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How University Endowments Respond to Financial Market Shocks: Evidence and Implications[†]

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Endowment payouts have become an increasingly important component of universities' revenues in recent decades. We study how universities respond to financial shocks to endowments and thus shed light on a number of existing models of endowment behavior. Endowments actively reduce payouts relative to their stated payout policies following negative, but not positive, shocks. This asymmetric behavior is consistent with "endowment hoarding," especially among endowments whose current value is close to the benchmark value at the start of the university president's tenure. We also document the effect of negative endowment shocks on university operations, such as personnel cuts. (JEL G35, I22, I23)

Endowments have become an increasingly important source of financing for universities over the past two decades, as the growth rate of the average endowment has far outpaced the growth rate of university expenditures. Much of this endowment growth is attributable to the positive investment returns that resulted from the gradual shift of endowment investments from fixed income to equities in the 1970s and 1980s, followed by a shift towards alternative assets such as hedge funds, private

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equity, and venture capital in the 1990s and 2000s (Lerner, Schoar, and Wang 2008). Although this shift provided endowments with impressive average returns, it also increased endowments' exposure to financial market risk, including the large market downturns witnessed in 2001–2002 (the bursting of the technology bubble) and 2008–2009 (the global financial crisis). This article uses these financial market fluctuations to shed light on various economic models of endowment payout behavior.

Several of the leading minds of the economics profession have written normative models of university endowments that have implications for endowment payout policy. Tobin (1974) presents a model in which endowments smooth the income provided to the universities they support. Merton (1992) analyzes a portfolio choice model in which endowment payouts are one part of a university's overall revenue stream and argues that endowments should be used to hedge shocks to other revenue sources. Black (1976) also emphasizes the idea of endowments as a form of self-insurance, noting that "it is important to see the endowment fund as just one of the university's sources of income." Despite this theoretical attention, the empirical literature on endowment payouts is surprisingly thin. We step into this void by analyzing the payout behavior of endowments, focusing specifically on how endowment payouts respond to both positive and negative financial shocks.¹

To document how endowments respond to shocks, we combine several sources of data into a panel with information on both endowments and their affiliated universities. We measure endowment shocks both by endowment returns as well as by the returns normalized by endowment size relative to university total costs. To allow for asymmetric responses, we decompose endowment shocks into positive and negative shocks. Although endowments experienced considerable growth over our 1987–2009 sample period, they also experienced two severe negative financial shocks—the collapse of the technology bubble and the global financial crisis.

Our panel data allow us to control for a rich set of covariates, including university fixed effects and year-by-public/private fixed effects. As such, we control directly for all time-invariant characteristics that might be unique to a given university including its endowment payout policies, as well as control for any factors that are specific to a given year, a given type of institution (public versus private), or their interactions (e.g., economic and financial conditions or demand for certain types of universities that may vary over time). Our identification therefore comes from studying different responses by universities of the same type (i.e., public or private) in the same year, to differences in the size of both positive and negative endowment shocks, while controlling for time-invariant differences across universities. In results presented in an online Appendix, we show that our results are robust to an even richer set of fixed effects, including state-by-year-by-public/private fixed effects.

Our primary finding is that university endowments respond asymmetrically to contemporaneous positive and negative financial shocks. In response to contemporaneous positive shocks, endowments tend to leave current payouts unchanged. Such behavior is consistent with endowments following their stated payout policies, which are based on past endowment values and not current returns, in order to smooth payouts (e.g., pay out 5 percent of the past three-year average of endowment values).

¹ We will use the term "endowment shock" or "shock" to refer to changes in endowment returns (either absolute or normalized by the ratio of endowment size to annual university costs) that result from market movements.

However, following contemporaneous negative shocks, endowments actively *reduce* payout rates. Unlike their response to positive shocks, this behavior is inconsistent with endowments following their standard smoothing rules. This asymmetry in the response to positive and negative shocks is especially strong if we explicitly control for the payout rate that is implied by the universities' stated payout rules (something we do for a subsample of the endowments for which we have sufficient information to precisely document their payout rules). We also fail to find consistent evidence that universities change endowment payouts to offset shocks to other sources of university revenues. These findings, which we confirm through several robustness checks, suggest that endowments' behavior differs from that predicted by several normative models of endowment behavior.

Instead, our results support an alternative hypothesis, which we refer to as "endowment hoarding."² This idea is captured succinctly by Hansmann (1990, p. 38) who argues that "maintenance of an endowment is often viewed as an objective in its own right, rather than as simply a means to an end." Similarly, Conti-Brown (2011, p. 704) speculates that university administrators limit payouts, even in bad economic times, because they value endowment size as a "symbol of status and prestige." Our core result regarding the asymmetric payout response to endowment shocks (i.e., reduced payouts following negative shocks, but no response to positive shocks) is, to our knowledge, the first empirical test of the "endowment hoarding" hypothesis, and the results support this view. To further refine our test, we examine situations where the incentive to hoard assets would be particularly strong. Specifically, we create a variable "president's benchmark," which is the ratio of the current endowment size to its size at the beginning of the president's tenure, the idea being that university leadership may be particularly sensitive to growing the size of the endowment from what they inherited. We find a sharp nonlinearity in the response of payouts to endowment shocks—the asymmetric response to shocks is driven entirely by universities whose endowments are within 10 percent of the president's benchmark.

We then examine whether this payout behavior has real consequences for university operations. Although the link between financing decisions and real activities of corporations has long been an important research question, dating to the work of Modigliani and Miller (1958), ours is the first study to provide evidence on how financial shocks to endowments affect universities. Because universities do not fully smooth over negative shocks (and, indeed, do the opposite), we expect universities to adjust on some other margin. Consistent with this expectation, we find that these shocks affect university employment:³ relative to universities with smaller shocks, universities with larger negative endowment shocks respond, on average, by reducing tenure-system faculty. A negative endowment shock equivalent to 10 percent of a university's budget leads to a 4.9 percent reduction in the number of tenure-system faculty during the following year

²This terminology is motivated by Senator Charles Grassley (R-Iowa), who has repeatedly accused university leaders of "hoarding assets." See <http://www.insidehighered.com/news/2011/12/09/grassley-renews-focus-endowments> and http://www.grassley.senate.gov/news/Article.cfm?customel_dataPageID_1502=38191. We note that Hansmann's (1990) discussion of "preferences of administrators and faculty" is consistent with our hoarding hypothesis.

³Focusing on university employment decisions has several advantages. First, salaries and benefits to university employees are sizable, representing roughly 60 percent of the typical doctoral university's budget. Second, the classifications and counts of university employees are measured consistently across universities and within a given university over time, enabling valid cross-sectional and time-series comparisons.

(either through less hiring, greater attrition, or more dismissals). In contrast, we do not observe any changes in the number of faculty following positive shocks. In addition to reducing tenure-system faculty, universities react to negative shocks by also cutting support employees (e.g., secretaries) and to some extent maintenance employees. We find no effect, however, on the number of adjunct faculty or administrators. Consistent with the payout results, the effects of negative endowment shocks on the employment of tenure-system faculty are concentrated among universities whose endowments are close to the president's benchmark, as these are precisely the universities that experience the largest endowment payout reductions.

Understanding the real effects of endowment behavior is important for several reasons. At a broad level, universities serve as a major source of knowledge creation and dissemination and thus contribute to the global stock of human capital. Our research contributes to the understanding of whether financial markets have an effect on these educational activities and, thus, provides evidence on a channel through which financial markets can influence the real economy in important and long-lasting ways. At a more personal level, many of the readers of this article are likely scholars employed by US doctoral institutions, and the effect of endowment shocks has the potential to influence our profession in a very direct way. In general, the results in this article allow us to shed light on the priorities of university leaders. In addition to endowment shocks, our study may also provide insight into how universities respond to other types of financial shocks, such as shocks to public funding or changes in gifts, grants, and contracts. The advantage of using endowments to identify a university's response to resource shocks is that these shocks are largely exogenous, as the variation arises from historical differences in activities to build and invest an endowment combined with fluctuations in global financial markets. In contrast, other types of variation in a university's resource base might be endogenously determined. Finally, our results have implications for the current policy debate about the proper role and payout policies of endowment funds.

The article proceeds as follow. Section I provides an overview of university endowments, their payout policies, and their recent growth. Section II reviews several existing models of endowment payouts and highlights their empirical implications. Section III discusses our research methodology. Section IV presents the core results, and the robustness tests that rule out alternative explanations such as legal constraints on spending. Section V tests the endowment hoarding hypothesis, which posits that payout decisions are influenced by a desire to grow the endowment, especially relative to the endowment's value at the start of a university president's tenure. Section VI provides evidence on how these payout responses affect universities' real operations, specifically personnel decisions. Section VII concludes.

I. An Overview of University Endowments

A. What is an Endowment?

Endowments consist of both financial and real assets held to generate income for current and future operations of their affiliated universities (Ehrenberg 2009). Typically, the endowment size reported by a university includes both "true endowments" (assets specified by the donor to be held in perpetuity) as well as

“quasi-endowments” (funds the university treats as an endowment but which could be spent should the university so choose).⁴

Although endowments are usually separate legal entities from the universities they serve, endowment boards are typically appointed by the university. Indeed, most endowment board members are also university trustees. The selection of investment managers is usually delegated to the endowment board’s investment committee, but the university usually retains direct control over endowment payout rates. Even when authority for payouts is formally granted to the investment committee, as is the case for approximately 38 percent of endowments, anecdotal evidence suggests that university leadership has enormous influence over resource allocation to the university. Indeed, in more than two-thirds of endowments, the university president sits on the investment committee. In more than three-quarters of endowments, the president, the CFO (who reports to the president), or both serve on the investment committee. As such, it is generally believed that university presidents have substantial influence over payout decisions.⁵

B. Endowment Payout Policies and Payout Rates

Unlike private foundations, which are legally required to make minimum annual payouts, university endowments are not subject to such payout restrictions. Nonetheless, nearly all university endowments follow payout policies that distribute money to support the educational mission of their affiliated university (see Sedlacek and Jarvis 2010 for a discussion of endowment spending policies). The typical endowment payout policy specifies a payout rate that is applied to a multi-year moving average of endowment values. For example, an endowment’s payout policy might specify that it distributes 5 percent of a three-year moving average of its endowment balance. This rule has the effect of partially smoothing payout levels as the endowment size changes over time. However, there is variation across universities in these rules, which is why we conduct sensitivity analysis below on a subset of universities for which we know their precise payout rules.

When discussing payout *rates*, it is useful to distinguish the rate specified in the endowment’s payout policy, and applied to a moving average of prior years’ endowment values, from the actual payout rate defined as actual dollar payouts relative to the contemporaneous endowment value. To help distinguish these two different concepts of payout rates, we use the terms “policy payout rate” and “actual payout rate.” A simple example is useful for illustrating this distinction: Suppose an endowment has a value of \$70 million at the start of year $t - 2$, experiences net growth of \$10 million per year for the next three years (where net growth includes new donations and returns on existing balances, minus payouts to the university), followed by a substantial loss of \$20 million during year $t + 1$, and no net growth in year $t + 2$. The following chart illustrates how payout amounts would follow these endowment

⁴Hansmann (1990) and Dimmock (2012) use the term “quasi-endowment,” whereas Ehrenberg (2009) uses the term “funds functioning as endowments.”

⁵These tabulations are based on the data described in Brown et al. (2011). See this paper for further details on endowment governance.

values assuming the endowment follows a policy of paying out 5 percent of a past three-year moving average:

	$t - 2$	$t - 1$	t	$t + 1$	$t + 2$	$t + 3$
Endowment value (beginning of year)	\$70	\$80	\$90	\$100	\$80	\$80
Net growth in endowment (during year)	\$10	\$10	\$10	−\$20	\$0	—
Payout amount (during year)	—	—	\$4.0	\$4.5	\$4.5	\$4.3
“Policy payout rate”	—	—	5.0%	5.0%	5.0%	5.0%
“Actual payout rate” (payout amount divided by endowment value at beginning of year)	—	—	4.4%	4.5%	5.6%	5.4%

This example illustrates the inherent smoothing effect of multiyear averaging payout rules. While the “policy payout rate” is constant at 5 percent as specified by the payout rule, the contemporaneous “actual payout rate” is below 5 percent in rising markets and above 5 percent in falling markets. Because the policy payout rate is defined based on historical endowment values, financial shocks *during the year* should not affect payout amounts during that year. Rather, a shock this year will affect *future* payouts through the moving average formula. Our empirical work below examines whether endowments adhere to their stated payout policies.

C. Data on Endowments and Universities

The best source of data on university endowments is the series of annual surveys conducted on behalf of the National Association of College and University Business Officers (NACUBO). These data have been used in several studies of endowment investment behavior, including Lerner, Schoar, and Wang (2008); Brown, Garlappi, and Tiu (2010); Barber and Wang (2011); and Dimmock (2012). These data cover the period from 1986 through 2009⁶ (where 2009 refers to the 2008–2009 academic year) and provide information on the market value of the endowment, investment performance, payout rates, and more. For a more detailed description of the NACUBO data, we refer the reader to Brown, Garlappi, and Tiu (2010). For some analyses, we also use information from the Commonfund endowment surveys.⁷ The Commonfund surveys provide more detailed information about the specific payout policies for a subset of the institutions in the NACUBO sample.

We are also interested in characteristics of the universities that the endowments support. Thus, we merge the NACUBO data with data from the Integrated Postsecondary Education Data System (IPEDS), collected by the National Center for Educational Statistics (a division of the US Department of Education). These

⁶In 2009, NACUBO and the Commonfund merged their endowment surveys. The data for the 2008–2009 academic year comes from the joint NACUBO-Commonfund Endowment Survey (NCES). For expositional simplicity, we refer to this merged dataset as the NACUBO dataset throughout the paper.

⁷See http://www.commonfund.org/Commonfund/About+Us/commonfund_mission_2004.

data include extremely rich information on nearly every aspect of universities, including numbers of employees by job category.⁸

We focus on universities with the Carnegie Classification of “doctoral” (i.e., universities that offer Ph.D. degrees)⁹ for three reasons. First, endowments tend to be relatively more important for these institutions than for other colleges and universities (the exception being a small set of prestigious liberal arts colleges, which we include in robustness checks in an online Appendix).¹⁰ Second, doctoral institutions are a more homogeneous group than all colleges and universities, thus allowing us to more cleanly focus on the effect of endowment shocks. Finally, more reliable and longer time-series data are available for doctoral institutions than for institutions with other Carnegie classifications.¹¹

In 2008, there were just over 200 US doctoral universities with endowment data available through the NACUBO surveys. This sample accounts for 80 percent of all doctoral institutions, 94 percent of total spending, 90 percent of students, and 99.9 percent of federal research spending of the entire universe of US doctoral institutions. Throughout the article, for expositional purposes, we use the term “universities” to refer to doctoral universities.

D. The Size, Growth, and Volatility of University Endowments

In Table 1, we report summary statistics for our sample of institutions from the 1985–1986 academic year through the 2008–2009 academic year. As shown in the first row of Table 1, endowment size varies tremendously, with the mean endowment size of nearly \$740 million being significantly larger than the median of \$193 million. The largest in the sample is Harvard University’s endowment, with a June 2008 value of more than \$43 billion.

In the second row of Table 1, we report the distribution of the endowment-to-cost ratio (endowment market value normalized by annual university budget) for all doctoral institutions. This ratio measures the importance of the endowment to university operations, and we again see heterogeneity. On average, it has a value of 1.03. A value of one for this ratio corresponds to a university in which the endowment value is equal to the amount of money that the university spends during the year.

As illustrated in Figure 1, the aggregate value of the endowments held by US doctoral universities has increased tremendously over the past two decades, growing from \$31 billion in 1986 to \$370 billion in 2008, before declining to \$273 billion in 2009 as a result of the global financial crisis. In Figure 2, we compare the growth in endowment values over our sample period with that of university budgets. In the top chart, we simply plot the growth rates of the average endowment value and average annual university budget. In the bottom chart, we plot the growth rates of

⁸Coverage in the NACUBO and IPEDS datasets differ by variable. The numbers of employees by job category are available throughout the sample except for the years 1988, 1990, and 2000. Endowment payouts are available from 1993 onward. Endowment size, endowment returns, and total university costs are available over the full sample.

⁹For more information on Carnegie Classifications, see <http://classifications.carnegiefoundation.org/>.

¹⁰In column 3 of each online Appendix table, we report results for a sample that includes the liberal arts colleges that belong to the Consortium on Financing Higher Education (COFHE): Amherst, Barnard, Bryn Mawr, Carleton, Mount Holyoke, Oberlin, Pomona, Smith, Swarthmore, Trinity, Wellesley, Wesleyan, and Williams.

¹¹Most doctoral universities participate in the NACUBO endowment survey for the entire period. In contrast, nondoctoral institutions generally entered the sample more recently.

TABLE 1—DISTRIBUTIONS OF VARIOUS CHARACTERISTICS OF ENDOWMENTS
AND OPERATIONS OF DOCTORAL UNIVERSITIES, 1986–2009

	Mean	SD	10th	25th	50th	75th	90th
<i>Endowment size, payouts, and performance</i>							
Assets (market value, \$M)	739	2,092	31	67	193	576	1,537
Endowment-to-university-cost ratio	1.03	1.65	0.10	0.22	0.51	1.13	2.29
Dollar payout (\$M)	40.5	105.4	2.0	4.4	11.1	34.0	90.6
Contemporaneous payout rate (in percent)	5.2	1.3	3.8	4.5	5.2	5.9	6.7
Payout-to-university-cost ratio	0.052	0.080	0.006	0.012	0.025	0.056	0.123
Return (in percent)	9.0	11.4	−5.9	2.0	11.0	16.8	20.9
Endowment shock	0.09	0.26	−0.03	0.00	0.03	0.10	0.26
<i>Budget, employment, and salary data</i>							
Total university costs (\$M)	620	660	113	201	386	773	1,450
Total salary and benefits for all employees (\$M)	361	434	65	118	221	419	825
Budget share of salary and benefits for all employees	0.58	0.21	0.42	0.51	0.57	0.61	0.65
Total number of employees	4,892	3,671	1,294	2,102	3,897	6,841	10,064
<i>Employee share of total university employment</i>							
Share of tenure-system faculty	0.26	0.11	0.14	0.18	0.23	0.31	0.41
Share of adjuncts	0.07	0.05	0.02	0.03	0.06	0.09	0.14
Share of support employees	0.48	0.11	0.33	0.41	0.48	0.55	0.61
Share of maintenance employees	0.12	0.05	0.06	0.10	0.12	0.15	0.18
Share of administrators	0.08	0.05	0.03	0.04	0.06	0.10	0.14
<i>Nonendowment revenue sources</i>							
Government appropriations (share of all revenue)	0.21	0.19	0.00	0.00	0.22	0.38	0.47
Government gifts, grants, and contracts (share of all revenue)	0.19	0.18	0.06	0.10	0.14	0.21	0.31
Revenue shock (from government revenue sources)	0.01	0.09	−0.02	0.001	0.02	0.04	0.06

Notes: Data sources are NACUBO and IPEDS. Year represents academic year (e.g., 2009 represents the 2008–2009 academic year).

the median values of these two variables. The annual growth rate for the average (median) endowment is 8.7 percent (8.3 percent) over 1986–2009, outpacing the growth rate for the average (median) university budget of 6.4 percent (5.7 percent).

Although our sample period was dominated by rising equity markets, there were several negative shocks. The recent drop in endowment values is quite substantial in both dollar amounts and percentage terms; however, it appears somewhat less drastic when placed in historical perspective. For example, as a result of the recent market declines, endowments, on average, returned to their level of about three years earlier (i.e., 2006). Thus, the extent to which universities felt the pain of the recent declines depends, in part, on how quickly they incorporated prior endowment gains into their payout decisions.

Turning back to Table 1, we find that payout rates (the amount of money transferred from the endowment to the university in a given year normalized by the market value of the endowment at the start of the year) are generally 4–6 percent. For the full sample, endowment payouts cover about 5 percent of a university's total costs, with endowments accounting for at least 12 percent of the annual budget at

FIGURE 1. AGGREGATE MARKET VALUE OF ENDOWMENT FUND ASSETS AT DOCTORAL UNIVERSITIES, 1986–2009

Notes: Data source is NACUBO. Year refers to academic year (e.g., 2009 is the 2008–2009 academic year). Endowment values are measured at the end of the academic year.

one-tenth of universities. The average annual endowment return is 9 percent over the full sample period, with a two-year average cumulative return over the 2001 and 2002 academic years of -9.2 percent, and an average return of -19.7 percent over the 2008–2009 academic year. Figure 3 illustrates both the time-series and cross-sectional variation in the performance of endowments over the full sample period.

Table 1 also shows that, not surprisingly, the main component of university expenditures is payment to employees: salaries and benefits account for 58 percent of the average university budget for the full sample; with a tight distribution across universities (the tenth percentile budget share is 42 percent and the 90th percentile budget share is 65 percent). The average (median) number of full-time employees is 4,892 (3,897). Tenure-system faculty account for just over one-quarter of the work force of a typical university, with support employees (e.g., secretaries) accounting for just under half of all full-time employees.¹²

II. Models of Endowments

As noted by Hansmann (1990), Winston (1999), and others, the theory of the non-profit sector in general, and higher education in particular, is not as well developed as standard producer or consumer theory. Indeed, there is no consensus view in the literature on how to define the objective functions of universities or of the endowments

¹²The number of employees is measured at the *end* of the academic year (e.g., the 2009 number of employees reflects the head count as of June 30, 2009).

Panel A. Percent change in average endowment size and university costs

Panel B. Percent change in median endowment size and university costs

FIGURE 2. GROWTH RATE OF ENDOWMENT SIZE (MARKET VALUE) AND UNIVERSITY COSTS AT DOCTORAL UNIVERSITIES, 1986–2009

Notes: Data sources are NACUBO for endowment market values and IPEDS for total university costs. Year refers to academic year (e.g., 2009 is the 2008–2009 academic year). Endowment values are measured at the end of the academic year, and university costs are measured during the year.

that help to support them.¹³ This lack of consensus is not due to a lack of attention, as several leading economists have proposed normative models of endowment behavior.

¹³ Winston (1999) summarizes a number of ideas relating to universities' objective functions, including Clotfelter's (1999) suggestion that universities are motivated by "the pursuit of excellence," Bowen and Breneman's (1993) notion that universities seek to improve the quality and equity of educational services, and James' (1990) idea of "prestige maximization." More recently, Hoxby (forthcoming) posits that a university maximizes its contribution to the intellectual capital of society, valued at social returns.

FIGURE 3. DISTRIBUTION OF ENDOWMENT RETURNS AT DOCTORAL UNIVERSITIES, 1986–2009

Notes: Data source is NACUBO. Year refers to academic year (e.g., 2009 is the 2008–2009 academic year).

A. Intergenerational Equity and Smooth Payouts

The first model of endowments comes from Tobin (1974), who argues that the trustees of an endowed institution should act as if the institution is immortal and seek to treat all generations equally. Thus, his model suggests that the trustees should behave as if they have a zero subjective rate of time preference. He further argues that the prospect of future gifts should not affect current consumption, nor should changes in tuition, grants, or other revenue affect payouts. The main implication of his model is that endowments should provide a smooth flow of real income to their affiliated universities, and they should do this by spending the real return on the endowment each year. In his summary of the early literature on endowment payouts, Merton (1992) states that most models take “as given that the objective for an endowment is to provide a perpetual level flow of expected real income.”¹⁴

In Tobin’s (1974) model, an endowment’s payout rate is determined by the dividend rate of the endowment’s investments, the expected rate of dividend growth, and the inflation rate for higher education. His model does not provide a direct prediction of the effect of return shocks on endowment payouts. Changes in asset prices resulting from changes in dividends (either the payout rate or the expected growth rate of dividends) affect payouts in his model, but changes in asset prices from

¹⁴ Merton’s (1992) review includes papers by Eisner (1974), Litvack, Malkiel, and Quandt (1974), and Nichols (1974), among others. For more recent contributions to this literature, see Gilbert and Hrdlicka (2013).

changes in discount rates do not. Thus, the effect of endowment shocks depends on whether investors believe the shocks are driven by cash flow news or discount rate news. Given the empirical difficulty in separating these two components of asset returns (e.g., see the review in Cochrane 2011), it is not easy to derive clear predictions from Tobin's model.

Several papers build upon Tobin (1974) and, by introducing some simplifying assumptions, develop models with clearer predictions. Gilbert and Hrdlicka (2013) assume that asset returns are mean reverting and, given these assumptions, show that the payout rate has a small, positive relation with return shocks, and that this relation is symmetric for positive and negative return shocks. Dybvig (1999) develops a similar model, but in his model the endowment's primary goal is to avoid reducing payments to the university. He also assumes that asset returns follow a random walk. Given these assumptions, the payout *amount* increases very slowly following positive shocks, but does not decline at all following negative shocks. As a result, the payout *rate* decreases following positive shocks (the small increase in dollar spending is more than offset by the increase in portfolio value), and the payout *rate* increases following negative shocks (the dollar spending amount is unchanged, but the endowment value is smaller).

Tobin's (1974) view that endowments should focus on intergenerational equity and a smooth stream of real income has been highly influential in practice. The 2004 Commonfund endowment survey asked about the main principle underlying endowments' payout policies. The responses showed that 54 percent of endowments considered delivering a constant (or increasing) stream of income to their university as the most important principle. Another 25.6 percent of endowments considered intergenerational equity as the primary principle guiding payout policy.

Although Tobin's (1974) model has had a significant effect on stated goals, it is not clear that common endowment payout policies are consistent with intergenerational equity. Hansmann (1990) shows that the model of Tobin (1974) is inconsistent with the goal of intergenerational equity for reasonable assumptions. For example, if there is economic growth, paying out a constant real amount transfers wealth from relatively poor students in the present to relatively wealthy students in the future. He also notes that a model should not ignore future gifts, or any future income that is reasonably foreseeable. His other critiques of Tobin (1974) include that a constant payout policy ignores changes in the productivity of university expenditures, changes in demand for university services, and changes in educational technology. Instead, Hansmann (1990) argues that the optimal payout rate depends upon the relative expectations of endowment returns, the growth of students' incomes, and the growth of the cost of educating students.

B. Endowments as Insurance or as Precautionary Saving

An alternative model of endowments is that they provide universities with the ability to self-insure, such as hedging against revenue shocks or providing precautionary savings that may be used when other revenues are unexpectedly low. Hansmann (1990) argues that one of the most compelling reasons to accumulate endowments is that "they serve as a financial buffer against periods of financial

adversity.”¹⁵ This idea is discussed in the context of asset allocation by Black (1976) and Merton (1992). In the case of complete markets, Merton (1992) shows that asset allocation can allow endowments to perfectly hedge against shocks to other revenues. Merton (1992) briefly addresses the issue of payout rates in incomplete markets, but his model does not lend itself to clear empirical implications. Fisman and Hubbard (2005) show that endowments can provide a valuable precautionary savings role for nonprofits, and that a key role for endowment payouts may be to smooth out other revenue shocks.

C. Agency Problems and Endowment Payouts

Both academics and public officials have suggested the possibility of agency problems in the context of endowments. For example, Hansmann (1990, pp. 35–36) argues that “extreme fiscal conservatism may serve the personal interests of a university’s faculty and administrators,” possibly leading them “to build reserves that will help make their jobs secure in the future.” US Senator Charles Grassley has publicly pressed the Obama Administration to “find ways to get educational institutions to help the people they’re supposed to help instead of hoarding assets at taxpayer expense” (Grassley 2011). Of course, administrator preferences could also work in the opposite direction, such as if an administrator has a short-time horizon and wants to please current faculty, students, and other constituents by spending heavily. Indeed, Hansmann (1990) recognizes this conflict, noting that university faculty may prefer “instead an increase in spending on current programs.” In such a case, universities might increase endowment payouts following positive shocks but fail to make necessary cuts after negative shocks.

Fisman and Hubbard (2005) explore the trade-off between the expenditure-smoothing benefits of an endowment and a concern that funds might be diverted for personal benefit. They provide empirical evidence consistent with donors being more willing to fund endowments in states with stronger oversight rules. Core, Guay, and Verdi (2006) provide further evidence on agency problems, noting that most nonprofit firms with excess endowments spend less on program expenditures and more on CEO, officer, and director pay.

III. Methodology

A. Defining Shocks

To shed light on these alternative models of endowments, we examine how payouts respond to endowment shocks. We begin by regressing the natural log of payouts on endowment returns during the year and a range of fixed effects. We then examine how payout *rates* respond to endowment shocks, which we

¹⁵ Hansmann (1990) also explains several other compelling reasons to hold endowments: “to insure the long-run survival of the institution’s reputational capital, they protect the institution’s intellectual freedom, and they assist in passing on values prized by the present generation.” He goes on to question whether endowments are really managed in a manner that is consistent with these goals and suggests that “prevailing endowment spending rules seem inconsistent with most of these objectives” (p. 39). However, he does not provide any rigorous empirical tests to support these arguments, and his conclusions have been criticized by Swensen (2000), among others.

measure by normalizing endowment returns by the endowment fund size relative to the university's expenditures in year $t - 1$. Specifically, we define endowment shocks as

$$(1) \quad Shock_{i,t} = Return_{i,t} \times \frac{Endowment\ Fund\ Size_{i,t-1}}{Total\ University\ Costs_{i,t-1}},$$

where subscripts i and t denote the university and the academic year, respectively.¹⁶

Our measure of endowment shocks is meant to capture the intuitive notion that a university with a large endowment-to-cost ratio may be more responsive to endowment returns than a university with a small ratio. For example, a university that relies on endowment income to cover the majority of its costs may respond to a given percentage return differently than a university whose endowment covers a trivial share of its costs. In essence, our measure captures the variation in the "shock" that comes from both the endowment's return and its size relative to university costs. One can also think of the shock variable as the ratio of the change in the dollar value of the endowment to the dollar flow of university expenditures.

Figure 4 illustrates both the time-series and cross-sectional variation in the shock variable from 1986 to 2009. Over our sample period, as shown in Table 1, the average endowment shock to a university was a positive 0.09, suggesting that the average financial shock to the endowment represents 9 percent of the university's total costs. Most universities suffered through two years of negative endowment shocks over the period 2001–2002. For example, in 2002, the average endowment shock was -0.054 (i.e., a shock equivalent to a 5.4 percent cut in the budget), with one-quarter of universities having a shock worse than -0.076 and one-tenth having a shock worse than -0.127 . Of course, the 2008–2009 shock corresponding to the global financial crisis was more pronounced, with even performers at the 90th percentile experiencing a negative shock.

In order to test for possible asymmetric responses to positive and negative shocks, we decompose the *Shock* variable into two components:

$$(2) \quad Shock_POS_{i,t} = \max \left[0, Return_{i,t} \times \frac{Endowment\ Fund\ Size_{i,t-1}}{Total\ University\ Costs_{i,t-1}} \right]$$

$$(3) \quad Shock_NEG_{i,t} = \min \left[0, Return_{i,t} \times \frac{Endowment\ Fund\ Size_{i,t-1}}{Total\ University\ Costs_{i,t-1}} \right].$$

Our regressions include contemporaneous and one-year-lagged values of these *Shock* variables.

Similarly, we create revenue shock variables based on universities' nonendowment revenues from the government. Specifically, the revenue shock variables are

¹⁶Results in an online Appendix show robustness to normalizing endowment returns by the start-of-sample endowment-to-cost ratio when constructing the *Shock* variable.

FIGURE 4. DISTRIBUTION OF ENDOWMENT SHOCKS AT DOCTORAL UNIVERSITIES, 1986–2009

Notes: Data sources are NACUBO for endowment returns and market value and IPEDS for university costs. Year refers to academic year (e.g., 2009 is the 2008–2009 academic year). The endowment shock for a university for a given year is defined as the endowment return during the year multiplied by the endowment market value at the end of the prior year normalized by total university costs during the prior year.

calculated using revenues from government appropriations (from federal, state, and local governments) and government gifts, grants, and contracts (e.g., research funding through agencies such as NSF and NIH). In Table 1, we provide summary statistics for the fraction of university costs financed by these two government-provided revenue sources. Our revenue shock measure does not include some major sources of revenue, such as tuition and current-use donations, because universities have a relatively large degree of control over these revenue sources. Note that if we include all revenue sources when constructing our revenue shock variables, the results are essentially unchanged. We define our revenue shock variable analogously to the endowment shock variable:

$$(4) \quad \text{Rev Shock}_{i,t} = \% \text{ Change in Revenue from Gov}'t_{i,t} \\ \times \frac{\text{Revenue from Gov}'t_{i,t-1}}{\text{Total University Costs}_{i,t-1}}.$$

Again, we decompose the revenue shock variable into positive and negative shocks, and include both contemporaneous and one-year-lagged values in our regressions.

TABLE 2—DESCRIPTION OF DEPENDENT AND EXPLANATORY VARIABLES

Panel A. Dependent variables	
<i>Variable name</i>	<i>Definition</i>
<i>Endowment payouts</i>	Payouts made by the endowment to the university during the year.
<i>Payout rate</i>	Endowment payouts to the university during the year divided by the endowment market value at the start of year (expressed in percentage points).
<i>Deviation from payout policy</i>	Payouts made by the endowment to the university during the year less the amount of payouts that would be implied by the endowment's payout policy, divided by the endowment market value at the start of the year (expressed in percentage points).
<i>Tenure system</i>	Logarithm of the number of tenure-system faculty.
<i>Adjuncts</i>	Logarithm of the number of adjuncts/lecturers.
<i>Administrators</i>	Logarithm of the number of administrators.
<i>Support</i>	Logarithm of the number of support staff (e.g., secretaries).
<i>Maintenance</i>	Logarithm of the number of maintenance employees.
Panel B. Explanatory variables	
<i>Variable name</i>	<i>Definition</i>
<i>Return_{i,t}</i>	Return of the endowment during the year.
<i>Return_POS_{i,t}</i>	$\max(\text{Return}_{i,t}, 0)$.
<i>Return_NEG_{i,t}</i>	$\min(\text{Return}_{i,t}, 0)$.
<i>Shock_{i,t}</i>	$\text{Return}_{i,t} \times \frac{\text{Endowment Fund Size}_{i,t-1}}{\text{Total University Costs}_{i,t-1}}$
<i>Shock_POS_{i,t}</i>	$\max(\text{Shock}_{i,t}, 0)$.
<i>Shock_NEG_{i,t}</i>	$\min(\text{Shock}_{i,t}, 0)$.
<i>Shock_POS_{i,t-1}</i>	One-year-lagged value of <i>Shock_POS_{i,t}</i>
<i>Shock_NEG_{i,t-1}</i>	One-year-lagged value of <i>Shock_NEG_{i,t}</i>
<i>Rev Shock_{i,t}</i>	$\text{Percent change in Revenue from Gov't}_{i,t} \times \frac{\text{Revenue from Gov't}_{i,t-1}}{\text{Total University Costs}_{i,t-1}}$
<i>Rev Shock_POS_{i,t}</i>	$\max(\text{Rev Shock}_{i,t}, 0)$.
<i>Rev Shock_NEG_{i,t}</i>	$\min(\text{Rev Shock}_{i,t}, 0)$.
<i>Rev Shock_POS_{i,t-1}</i>	One-year-lagged value of <i>Rev Shock_POS_{i,t}</i>
<i>Rev Shock_NEG_{i,t-1}</i>	One-year-lagged value of <i>Rev Shock_NEG_{i,t}</i>
<i>Near benchmark</i>	Indicator variable equal to one if the value of the university endowment at the start of the year is 90–110 percent of the value of the endowment when the current university president took office and zero otherwise.

B. Estimation and Identification

We use the endowment and revenue shock variables to test how endowments respond to these economic shocks. Our baseline specification is

$$\begin{aligned}
 (5) \quad \text{Dep Var}_{i,t} = & \beta_1 \cdot \text{Shock_POS}_{i,t} + \beta_2 \cdot \text{Shock_NEG}_{i,t} + \beta_3 \cdot \text{Shock_POS}_{i,t-1} \\
 & + \beta_4 \cdot \text{Shock_NEG}_{i,t-1} + \gamma_1 \cdot \text{Rev Shock_POS}_{i,t} \\
 & + \gamma_2 \cdot \text{Rev Shock_NEG}_{i,t} + \gamma_3 \cdot \text{Rev Shock_POS}_{i,t-1} \\
 & + \gamma_4 \cdot \text{Rev Shock_NEG}_{i,t-1} + \nu_i + \lambda_{\text{year} \times \text{private}} + \varepsilon_{i,t}.
 \end{aligned}$$

For convenience, all of our dependent variables and explanatory variables used in our subsequent analyses are defined in Table 2. The dependent variable in our

main specification is the contemporaneous payout rate. The symbol ν represents a complete set of university fixed effects, and λ represents a complete set of year-by-private fixed effects (where “private” distinguishes private from public universities). The inclusion of university fixed effects means that any differences in the dependent variable driven by time-invariant characteristic of a university or its endowment are accounted for in the specification. Furthermore, these fixed effects control for differences between public and private universities over time. As we will demonstrate below, our results are robust to using fewer fixed effects (e.g., including only university fixed effects and time trends) as well as using more fixed effects (e.g., university fixed effects plus state-by-year-by-private fixed effects).

In our baseline specification, the primary source of variation that identifies the effect of shocks on payout rates and university employment arises from differences in two public (or two private) institutions in the same year. For example, we implicitly compare how changes over time in the shocks faced by the University of Texas differ from shocks faced by UC-Berkeley, or how shocks faced by Harvard differ from shocks faced by Yale. As noted, our results are also robust to restricting our identifying variation to similar universities within the same state and year (e.g., Northwestern versus University of Chicago or UC-Berkeley versus UCLA).

The revenue shock variables are included both to control for any shocks that might be correlated with the endowment shocks as well as to shed light on the validity of precautionary saving models in explaining endowment payout behavior. Although we limit our revenue shock variables to include only revenue sources which the university does not directly control (e.g., from the government), we acknowledge that these other revenue shocks might nonetheless be endogenously determined, such as if a state legislature changed funding in response to university spending. If they are endogenous, then the coefficients on these revenue controls would be biased if they are included in the specification. If we exclude them, but they are correlated with both payouts and the endowment shock, then we run the risk of these omitted variables biasing the coefficients on our endowment shock variables. Fortunately, we find that the inclusion or exclusion of these other revenue shock variables does not significantly alter the coefficient estimates on the endowment shock variables, thus mitigating these endogeneity concerns.

We also separately examine a subset of 69 university endowments covered in the Commonfund data over the period 2000–2009, for which we can precisely measure the exact trailing percentage rate applied to the lagged endowment values.¹⁷ For this subset of institutions, we analyze whether the endowments deviate from their own payout policies and “actively manage” payouts to the universities. The results from these tests strongly support our findings.

We note that our specification does not include any measures of expectations, *per se*. However, with regard to asset returns, the prior literature shows that there is little out-of-sample predictability (e.g., Welch and Goyal 2008). Hansmann (1990) discusses the measures of expectations for other variables that may matter to payout

¹⁷ We limit our sample to university endowments whose payout policies are based on a moving average of prior end-of-year endowment asset values, as we can calculate the precise amount of expected payouts for these endowments. We do not consider universities that base payouts on a moving average of past quarterly endowment values, because NACUBO reports only end-of-year endowment values.

TABLE 3—RELATION BETWEEN PAYOUTS FROM ENDOWMENTS AND ENDOWMENT RETURNS

	ln(Endowment payouts in \$), 1993–2009							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Return_{i,t}$	0.35*** (0.05)		0.27** (0.12)		0.32** (0.13)		0.48*** (0.16)	
$Return_POS_{i,t}$ = $\max(Return_{i,t}, 0)$		0.13 (0.08)		0.14 (0.14)		0.19 (0.15)		0.32* (0.19)
$Return_NEG_{i,t}$ = $\min(Return_{i,t}, 0)$		0.82*** (0.14)		0.81*** (0.31)		0.82*** (0.31)		1.08*** (0.38)
p-value of test $Return_POS_{i,t}$ = $Return_NEG_{i,t}$	N/A	0.00***	N/A	0.06*	N/A	0.08*	N/A	0.09*
University fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time trends	Yes	Yes	Subsumed	Subsumed	Subsumed	Subsumed	Subsumed	Subsumed
Year fixed effects	No	No	Yes	Yes	Subsumed	Subsumed	Subsumed	Subsumed
Year-by-private fixed effects	No	No	No	No	Yes	Yes	Subsumed	Subsumed
State-by-year-by-private fixed effects	No	No	No	No	No	No	Yes	Yes
R^2 (within a university)	0.69	0.69	0.72	0.72	0.73	0.73	0.85	0.85
Observations	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000

Notes: See Table 2 for variable definitions. Standard errors, shown in parentheses, allow for correlations among observations of a given university over time (i.e., are clustered by university).

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

decisions, such as the real rate of growth of student income or real increases in the cost of educating students. Although we obviously cannot observe these expectations, we are not concerned about this biasing our results. With fixed effects and controls for time trends, it would have to be the case that changes in expectations differ across universities in a way that is correlated with the size of the endowment shock, which is unlikely. Further, for these changes in expectations to explain the results we find below, the estimated coefficients on the negative shock variable would have to be of the “wrong sign,” i.e., a negative shock would have to imply additional lower expected returns going forward, which is counter to the evidence against long-run momentum in stock returns (and perhaps, if anything, some long-run mean reversion). At the end of Section IVA below, we will also provide some evidence regarding life-income gifts that further suggest that changes in expectations do not spuriously drive our results.

As a final methodological note, we stress that our estimation clusters the standard errors by university. This approach accounts for correlations among observations for a given university over time.

IV. How Do Endowment Payouts Respond to Endowment Shocks?

Before turning to the main specification outlined above, we begin with our most basic analysis: regressing the log of dollar payouts from endowments on endowment returns. In column 1 of Table 3, we estimate a model that includes university fixed effects and time trends. We find that, on average, if an endowment experiences a return of +10 percent (−10 percent), it responds by increasing (decreasing) payouts in the current year by 3.5 percent. This coefficient estimate is significant at the

1 percent level, rejecting the null hypothesis that endowment payouts are insensitive to contemporaneous returns. These results are not consistent with what would be expected if endowments abided by their payout policies, which determine payouts as a function of past endowment values (and thus should not reflect current-year fluctuations in value).

However, as shown in column 2, this average response masks a substantial and important asymmetry in payout responses. We find that, as would be expected if endowments followed their own payout rules, the response to positive endowment returns is small in magnitude and not significantly different from zero. In sharp contrast, the response to negative endowment returns is economically large and statistically significant. The coefficient estimate of 0.82 implies that a 10 percent negative endowment return is associated with an 8.2 percent *reduction* in payouts, an effect that is significantly different from the effect of a 10 percent positive endowment return on payouts. To put this in perspective, this result implies that given the average payout rate of 5.2 percent in our sample (Table 1), a contemporaneous negative return of 10 percent reduces payouts by approximately 0.43 percentage points ($= 0.1 \times 0.82 \times 5.2$).

As we move across the columns in Table 3, we add richer fixed effects to control for heterogeneity in responses. In columns 3 and 4 we replace the time trends with year fixed effects and find almost identical results. In columns 5 and 6 we replace year fixed effects with year-by-private fixed effects. In these regression specifications, the identifying variation comes from differential responses to shocks by two public (or two private) universities in the same year. We use this set of fixed effects as our base case for the rest of the article. However, we hasten to note that our results are extremely robust to including an even stricter set of fixed effects. For example, in columns 7 and 8 we replace the year-by-private fixed effects with state-by-year-by-private fixed effects. Thus, in these last two columns, we measure the effect of endowment shocks on payouts by comparing two public (or two private) institutions in the same state and in the same year, which allows us to control for a wide range of time-varying factors that might otherwise spuriously drive the relation, such as state-specific economic trends or changes in state support for higher education. Overall, we continue to find a substantial effect of contemporaneous negative returns on endowment payouts, a negligible effect of positive returns on payouts, and a significant difference between the effects of positive and negative shocks. Thus, these results highlight a striking asymmetry in endowment payout policy.

A. *Endowment Shocks and Payout Rates*

As noted previously, the proportion of the total university budget funded from the endowment varies widely across universities. Thus, in Table 4 we turn to an explanatory variable that weights endowment returns by the ratio of the endowment size to total university costs: the *Shock* variable defined in the previous section. In all columns of Table 4, we report the coefficient estimates from regressions of the endowment payout rate over the period 1993–2009 on our measures of contemporaneous positive and negative shocks. The payout rate is defined as payouts made by the endowment to the university during the year divided by the endowment market value at the start of the year and is expressed in percentage points. All columns

TABLE 4—PAYOUT RATES OF UNIVERSITY ENDOWMENTS (*in percentage points*)

	Payout rate, 1993–2009		
	(1)	(2)	(3)
$Shock_POS_{i,t} = \max(Shock_{i,t}, 0)$	0.02 (0.14)	0.14 (0.15)	0.16 (0.15)
$Shock_NEG_{i,t} = \min(Shock_{i,t}, 0)$	1.40** (0.60)	1.51** (0.60)	1.61*** (0.62)
$Shock_POS_{i,t-1}$		−0.48*** (0.14)	−0.46*** (0.15)
$Shock_NEG_{i,t-1}$		−0.46 (0.74)	−0.48 (0.74)
$Rev\ Shock_POS_{i,t}$			0.77 (0.61)
$Rev\ Shock_NEG_{i,t}$			−0.47 (0.83)
$Rev\ Shock_POS_{i,t-1}$			1.23** (0.57)
$Rev\ Shock_NEG_{i,t-1}$			−1.46 (0.91)
Joint <i>p</i> -value of endowment shocks	0.05**	0.00***	0.00***
<i>p</i> -value of test $Shock_POS_{i,t} = Shock_NEG_{i,t}$	0.03**	0.04**	0.03**
<i>p</i> -value of test $Shock_POS_{i,t-1} = Shock_NEG_{i,t-1}$	N/A	0.98	0.98
Joint <i>p</i> -value of Revenue Shocks	N/A	N/A	0.11
University fixed effects	Yes	Yes	Yes
Year-by-private fixed effects	Yes	Yes	Yes
R^2 (within a university)	0.23	0.23	0.24
Observations	2,958	2,893	2,869

Notes: See Table 2 for variable definitions. Standard errors, shown in parentheses, allow for correlations among observations of a given university over time (i.e., are clustered by university).

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

include university fixed effects as well as year-by-private fixed effects. In columns 2 and 3, we also include one-year lagged positive and negative shocks. In column 3, we further control for contemporaneous and lagged shocks to other revenues.

Across all three specifications, we find an asymmetric response to contemporaneous shocks. When an endowment experiences a negative shock during the year equal to 10 percent of the university's budget (i.e., $Shock_NEG_{i,t} = -0.10$), the payout rate for the average endowment falls by a highly significant 14–16 basis points. Note that these results do not necessarily imply that payout rates decline in absolute terms. Rather, they indicate that after conditioning out the average level of changes in payout rates for comparable universities, universities with larger negative shocks have relatively lower payout rates. Put differently, universities that experience larger negative shocks have lower payout rates than one would expect. In contrast, when an endowment experiences a positive shock during the year equal to 10 percent of the university's budget (i.e., $Shock_POS_{i,t} = 0.10$), payouts from the average endowment are little changed.

In column 3, we also test whether shocks to other revenue sources are related to endowment payouts. The coefficient estimates for the contemporaneous and lagged revenue shock variables are not jointly significant (p -value = 0.11), while those for the endowment shocks are jointly highly significant (p -value < 0.01). Although the individual coefficient on the lagged positive revenue shock is significantly negative

in this specification, its significance is not robust to alternative specifications (as can be seen in an online Appendix). Thus, overall, we find little evidence that universities use endowment payouts to insure against shocks to other revenue sources. Equally important, the effect of endowment shocks on endowment payouts is independent of the effect of other revenue shocks. In an online Appendix, we also show that the conclusions drawn from Table 4 are robust to other specifications.¹⁸

As noted above, we do not control directly for future expectations. However, we note that our rich set of institutional and year-by-private fixed effects controls for many changes in expectations. Specifically, any change in expectations in a given year for each group of universities of the same type (i.e., public or private) will be accounted for by our fixed effects. For example, changing expectations about federal funding for research grants or changing expectations about asset returns are largely captured by year-by-private fixed effects.

For changing expectations to have a material effect on our results, they would have to be correlated with the size of endowment shocks. Thus, it is not enough for a university to change future expectations as a result of an endowment shock. Rather, it must be the case that institutions that experience larger shocks make larger changes in their expectations (controlling for the change in expectations during the year common to all universities of the same type, or, in our specifications with state-by-year-by-private fixed effects, common to all universities from the same state and of the same type). To partially address this possibility, we test whether endowment payouts are related to the amount of life-income gifts held by the endowment.¹⁹ In exchange for making a life-income gift, the beneficiary receives an annuity. The endowment “owns” and invests these gifts, but payouts to the university cannot be made from them until the beneficiary dies. Further, life-income gifts are not included in the reported endowment size. Nonetheless, a university with a larger amount of life-income gifts can expect to have a larger endowment in the future.²⁰ Thus, if future expectations play an important role in our results, the anticipation of the larger *future* endowment resulting from these life-income gifts should affect the payout rate from the endowment *today*. We find little evidence to support this prediction: interaction terms between the endowment shock variables and the ratio of life-income gifts-to-endowment size are not significant, and their inclusion in the regression leaves the coefficient estimate on the contemporaneous negative shock essentially unchanged.

B. *Endowment Shocks and Deviations from Payout Policies*

Although our fixed effects strategy should control for any unobserved time-invariant differences across endowments in payout policies, we can further alleviate this concern by reestimating the regressions in Table 4 using the subset of

¹⁸ In online Appendix Table 1, we report results for three additional specifications of column 3 in Table 4: (i) adding a richer set of state-by-year-by-private fixed effects; (ii) expanding the sample to include elite liberal arts colleges; and (iii) normalizing endowment returns by the start-of-sample endowment-to-cost ratio when constructing the *Shock* variables.

¹⁹ These results are available upon request.

²⁰ Across all doctoral universities in 2008, the ratio of life-income gifts to endowment size averages 0.10 (with this ratio exceeding 0.19 at one-tenth of universities).

TABLE 5—DEVIATIONS FROM ENDOWMENT PAYOUT POLICY AND UMIFA CONSTRAINTS (*in percentage points*)

	Deviation from payout policy, 2000–2009			Payout rate with UMIFA constraint, 1998–2009		
	(1)	(2)	(3)	(4)	(5)	(6)
$Shock_POS_{i,t} = \max(Shock_{i,t}, 0)$	−0.06 (0.28)	−0.09 (0.29)	−0.01 (0.30)	−0.07 (0.15)	0.01 (0.16)	0.02 (0.16)
$Shock_NEG_{i,t} = \min(Shock_{i,t}, 0)$	1.96* (1.10)	2.00* (1.11)	2.23** (1.12)	1.72*** (0.61)	1.85*** (0.61)	1.97*** (0.96)
$Shock_POS_{i,t-1}$		−0.25 (0.32)	−0.15 (0.32)		−0.46*** (0.16)	−0.42*** (0.16)
$Shock_NEG_{i,t-1}$		1.84 (1.28)	1.87 (1.27)		−0.05 (0.75)	−0.12 (0.75)
$Rev\ Shock_POS_{i,t}$			2.33** (1.10)			0.64 (0.67)
$Rev\ Shock_NEG_{i,t}$			−0.18 (1.17)			0.10 (0.89)
$Rev\ Shock_POS_{i,t-1}$			2.94*** (0.86)			0.49 (0.63)
$Rev\ Shock_NEG_{i,t-1}$			−1.32 (1.35)			−1.43 (0.95)
p -value of test $Shock_POS_{i,t}$ = $Shock_NEG_{i,t}$	0.10*	0.10*	0.08*	0.01***	0.01***	0.00***
p -value of test $Shock_POS_{i,t-1}$ = $Shock_NEG_{i,t-1}$	N/A	0.15	0.16	N/A	0.61	0.71
University fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-by-private fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (within a university)	0.28	0.28	0.30	0.34	0.35	0.35
Observations	607	604	603	2,238	2,192	2,185

Notes: See Table 2 for variable definitions. Standard errors, shown in parentheses, allow for correlations among observations of a given university over time (i.e., are clustered by university).

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

university endowments for which we have sufficient information about their payout policies from the Commonfund data. These analyses appear in columns 1 through 3 of Table 5. As our dependent variable, we use the difference between the actual payout rates and the hypothetical payout rates that would arise from a strict application of the endowment payout policies, expressed in percentage points. We find an even stronger asymmetric response: a 10 percent negative shock reduces payouts by 20 to 22 basis points, whereas the coefficient for positive shocks remains small in magnitude and insignificantly different from zero.

C. Robustness: Ruling out External Constraints on Payouts

The interpretation of our findings depends critically on whether the cut in payouts is a *choice*, rather than the result of external constraints. An important legal constraint on endowment payouts is the Uniform Management of Institutional Funds Act (UMIFA), which historically restricted endowment payouts. UMIFA's restrictions on the payouts of endowments are well described in Gary (2004): "although variations exist, the general principles of UMIFA have been adopted almost universally ... UMIFA created the concept of "historic dollar value" and then permitted

the expenditure of appreciation in excess of historic dollar value if the institution determined that expenditure of the funds was prudent. Historic dollar value was determined based on contributions to the endowment fund. Income, appreciation and depreciation of assets did not affect historic dollar value.” Given this restriction against spending the endowment below its historic dollar value, it is possible that universities were constrained by UMIFA following negative endowment shocks. For example, if a shock reduced the endowment value below the historical dollar value, then the university would be constrained to reduce expenditures in order to abide by the limits. Such restrictions are typically applied on a gift-by-gift basis. Indeed, even in the absence of UMIFA, donors themselves could impose constraints against spending the principal, either explicitly (e.g., in donor agreements) or implicitly (e.g., by placing pressure on endowment managers).

We perform additional specification tests, reported in columns 4–6 of Table 5, to ensure that such constraints cannot explain our results, even during the 2001–2002 negative endowment shocks when these constraints were more likely to bind.²¹ To account for the possibility that in a particular year a cohort of gifts may be under water, and thus unavailable for payouts, we reestimate the payout rate regressions presented in Table 4. Using endowment data on annual donations and annual returns, we impute the amount of the endowment eligible for payouts (i.e., the amount that is not “under water”) based on the UMIFA restrictions under the following three assumptions: (i) the eligibility of each year’s gifts for inclusion in the imputed payouts is determined at the start of the academic year; (ii) partial inclusion of a cohort of gifts is possible, e.g., if a given year’s gifts were valued at 103 percent of the original donation value, then up to 3 percent of these gifts could be paid out; (iii) all donations given prior to 1998 were sufficiently above water that UMIFA was not binding (this assumption, which is made because of data limitations on historical donations, is unlikely to be problematic because returns prior to 1998 were sufficiently high that these gifts were unlikely to be under water even after the technology bubble burst).²² We then calculate a new payout rate for the endowment in which we divide actual payouts from the endowment during the year by the hypothetical amount of the endowment that is not “under water” at the end of the prior year. Accounting for these UMIFA restrictions on endowment payouts has virtually no effect on our results. Further casting doubt on the likelihood that our results are driven by external constraints is the fact that a large portion of endowments are quasi-endowments rather than true endowments. As noted by Conti-Brown (2011), quasi-endowment funds are not subject to the UMIFA restrictions, yet endowments typically do not increase the payout rate from quasi-endowment funds following negative shocks.

²¹ Forty-three states to date have relaxed the UMIFA rules, replacing them with the Uniform Prudent Management of Institutional Funds Act (UPMIFA). Under UPMIFA, the historical-dollar value method was replaced with a standard of prudence that can permit spending of principal (Gary 2004; Ehrenberg 2009; and NACUBO-Commonfund 2009). As such, the historical-value constraint would not apply during the later years of our sample and during the 2008–2009 financial crisis, allowing endowment payouts even from gifts that are under water.

²² Donations to universities are available from the Voluntary Support of Education produced by the Council for Aid to Education dataset and start in 1998. Thus, our payout regressions that account for UMIFA constraints cover the academic years 1998–2009.

D. Interpretation and Discussion

The results in Tables 4 and 5 clearly show that endowments respond to negative shocks by reducing payouts and do so relative to their own payout rules. This pattern is clearly inconsistent with models that suggest that payouts should stay flat (e.g., Gilbert and Hrdlicka 2013). We also find little evidence that universities dip into endowments when other revenues are low, as suggested by some of the precautionary savings models. The findings that endowments respond asymmetrically to shocks, and that the contemporaneous response to negative shocks is large, are virtually orthogonal to changes in other revenue sources. Moreover, we do not find consistent results across different specifications for the revenue shock variables. While not the focus of this paper, the finding in previous studies that endowment portfolios are heavily concentrated in procyclical asset classes (Lerner, Schoar, and Wang 2008; Gilbert and Hrdlicka 2013) casts further doubt on the self-insurance hypothesis: if universities view endowments as self-insurance, they would not invest so heavily in these asset classes.

V. The Endowment Hoarding Hypothesis

In this section we examine the endowment hoarding hypothesis, which posits that university and endowment leadership care about endowment size above and beyond the endowment's contribution to university operations. There are several reasons university leaders may care about endowment size. For example, if university leaders believe their future employment opportunities or university prestige are functions of endowment size, they may have an incentive to maintain a large endowment. Moreover, the compensation of university leaders tends to rise with the growth of endowment size. Ehrenberg, Cheslock, and Epifantseva (2001) reports that university presidents are compensated at least in part based on endowment size. These incentives could cause university presidents to respond slowly to positive shocks in order to grow the endowment, but quickly cut endowment payouts following negative shocks in order to maintain endowment size. Our results are consistent with this prediction of the endowment hoarding hypothesis: following positive shocks, endowments are slow to increase payouts, thus allowing the endowment to grow. In contrast, following negative shocks, endowments are quick to reduce payouts below the level implied by their own payout rules, thus limiting the "hit" to the size of the endowment.

To test this idea further, it is useful to look for evidence in situations where incentives for endowment hoarding are likely to be strongest. To do this, we draw upon the corporate finance literature; Baker and Xuan (2009) show that the stock price at the time the CEO joined the firm serves as a reference point for the CEO when he/she is deciding whether to conduct seasoned equity offerings or repurchase shares. In a similar spirit, we hypothesize that university presidents might use the size of the endowment at the time they became president as an important benchmark when making payout decisions. Our hypothesis is that endowment payouts are more likely to be reduced following a negative shock if the current endowment value is close to the president's benchmark (i.e., the value when he or she became president).

To test this hypothesis, we construct a variable, the president's benchmark ratio, defined as the ratio of the endowment's value at the start of the current year to the

endowment's value when the university president took office. We also construct an indicator, which we call *Near benchmark*, for whether this ratio lies between 0.9 and 1.1 (which is the case for 12 percent of our observations). We then regress the university's endowment payout rate against the four endowment shock variables (positive and negative, contemporaneous and lagged) and interaction terms between each of these four shock variables and the indicator for being near the president's benchmark. We also control for university fixed effects and year-by-private fixed effects. We hypothesize that when endowment values are either just above or just below this personal benchmark, and the endowment suffers a negative shock, university presidents will be especially sensitive to maintaining the size of the endowment. This leads to the prediction of a positive coefficient estimate on the interaction term between the negative shock variable and the *Near benchmark* indicator.

The results are reported in Table 6.²³ In column 1, we report results excluding revenue shocks, whereas in column 2 we report results that include revenue shocks as controls. We find that, consistent with the prediction of the endowment hoarding hypothesis, our earlier result that universities respond to negative endowment shocks by reducing payouts is entirely driven by those universities whose current endowment value is close (within 10 percent) to the value of the endowment when the president started. Thus, for universities close to the current president's benchmark, a negative endowment shock equal to 10 percent of the university's budget leads to a 37 to 39 basis point reduction in the endowment's payout rate ($0.10 \times (0.90 + 2.96) = 0.39$ in column 2). For universities whose endowment value is farther away from the president's benchmark, there is no significant relation between financial shocks and endowment payout rates. In online Appendix Table 2, we show robustness to additional specifications.²⁴

In columns 3 and 4 of Table 6, we include additional controls in which we interact the shock variables with the ratio of endowment value to the value when the president took office in order to ensure that there is indeed something important about the current value of the endowment being "near the president's benchmark." We continue to find the same pattern of results: the effect of a negative shock is largest for those near the benchmark and is not different from zero for those far away from the benchmark. Furthermore, the interactions of the shock variables with the ratio of the current endowment value to the value when the president took office are jointly insignificant.

In columns 5 and 6, to make sure that our "Near benchmark" results do not simply reflect differences between new and long-serving presidents, we include interactions of the shock variables with the tenure of the university president. For example, a president that has served two years is more likely to have an endowment near his/her benchmark than one who has served ten years, so we want to be sure our "Near benchmark" does not simply reflect a president's tenure. Even after including interactions of the tenure of the president with our shock variables, we continue to

²³ We have fewer observations in these payout regressions than those in Table 4 for several reasons. First, we do not use observations from the president's first year on the job. Second, data on university presidents first became available in IPEDS in 1990. Thus, we are unable to calculate the president's benchmark for presidents who began their tenure before 1990, so these observations are excluded.

²⁴ In online Appendix Table 2, we report results for three additional specifications of column 2 in Table 6: (i) adding a richer set of state-by-year-by-private fixed effects; (ii) expanding the sample to include elite liberal arts colleges; and (iii) normalizing endowment returns by the start-of-sample endowment-to-cost ratio when constructing the *Shock* variables.

TABLE 6—INTERACTION OF ENDOWMENT SHOCKS WITH ENDOWMENT SIZE BEING NEAR PRESIDENT'S BENCHMARK

	Payout rate (percent)					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Shock_POS_{i,t}</i>	0.05 (0.21)	0.07 (0.22)	−0.08 (0.31)	−0.06 (0.31)	0.24 (0.32)	0.26 (0.32)
<i>Shock_POS_{i,t}</i> × <i>Near benchmark</i>	−0.46 (0.52)	−0.48 (0.52)	−0.47 (0.56)	−0.49 (0.56)	−0.62 (0.55)	−0.63 (0.55)
<i>Shock_NEG_{i,t}</i>	0.78 (0.82)	0.90 (0.84)	0.12 (1.00)	0.22 (1.01)	0.02 (1.18)	−0.08 (1.18)
<i>Shock_NEG_{i,t}</i> × <i>Near benchmark</i>	2.89** (1.21)	2.96** (1.21)	3.63*** (1.30)	3.75*** (1.30)	3.21** (1.28)	3.42*** (1.29)
<i>Shock_POS_{i,t−1}</i>	−0.56** (0.22)	−0.53** (0.22)	−0.87*** (0.32)	−0.85*** (0.32)	−0.77** (0.34)	−0.75** (0.34)
<i>Shock_POS_{i,t−1}</i> × <i>Near benchmark</i>	0.36 (0.45)	0.39 (0.45)	0.62 (0.50)	0.66 (0.50)	0.54 (0.49)	0.56 (0.49)
<i>Shock_NEG_{i,t−1}</i>	−0.35 (1.06)	−0.42 (1.07)	−0.05 (1.37)	−0.09 (1.38)	−0.56 (2.14)	−0.40 (2.14)
<i>Shock_NEG_{i,t−1}</i> × <i>Near benchmark</i>	−2.11 (2.12)	−2.18 (2.12)	−2.26 (2.28)	−2.37 (2.28)	−2.05 (2.37)	−2.30 (2.37)
Shock variables interacted with ratio of endowment value to value when president took office	No	No	Yes	Yes	No	No
<i>p</i> -value of shock-ratio interactions	N/A	N/A	0.14	0.12	N/A	N/A
Shock variables interacted with tenure of university president	No	No	No	No	Yes	Yes
<i>p</i> -value of shock-tenure interactions	N/A	N/A	N/A	N/A	0.84	0.76
Revenue shock controls	No	Yes	No	Yes	No	Yes
University fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-by-private fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
<i>R</i> ² (within a university)	0.21	0.21	0.21	0.22	0.21	0.21
Observations	2,004	1,991	2,004	1,991	2,004	1,991

Notes: See Table 2 for variable definitions. Each shock variable is interacted with an indicator for whether the value of the university endowment at the start of the year is 90–110 percent of the value of the endowment when the current university president took office (“Near benchmark”). Standard errors, shown in parentheses, allow for correlations among observations of a given university over time (i.e., are clustered by university).

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

find a very strong effect of the negative shock variable for those universities near the benchmark. Thus, this effect is not driven by how long the president has served. Also, as with the ratio of the current endowment value to the value of the endowment at the start of the president's tenure, the interactions of the shock variable with the president's tenure are themselves insignificant.

VI. Do Shocks Matter? The Effect of Endowment Shocks on University Personnel

Our empirical results thus far indicate that universities with larger negative endowment shocks respond by reducing their payout rates relative to universities

TABLE 7—RELATION BETWEEN UNIVERSITY EMPLOYMENT
(*logarithm of number of employees*) AND ENDOWMENT SHOCKS

	Tenure system (1)	Adjuncts (2)	Support (3)	Maintenance (4)	Administration (5)
$Shock_POS_{i,t} = \max(Shock_{i,t}, 0)$	-0.03 (0.03)	0.03 (0.13)	-0.06 (0.05)	0.00 (0.04)	-0.07 (0.07)
$Shock_NEG_{i,t} = \min(Shock_{i,t}, 0)$	0.14 (0.11)	0.33 (0.50)	0.51*** (0.18)	0.22 (0.14)	-0.02 (0.24)
$Shock_POS_{i,t-1}$	-0.04 (0.02)	-0.20* (0.12)	0.05 (0.04)	0.02 (0.03)	-0.06 (0.06)
$Shock_NEG_{i,t-1}$	0.49*** (0.15)	0.29 (0.71)	-0.02 (0.25)	-0.04 (0.20)	-0.12 (0.34)
$Rev\ Shock_POS_{i,t}$	0.18* (0.10)	0.84* (0.48)	0.01 (0.19)	-0.21 (0.15)	0.19 (0.27)
$Rev\ Shock_NEG_{i,t}$	0.22 (0.14)	0.45 (0.67)	0.03 (0.24)	0.09 (0.21)	-0.11 (0.33)
$Rev\ Shock_POS_{i,t-1}$	0.20* (0.12)	0.72 (0.54)	-0.06 (0.20)	-0.06 (0.16)	0.27 (0.28)
$Rev\ Shock_NEG_{i,t-1}$	-0.10 (0.15)	-1.21* (0.69)	0.12 (0.26)	0.19 (0.20)	-0.41 (0.36)
p -value of test $Shock_POS_{i,t}$ = $Shock_NEG_{i,t}$	0.17	0.57	0.00***	0.16	0.86
p -value of test $Shock_POS_{i,t-1}$ = $Shock_NEG_{i,t-1}$	0.00***	0.51	0.78	0.79	0.85
University fixed effects	Yes	Yes	Yes	Yes	Yes
Year-by-private fixed effects	Yes	Yes	Yes	Yes	Yes
R^2 (within a university)	0.67	0.38	0.74	0.04	0.17
Observations	2,980	2,979	2,392	2,289	2,392

Notes: See Table 2 for variable definitions. Standard errors, shown in parentheses, allow for correlations among observations of a given university over time (i.e., are clustered by university).

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

with smaller shocks. Thus, universities that experience a negative endowment shock must respond along another margin. We have shown above that this adjustment does not occur via other revenue sources. Thus, to further understand how universities behave following negative shocks, we investigate how these shocks affect the most important university expenditure—personnel.

In Table 7, we show the effect of endowment shocks on university employment decisions. The dependent variable in the regressions is the logarithm of the number of employees in a specific job category (i.e., tenure-system faculty, adjuncts/lecturers, support staff, maintenance, and administrators). As with the payout regressions, we report the coefficient estimates on the contemporaneous and lagged measures of the positive and negative endowment shocks. For each job category, we report regression results with the additional revenue shock variables also included in the specification.²⁵

²⁵The coefficients on the contemporaneous and lagged endowment shocks in the employment regressions are nearly identical if the additional revenue shock variables are not included in the specification.

The results in column 1 suggest that universities respond to a negative shock by reducing the number of tenure-system faculty with a one-year lag. An endowment shock equal to losing 10 percent of a university's budget leads to a nearly 5 percent reduction in tenure-system faculty in the following year. As in the payout regressions, by "reduce" we mean a reduction relative to otherwise similar universities, which could imply either a reduction in absolute terms or a smaller increase. This could be accomplished through a reduction in new hires, an increased attrition rate (i.e., failing to replace faculty who retire or depart), or increased terminations (although this is less likely for tenured faculty). The corresponding coefficient estimate for adjuncts (column 2) is of the same sign but is of slightly smaller magnitude than that for tenure-system faculty. It is imprecisely measured and is thus not statistically significant. In our online Appendix, we report on the robustness of the tenure-system faculty results for a range of additional specifications.²⁶

Column 3 indicates that when universities suffer a negative endowment shock, they make significant and immediate cuts in the number of support employees (e.g., secretaries). A negative endowment shock equivalent to a 10 percent reduction in a university's budget results in a decline of 5.1 percent in the number of support employees. The effect on maintenance workers, shown in column 4, is about half as large and not statistically significant.

In contrast to these large effects on other employees, university administrators are largely unaffected.²⁷ As shown in column 5 in Table 7, there is no significant response to contemporaneous or lagged negative shocks for this group. The sum of the contemporaneous and lagged coefficient estimates for administrators is -0.14 , suggesting that their ranks actually increase by 1.4 percent following the negative shock. Although this estimate is not statistically different from zero, the two-year cumulative effect for administrators is significantly different from that for tenure-system faculty at the 5 percent level. Thus, the number of administrators employed is significantly less likely to decrease in the event of a negative endowment shock, when compared with tenure-system faculty. It remains an open question whether this difference is an efficient response to a shock (e.g., a higher administrator-to-faculty ratio is required to manage the changes) or whether it is an inefficient response to a shock (e.g., administrators "protecting their own").

As discussed earlier, the relative curtailing of endowment payouts in response to negative shocks is largely concentrated among universities at which the current endowment size is near to the historical endowment size when the president joined. One would expect the operational responses to negative shocks to also be more substantial at these universities. We explore this issue by interacting the four endowment shock variables with an indicator variable equal to one if the endowment is "*Near*

²⁶In online Appendix Table 3, we report results for three additional specifications of column 1 of Table 7: (i) adding a richer set of state-by-year-by-public fixed effects; (ii) expanding the sample to include elite liberal arts colleges; and (iii) normalizing endowment returns by the start-of-sample endowment-to-cost ratio when constructing the *Shock* variables.

²⁷For reporting purposes, IPEDS assigns personnel into a single job category (e.g., tenure-system faculty or administration) based on the role in which they spend more than half of their time. Although we recognize that the classification of personnel into faculty versus administrators may vary across universities, the inclusion of university fixed effects will control for any differences in classifications that are reasonably consistent over time. Our finding could be driven by labeling only if universities are likely to reclassify faculty as administrators following negative shocks and revert back to labeling them as faculty in years without negative shocks.

TABLE 8—RELATION BETWEEN UNIVERSITY EMPLOYMENT (*logarithm of number of employees*) AND THE INTERACTION OF ENDOWMENT SHOCKS NEAR PRESIDENT'S BENCHMARK

	Tenure system (1)	Adjuncts (2)	Support (3)	Maintenance (4)	Administration (5)
<i>Shock_POS_{i,t}</i>	-0.01 (0.03)	0.05 (0.15)	-0.08 (0.06)	-0.02 (0.04)	-0.06 (0.08)
<i>Shock_POS_{i,t} × Near benchmark</i>	-0.10 (0.07)	0.12 (0.36)	0.05 (0.12)	0.05 (0.10)	0.17 (0.18)
<i>Total effect of Shock_POS_{i,t} when endowment Near benchmark</i>	-0.10	0.17	-0.02	0.03	0.11
<i>Shock_NEG_{i,t}</i>	0.19 (0.12)	0.72 (0.56)	0.40** (0.19)	0.17 (0.15)	0.05 (0.27)
<i>Shock_NEG_{i,t} × Near benchmark</i>	0.10 (0.16)	-0.06 (0.77)	0.01 (0.25)	0.15 (0.20)	0.21 (0.37)
<i>Total effect of Shock_NEG_{i,t} when endowment Near benchmark</i>	0.29	0.66	0.41	0.31	0.26
<i>Shock_POS_{i,t-1}</i>	-0.05 (0.03)	-0.08 (0.14)	0.02 (0.05)	-0.03 (0.04)	-0.01 (0.07)
<i>Shock_POS_{i,t-1} × Near benchmark</i>	0.11* (0.06)	0.00 (0.30)	-0.05 (0.10)	-0.01 (0.09)	-0.11 (0.15)
<i>Total effect of Shock_POS_{i,t-1} when endowment Near benchmark</i>	0.06	-0.08	-0.03	-0.04	-0.12
<i>Shock_NEG_{i,t-1}</i>	0.30 (0.19)	-0.62 (0.90)	0.17 (0.29)	0.14 (0.23)	-0.32 (0.43)
<i>Shock_NEG_{i,t-1} × Near benchmark</i>	0.84** (0.39)	2.66 (1.87)	-0.10 (0.62)	-0.35 (0.49)	1.18 (0.90)
<i>Total effect of Shock_NEG_{i,t-1} when endowment Near benchmark</i>	1.14***	2.04	0.07	-0.22	0.86
Revenue shock controls	Yes	Yes	Yes	Yes	Yes
University fixed effects	Yes	Yes	Yes	Yes	Yes
Year-by-private fixed effects	Yes	Yes	Yes	Yes	Yes
R ² (within a university)	0.69	0.39	0.70	0.03	0.17
Observations	2,224	2,230	1,765	1,690	1,765

Notes: See Table 2 for variable definitions. The “*Total effect of Shock_POS_{i,t} when endowment Near benchmark*” is the sum of the coefficient estimates on *Shock_POS_{i,t}* and its interaction with *Near benchmark*. Other Shock variables are defined in a similar way. We omit the standard errors for the “*Total effect of Shock when endowment Near benchmark*” effects and indicate only their statistical significance. “Near benchmark” indicates that the value of the university endowment at the start of the year is 90–110 percent of the value of the endowment when the current university president took office. Standard errors, shown in parentheses, allow for correlations among observations of a given university over time (i.e., are clustered by university).

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

benchmark.” The results are reported in Table 8. A key result is that the lagged negative effect on tenure-system faculty is concentrated among those universities with endowments that are near the president’s benchmark. Specifically, the total effect of a 10 percent negative endowment shock for a university with an endowment near the president’s benchmark value is an 11.4 percent reduction in tenure-system faculty (compared to an insignificant 3.0 percent reduction at universities where the

endowment value is not close to the president's benchmark). In contrast, we find that the contemporaneous reduction in support staff does not differ based on proximity to the benchmark. As with earlier key results, we provide additional robustness checks in an online Appendix.²⁸

VII. Conclusions

Over the past few decades, the growth rate of university endowments has far outpaced that of university expenditures, and endowment payouts have become an increasingly important component of most universities' revenues. We use financial shocks to endowments, particularly the responses to the technology-bubble collapse in 2001–2002 and the financial crisis in 2008–2009, to study both the payout decisions of endowment funds and the resultant effects on universities' operational decisions. We find that although most universities have formal policies intended to smooth payouts over time, endowments significantly deviate from these policies following negative financial shocks. Surprisingly, they deviate in the direction of reducing their payouts by more than their formal smoothing policies would suggest. This pattern is difficult to reconcile with existing models of university payouts, which often imply that payout rates will be constant or that universities will use endowments as a form of precautionary saving.

Our results are consistent with a model in which university leaders care directly about the size of the endowment, perhaps due to the private benefits (e.g., prestige, future career opportunities, high compensation, etc.) they obtain from a larger endowment. Consistent with this view, we find that our key results are driven primarily by endowments whose current value is close to the historical value when the current president's tenure began.

We also find that financial shocks to an endowment have real consequences for the operational decisions of the university. As a result of negative endowment shocks, universities cut back on the hiring (or accelerate the firing) of employees, with the notable exception of university administrators. Consistent with our results concerning endowment payouts, for tenure-system faculty, we find that these effects are driven primarily by endowments that are close to their benchmark value.

Taken as a whole, our results provide strong evidence that endowment shocks have an important and significant effect on payout policies and the real operations of the universities that these endowments support. Thus, our results provide new evidence on an unexplored channel through which financial markets affect real investments.

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²⁸In online Appendix Table 4, we report results for three additional specifications of column 1 in Table 8: (i) adding a richer set of state-by-year-by-public fixed effects; (ii) expanding the sample to include elite liberal arts colleges; and (iii) normalizing endowment returns by the start-of-sample endowment-to-cost ratio when constructing the *Shock* variables.

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