020-21 in a year with essentially no inflation. Though 2021-22 brought a combination of endowment declines and outsize inflation, both 2022-23 and the first three quarters of 2023-24 have been fertile periods for investments. For example, the S&P 500 increased 17.6% in 2022-23 (from 3785 on 6/30/22 to 4450 on 6/23) and another 17.6% so far in 2023-24, a year of declining inflation. Based on these figures, it could be common for an institution to increase its endowment by 50% in real terms during these four years. A change in endowment status of that size would likely provide a variety of new opportunities and suggest substantive adjustments to existing endowment spending rules. The optimal response will depend on future expectations however of all revenue and expenditure streams, as suggested by Campbell, Stein, and Wu. The increase in quasi endowments that we observe do suggest that institutions are optimizing over all revenue streams, not just from endowments, and that they are anticipating challenges in the future. Whether this should be considered "hoarding" depends on one's view of the likelihood of these anticipated challenges.

References

Ang, Andrew, Andrés Ayala, and William N. Goetzmann. 2018. "Investment beliefs of endowments", *European Financial Management*, 24, 3–33.

Baum, Sandy, Catharine Bond Hill, Emily Schwartz. 2018. "College and University Endowments: In the Public Interest?" Ithaka Policy Report.

Baum, Sandy, and Victoria Lee. 2019. "The Role of College and University Endowments." Center on Education Data and Policy Research Report.

Blanchett, D, 2014. "Donation risk and optimal endowment portfolio allocations", *Journal of Portfolio Management* 41, 109–120.

Brown, David, and Dan Scholz. 2019. "Discount rates and asset returns: Implications for endowment strategies", Working Paper.

Brown, Jeffrey R., Stephen G. Dimmock, Jun-Koo Kang, and Scott J. Weisbenner. 2014. "How University Endowments Respond to Financial Market Shocks: Evidence and Implications." *American Economic Review* 104(3): 931962.

Brown, Keith, Cristian Tiu. 2013. "The interaction of spending policies, asset allocation strategies, and investment performance at university endowment funds," in in *How the Financial Crisis and Great Recession Affected Higher Education*, eds. Jeffrey R. Brown and Caroline M. Hoxby. University of Chicago Press.

Bulman, George. 2022. "The effect of college and university endowments on financial aid, admissions, and student composition." NBER Working Paper 30404.

Campbell, John, and Ian Martin. 2023. "Sustainability in a risky world", Working Paper.

Campbell, John, and Roman Sigalov. 2022. "Portfolio choice with sustainable spending: A model of reaching for yield", *Journal of Financial Economics* 143, 188–206.

Cejnek, Georg, Richard Franz, Neal M. Stoughton. 2023. "Portfolio Choice with Endogenous Donations - Modeling University Endowments", Working Paper.

Cejnek, Georg, Richard Franz, Otto Randl, and Neal M. Stoughton, 2014. "A survey of university endowment management research." *Journal of Investment Management* 12, 90-117.

Chambers, David, Elroy Dimson, and Charikleia Kaffe, 2020. "Seventy-five years of investing for future generations. *Financial Analysts Journal* 76, 5-21.

Dahiya, Sandeep, and David Yermack. 2021. “Investment returns and distribution policies of non-profit endowment funds”, Working Paper.

Dimmock, Stephen G. 2012. “Background risk and university endowment funds”, *Review of Economics and Statistics*, 94, 789–799.

Dybvig, Philip and Zhenjiang Qin. 2021. “How to squander your endowment: Pitfalls and remedies”, Working Paper.

Deming, David and Christopher Walters. 2017. “The Impact of Price Caps and Spending Cuts on U.S. Postsecondary Attainment,” NBER Working Paper 23736.

Ehrenberg, Ronald G. 2000. *Tuition Rising*, Harvard University Press.

Ehrenberg, Ronald G. 2009. “Demystifying Endowments.” TIAA-CREF Institute Advancing Higher Education Working Paper.

Filosa, Tracy. 2023. *The Role of the Endowment in the Dynamic College and University Business Model*. Cambridge Associates. Presentaion. NBER Conference, Financing Higher Education, Spring.

Gilbert, Thomas, and Christopher Hrdlicka. 2015. “Why are university endowments large and risky?”, *Review of Financial Studies*, 28, 2643–2686.

Grawe, Nathan D. 2018. *Demographics and the Demand for Higher Education*, Johns Hopkins Press.

Halem, Zachery, Andrew Lo, Egor Matveyev, and Sarah Quraishi, 2022, “The effects of spending rules and asset allocation on nonprofit endowments”, *Journal of Portfolio Management* 49, 44.

Hansmann, Henry. 1990. “Why Do Universities Have Endowments?” *The Journal of Legal Studies* 19 (1): 3-42.

Hoxby, Caroline M. 2014. “Endowment Management Based on a Positive Model of the University,” in *How the Financial Crisis and Great Recession Affected Higher Education*, eds. Jeffrey R. Brown and Caroline M. Hoxby. University of Chicago Press.

IRS Form 990 data, including Schedule D.

Lo, Andrew, Egor Matveyev, and Stefan Zeume. 2021. “The risk, reward, and asset allocation of nonprofit endowment funds”, Working Paper.

National Center for Education Statistics (NCES). Integrated Postsecondary Education Data System, Complete Data Files. U.S. Department of Education. https://nces.ed.gov/ipeds/datacenter/DataFiles.aspx.

Piketty, Thomas. 2014. *Capital in the 21st Century*, Harvard University Press.

Sedlacek, Verne O.; Jarvis, William F. 2010. "Endowment Spending: Building a Stronger Policy Framework," Commonfund Institute Report available at https://eric.ed.gov/?id=ED559301

Stein, Jeremy. 2023. "Economic Budgeting for Universities," presentation at NBER Financing Higher Education Conference, February 3, 2023.

Tobin, James. 1974. "What Is Permanent Endowment Income?" *The American Economic Review Papers and Proceedings* 64(2): 427-432.

Webber, Douglas A. 2018. "Higher Ed, Lower Spending: As States Cut Back, Where Has the Money Gone?" *"Higher Ed, Lower Spending: As States Cut Back, Where Has the Money Gone?" Education Next,* 18(3): 72-78.

Webber, Douglas A. and Ronald Ehrenberg G., 2010. "Do Expenditures other than Instructional Expenditures Affect Graduation and Persistence Rates in American Higher Education," *Econonmics of Education Review*, 29(6), 947-958.