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THE EFFECT OF COLLEGE AND UNIVERSITY ENDOWMENTS ON FINANCIAL
AID, ADMISSIONS, AND STUDENT COMPOSITION

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The Effect of College and University Endowments on Financial Aid, Admissions, and Student Composition

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ABSTRACT

This paper examines how private college and university endowments affect financial aid, admissions selectivity, and the economic and racial composition of incoming students. Because endowment levels are a function of expenditures and alumni giving, which are endogenous to the outcomes of interest, the design exploits changes in endowments stemming from variation in investment returns over time and across peer institutions. Estimates reveal that growing endowments generate large and persistent increases in spending overall and for instruction, student services, and administration in particular. However, wealthier colleges and universities do not increase the number of students they serve or the fraction of students receiving aid, and only modestly increase the generosity of aid packages. Instead, these institutions offset higher freshman yield rates by becoming more selective and enrolling fewer low-income students and students of color. Overall, colleges and universities appear to use greater endowment wealth to increase spending and to become more selective, resulting in higher institutional rankings, but do not increase the size or diversity of their student bodies. The results are important in light of the preferential tax treatment of endowments and interest in increasing access to elite postsecondary education for underserved populations.

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I Introduction

Relatively little is known about the causal effect of college and university endowment wealth on financial aid generosity, the number of students institutions serve, admissions selectivity, and the economic and racial diversity of student populations. Institutions report spending an average of two-thirds of endowment revenue on financial aid and academic programs (NACUBO, 2018).¹ However, it is not known whether reported expenditures offset spending from other revenue sources or represent net increases in financial aid and academic support, and whether such spending is used to increase access to elite education. Shedding light on these questions is informative for understanding institutional objectives and opportunities for underserved populations at selective institutions.² The estimates may also be informative about the effects of taxing endowments (or other approaches to inducing endowment expenditures) on institutional and student outcomes.³

In the cross-section, colleges and universities with larger endowments provide more generous grant aid, but are more selective and serve undergraduate populations with lower fractions of Black and low-income students.⁴ Similarly, exploiting variation over time indicates that colleges and universities with growing endowments have increasing operating expenditures, but do not have increasing enrollments or diversity. However, such correlations in the cross-section and over time cannot be interpreted as causal. Factors such as the age and prestige of institutions are likely to shape endowment levels and other sources of revenue (e.g., tuition and research grants) as well as outcomes of interest such as admissions selectivity and the composition of students who apply and attend. Further, endowments decrease mechanically with spending, so, for example, enrolling more low-income students who receive institutional aid creates negative

¹The 2018 NACUBO survey was the first in which institutions reported how endowment income is allocated to various expenditure categories. Institutions report allocating 49 percent to financial aid, 16 percent to academic programs, 10 percent to faculty, 7 percent to campus operations, and 18 percent to other uses.

²Pallais and Turner (2006) document that there is a supply of academically eligible, low-income students who could be pursued by elite institutions through outreach, aid, and other initiatives. However, Blair and Smetters (2021) argue that the pattern of low enrollment growth and increased selectivity at elite institutions can only be explained by competition for prestige, and not by a desire to expand access.

³See, for example, Hinrichs (2018) and Levine (2018) for discussions of the endowment income tax of 1.4 percent included in the Tax Cuts and Jobs Act of 2017. While the tax applies to the highest endowment institutions (those with at least \$500,000 of endowment per full-time student), the endowment cutoff is not adjusted for inflation and thus the fraction of affected institutions is growing over time.

⁴Baum, Hill, and Schwartz (2018) and Baum and Lee (2019) detail differences across institutions in the fraction of students who are eligible for financial aid and the amounts of aid received. This reveals that the highest endowment institutions offer more institutional aid and have lower net cost for students from lower-income household, but serve smaller percentages of these high-need students. In the sample used in this study, higher endowment institutions are more selective, have higher yield rates for admitted students, and provide more institutional aid conditional on receipt, but enroll a smaller fraction of Black students and student receiving federal or institutional aid.

bias in the relationship between endowments and socioeconomic diversity.

In the seminal paper on endowment spending, Brown et al. (2014) exploit variation in investment returns to document evidence of “endowment hoarding” in which institutions reduce, rather than increase, the rate of endowment spending during economic downturns.⁵ Following this approach, and to abstract from endogenous changes in endowments, this study exploits variation in investment returns within and across the 200 private colleges and universities included in the analysis. Average annual investment returns vary considerably over time during the sample period, ranging from 19.5 percent in 2007 to -19.6 percent in 2009 to 19.4 percent in 2011. Returns also vary considerably across peer institutions during the sample period. For example, average returns varied from 5.2 to 10.2 percent among top 10 liberal arts colleges, and from 7.2 to 10.8 percent among top 10 research universities. Because institutions adopt fiscal rules that dictate spending a fixed fraction of endowment wealth each year (typically 4 to 5 percent of the three-year rolling average), annual investment returns shape long-run endowment growth and the stream of future spending.⁶ In turn, spending from the endowment may affect a range of institutional and student outcomes, such as financial aid generosity, admissions selectivity, and the socioeconomic and racial composition of incoming cohorts.

The empirical design examines changes in outcomes of interest within and across institutions between 2003 and 2018 in response to endowment growth due to investment returns. Specifically, annual investment returns are used to compute expected endowments in each year and are then averaged over three-year periods in order to capture the relevant endowment measure for institutional spending rules. These simulated endowments are used to instrument for actual endowments. In order to exploit variation over time across close peer institutions, colleges and universities are grouped using their baseline U.S. News and World Report rankings. Within these groups, cumulative investment returns during the sample period are not correlated with baseline institutional characteristics (enrollment, spending per student, demographics, admissions selectivity, tuition, and financial aid) or with pre-trends in these characteristics. The robustness of the design is examined by controlling for baseline and pre-trend differences in endowments and the outcomes of interest, as well as an alternative methods of grouping peer institutions.⁷ The analysis uses endowment, expenditure,

⁵The authors also document evidence that institutions appear to reduce faculty positions but not administration if they experience negative returns.

⁶On average, endowments have grown substantially over time in real terms, indicating that institutions are growing their endowments and enabling greater future expenditures, rather than preserving the current set of activities as proposed in Tobin (1974).

⁷In the primary design, colleges are placed into groups of ten peer institutions (e.g., liberal arts colleges ranked 1 to 10, 11 to 21, etc.). The robustness of the results is examined for alternative peer institution groupings based on baseline endowment wealth, baseline outcome levels, pre-period investment returns, and investment return volatility.

enrollment, and admissions data from the Integrated Postsecondary Education Data System, and is supplemented with endowment data from the National Association of College and University Business Officers and historical U.S. News and World Report college and university rankings.

The analysis reveals that colleges and universities that experience larger investment returns retain a significant fraction of the returns as endowment wealth and, in turn, substantially increase spending. Endowment-driven spending is largely allocated to instruction, student services, and administration. However, there is no evidence that institutions with endowment growth expand enrollments. That is, increases in spending do not lead to greater overall access to these selective institutions. Colleges and universities with larger endowments also do not reduce the list price for tuition or room and board, do not increase the fraction of students receiving institutional aid, and only modestly increase aid for those who receive it. Thus, overall, there is no statistically significant reduction in estimated net cost per student. Further, institutions with growing endowments do not increase the fraction of entering freshmen who are eligible for federal aid, revealing that they do not increase access for low-income students. These results, which capture the net changes in expenditures and access, are not consistent with the allocation of endowment revenue self-reported by colleges and universities.

Endowment growth leads to changes in freshman admissions. Specifically, wealthier institutions have higher freshman admissions yields (perhaps reflecting the effect of greater spending and somewhat larger aid packages), but become more selective, resulting in no net increase in freshman enrollment. Entering cohorts have, on average, lower fractions of students of color and higher fractions of White and Asian students. The reduction in enrollment of underrepresented students is statistically significant and meaningful in magnitude relative to baseline levels. This suggests that institutions do not use endowment wealth to expand access to a more racially diverse student population and is consistent with the reduced fraction of students receiving federal aid. Institutions with greater endowment growth do, however, experience significant gains in their rankings in the U.S. News and World Report.⁸ Overall, the results are consistent with the concerns of policy advocates that institutions do not use their wealth to expand educational opportunity and contribute to the academic literature documenting barriers to access to elite colleges for underserved populations.⁹

⁸The improvements in rankings are largest for liberal arts colleges. Higher rankings stem in part from the direct effect of increased spending per student, which is weighted explicitly in ranking formulas. Additionally, rankings weight factors that are observed changing in response to endowments, such as admissions selectivity, and that are likely to change as a result of greater spending and selectivity (e.g., student retention and peer assessment scores).

⁹See De Alva and Schneider (2015), Woodhouse (2015), Nichols and Santos (2016), Meyer and Zhou (2017), and Zinshteyn (2017) for examples of policy interest in the disconnect between endowment wealth and serving low-income and underrepresented minority students.

The estimates are robust to a range of alternative specifications, methods of grouping peer institutions, and alternative research designs. Notably, controlling for baseline levels and pre-trends in endowments and the outcomes of interest has modest effects on point estimates. To examine if the results are driven by institutions that are more or less willing to take investment risk, colleges and universities are grouped based on having the same variance of annual returns, but different return averages, during the sample period. Results are also presented for two alternative designs. The first exploits only endowment changes starting with the Great Recession, the largest and most unexpected investment shock during the last two decades. The second examines short-run responses by considering five-year rolling changes in the outcomes in response to concurrent investment returns. These designs confirm the findings that larger endowments increase spending but do not result in expanded capacity, significantly increased aid, or greater access for low-income students and students of color.

The paper is organized as follows. Section II discusses the data sources and sample and variable construction. Section III introduces the empirical design, documents variation in returns across peer institutions, and presents evidence of the strength of the first stage and the balance of the design. Section IV presents estimates of the effect of endowments on expenditures, enrollment, financial aid, admissions, the composition of incoming freshmen, and institutional rankings. Section V concludes.

II Data

The data for this paper are derived from the National Center for Education Statistics Integrated Postsecondary Education Data System (IPEDS), endowment reports from the National Association of College and University Business Officers (NACUBO), and historical U.S. News and World Report rankings. The analysis focuses on investment returns and changes in endowments at private colleges and universities between 2003 and 2018.

II.1 Endowments and Investment Returns

IPEDs data include reported endowments at the beginning and end of each reporting year and their annual investment returns, making it possible to compute each institution's annual percent investment return (NCES 1999-2018).¹⁰ NACUBO publishes institution-reported endowments each year for a subset of high endow-

¹⁰Endowments are reported in IPEDS starting in 2003, while investment returns and total long-term assets are available in prior years.

ment colleges and universities, which are used to verify the accuracy of the IPEDs measures (NACUBO 1999-2018). Some colleges and universities have investments that are not part of their endowments. Total long-term investment assets are reported in IPEDs each year and closely mirror endowments for most institutions, but serve two important functions. First, they allow the identification of institutions that have investments that are not part of the endowment, and thus for which considering changes endowments alone could produce biased estimates. Second, they provide an alternative measure of college wealth, extending further back than endowments in IPEDs, which can be used to control for pre-sample trends in investment returns.

In the analysis, endowments, investment returns, and outcomes measured in dollars (e.g., spending, tuition, aid) are adjusted to real 2018 dollars. Institutional spending rules generally dictate that revenue drawn from endowments is based on a three-year lagged average of endowment levels. This rolling endowment average is computed for each institution in each year. The primary specifications use the natural log of endowments, revealing the effect of percent changes on the outcomes of interest. This approach provides approximately equal weight to each institution in the sample. Alternative measures, such as endowment per student, substantially shift the focus to a small number of very wealthy colleges.

II.2 Outcomes of Interest

A rich set of expenditure, enrollment, financial aid, admissions, and demographic data from IPEDS are merged to the panel of investment returns and endowments (NCES 1999-2018). Expenditures are reported separately for categories such as instruction, academic support, student services, auxiliary enterprises, institutional support, and research.¹¹ Financial aid measures include the number of freshmen receiving federal, state, and institutional grants, loans, and any form of financial aid. These counts are used to compute the percent of students receiving aid of each type. Federal aid receipt sheds light on the fraction of incoming students who are Pell Grant eligible, a proxy for being low-income, while the fraction receiving institutional aid can reflect both changes in student composition and financial aid generosity. In addition, IPEDs includes the average amount for each type of aid, conditional on receipt, revealing the generosity of institutional aid for eligible students. Colleges and universities report their list tuition and fees and on-campus room and

¹¹Instruction includes expenses directly associated with courses, while academic support includes peripheral components such as libraries, IT, and academic administrators. Student services include psychological services, student activities, sports, and the registrar's office, while auxiliary enterprises include residence halls, dining, and health services. Institutional support captures general administration, management, legal, and public relations. Research expenditures include institutes, research centers, and faculty research funds.

board prices, which are used to estimate whether institutions with growing endowments reduce or increase their prices, providing context for changes in aid levels and making it possible to approximate net prices. The analysis considers change in the number of first-time undergraduate applicants who are admitted and the yield rate based on the number who matriculate. Many, but not all, colleges report SAT and ACT scores for incoming students, providing an additional measure of selectivity.

Enrollment for each institution is computed as full-time equivalents, with full-time students counting as 1 and part-time students as 0.5. Counts of the race of entering freshmen are used to document the percent of students who are American Indian, Asian, Black, Hispanic, White, or non-resident alien.¹² I construct two aggregate measures of race to shed additional light on potential changes in the composition of incoming students. The first is a measure of underrepresented students of color equal to the sum of Black, Hispanic, and American Indian students. The second is a measure of Asian and White students.

U.S. News and World Report college and university rankings are widely used by college applicants when choosing where to apply and attend. Factors receiving weight in the ranking include per-student spending, admissions selectivity, and peer assessment scores from other institutions. Thus, rankings represent an outcome of interest as well as a potential mechanism by which endowments can affect outcomes such as admissions selectivity and student diversity. In order to assess the effect of endowments on rankings, I merge historical rankings for each institution in each year.¹³ Some institutions fall outside of the reported ranking range for colleges or universities in some or all years during the sample period. I assign the maximum observed ranking to all institutions that fall outside of the ranking range, thus capturing institutions that fall out of the ranking or climb into the ranking range. Heterogeneity analysis is conducted by restricting attention to institutions that were ranked in the baseline period.

II.3 Sample Construction

The sample in this study is comprised of private, not-for-profit colleges and universities that award bachelor's degrees. Specifically, attention is restricted to institutions identified in the Carnegie Classification as private research universities and liberal arts colleges. Colleges that primarily award associates degrees, have narrow specialties (e.g., theology, art, music), and graduate institutes that do not serve undergraduate

¹²Starting in 2010, many colleges started reporting a "two or more races" category. Any systematic reclassification of race groups across years should be common to institutions with similar initial demographics. In the primary analysis, students classified as two or more races are distributed proportionately to the other races at the institution. This has little effect on the estimates relative to using the raw race totals.

¹³The rankings were compiled by Andrew G. Reiter and can be found at the following website: <http://andyreiter.com/datasets>.

students are not included. Not all colleges and universities have significant endowments, and this is highly correlated with institution type. In 2018, private research universities and liberal arts colleges had median endowments of approximately \$73,000 and \$104,000 per student, respectively, while master's colleges and universities and general baccalaureate colleges had median endowments of \$21,000 and \$17,000. Colleges and universities with small endowment levels per-student are unlikely to significantly alter their expenditures in response to market-driven variation in investment returns, as their primary revenue comes from other sources (e.g., tuition payments). Thus, the sample is restricted to research universities and liberal arts colleges with endowments of at least \$20,000 per student in the first year of the sample period.¹⁴ For high endowment institutions, endowments often account for a significant fraction of total revenue.¹⁵

As noted above, a small fraction of colleges and universities have substantial long-term investments separate from their endowments. This poses challenges for analyses that attempt to isolate the causal effects of endowment wealth and, additionally, may cause investment returns to be mismeasured. Thus, in the primary sample, I exclude the small fraction of institutions (about 5 percent) for which non-endowment investments represent a significant fraction of total investments in the baseline year.¹⁶ Finally, a small number of institutions in the sample have multiple campuses and inconsistent reporting of data across years. Specifically, some institutions report merged data for campuses in some years and separate data for the primary campus in others. Such reporting inconsistencies render changes in outcomes over time spurious, so these institutions are excluded from the analysis.

The resulting sample includes 200 institutions (140 liberal arts colleges and 60 research universities) that served approximate 1.1 million students in 2018. The sample captures the majority of highly selective private institutions in the United States, including 48 of the 50 highest ranked liberal arts colleges and 31 of the 50 highest ranked research universities. In 2018, the average acceptance rate across these institutions was 48 percent, with nearly a quarter of the institutions accepting less than 20 percent of applicants. The institutions are characterized by large endowments (averaging 262,171 dollars per student) and high operational spending (63,411 dollars per student). Approximately 25 percent of students at these colleges and universities receive need-based federal aid, 11 percent of students are Hispanic, and 8 percent are Black.

¹⁴Few institutions that are classified as private research universities or liberal arts colleges have such modest endowments. Thus, restricting the sample to institutions with at least \$20,000 of endowment per student only excludes 8 percent of the sample. The results in the analysis are robust to alternative restrictions on minimum endowment size, such as \$10,000 per student.

¹⁵For example, Swarthmore College and Haverford College report that approximately 50 percent and 25 percent of annual operating revenue comes from the endowment, respectively.

¹⁶Specifically, I exclude institutions for which non-endowment investments represent more than 30 percent of total investments. For the remaining institutions, endowments represent approximately 95 percent of long-term investments.

III Empirical Design

This paper attempts to isolate the causal effect of endowments on spending, the generosity of financial aid, admissions selectivity, and the composition of incoming freshmen. However, there are fundamental sources of endogeneity that complicate the analysis. In the cross-section, numerous factors such as institution age, prestige, and alumni networks can shape endowment levels and outcomes of interest such as admissions selectivity and student composition. Endogeneity also poses fundamental challenges to panel analyses. First, there is a mechanical negative relationship between endowment levels and spending, as distributing revenue from endowments means that less can be retained. This mechanical effect can create bias when examining the relationship between endowments and, for example, aid generosity and enrolling low-income students. Second, there are likely to be correlations between an institution's capacity to attract new endowment gifts and its trajectory on other dimensions. For example, a college or university with increasing prestige may become more selective and more able to grow its endowment. Thus, estimating the relationship between endowments and the outcomes of interest is likely to produce biased measures of the causal relationships.

III.1 Variation in Investment Returns

To abstract from the endogeneity issues detailed above, the design exploits variation in endowment investment returns within and across institutions over time. Variation in investment returns provides shocks to endowment levels among otherwise similar institutions and a promising mechanism for identifying causal effects. Brown et al. (2014) argue that investment returns 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.”¹⁷ In this study, simulated endowments are computed for each institution and year using initial endowments and annual investment returns. Three-year lagged averages of the simulated endowments are then used as instruments for the actual three-year endowment averages that determine spending under institutional rules.¹⁸ That is, I use annual returns to determine expected endowments in each year, compute the three-year lagged value of these expected endowments, and then use this value as an instrument for

¹⁷Differences in returns across institutions can emerge from allocating investments to different asset classes or to choosing different assets within those classes. In 2008, 75 percent of assets were invested in stocks, bonds, and cash, 17 percent in hedge funds, private equity, and venture capital, 4 percent in real estate, 2 percent in commodities and energy, and 2 percent in other vehicles (NACUBO 2008). Decisions about how to invest endowment wealth are typically made by trustees, professional managers, internally by institutions, or by some combination of these.

¹⁸Analyses indicate that average expenditure rates from endowments typically fall close to the 4 to 5 percent targets outlined in institutional spending rules (Hansman, 1990; Sedlacek and Jarvis, 2010; Brown et al., 2014).

the actual three-year rolling endowment average.

It is crucial to the design that investment returns vary over time within institutions and across similar institutions. Figure 1 presents the distribution of average returns between 2003 and 2018 for the 200 institutions in the sample, revealing a wide range of returns. Notably, there is significant variation in returns across institutions that are very similar in terms of their characteristics. Figure 2 shows that there are large differences in average returns across colleges (top panel) and universities (bottom panel) with similar baseline U.S. News and World Report rankings. Similarly, Figure 3 reveals significant differences in returns across institutions with similar baseline endowment wealth (measured as endowment per student).¹⁹ Thus, it is not the case that variation in returns stems solely from higher ranked and richer schools having greater capacity to invest more aggressively and achieve higher returns. Close peer institutions experience very different returns.

Investment returns also varied substantially over time during the sample period. As shown in Figure 3, the period between 2003 and 2007 represents a significant boom, followed by a sharp decline during the Great Recession, and rebound after 2010. While there are large fluctuations in average annual returns across years, significant positive growth is the norm and drives most of the variation. For example, between 2003 and 2018, there were nine years with positive returns exceeding 10 percent, and just one year with endowment losses of 10 percent or more.²⁰ Notably, the differences in returns across institutions are large. For example, the gap in returns between the 10th and 90th percentile of returns in each year ranges from 8 to 15 percent. Importantly, some institutions experienced both large losses during the recession and modest rebounds when markets rallied, while other, similar institutions performed above the average during both boom and bust markets.²¹ These annual differences generate large cumulative differences in returns over time. As shown in Figure 5, the difference in cumulative returns between the 10th and 90th percentile of institutions during the fifteen year sample period is more than 100 percent. Large differences in cumulative returns are also evident when looking within liberal arts colleges and research universities and within institutions of similar baseline rankings (Figure 6).

¹⁹Lerner, Schoar, and Wang (2008), Dimmock (2012), Smith (2015), and Cejnek, Franz, and Stoughton (2017), each note that institutions with larger endowments tend to take riskier investment positions and have higher average returns. This is observable in Figure 3, though there is significant variation in returns across similarly resourced institutions.

²⁰Gilbert and Hrdlicka (2015) attribute the high level of returns and risk in university endowments to The Uniform Prudent Management of Institutional Funds Act, which dictates that the future spending power of endowments, rather than initial principal, should be preserved.

²¹For example, among highly ranked liberal arts colleges with large initial endowments, colleges such as Haverford, Carleton, and Bryn Mawr experienced average annual returns during the sample period of just 4 to 6 percent, while Bowdoin, Grinnell, and Smith had returns of 8 to 10 percent.

III.2 Primary Specification

To exploit the wide variation in returns across otherwise similar colleges and universities, the primary design groups institutions of the same type (research universities and liberal arts college) and baseline U.S. News and World Report rankings. Specifically, in order to restrict comparisons to peer institutions, college and universities are placed into groups of 10 institutions based on their rankings in the baseline year. Thus, for example, highly selective research universities such as Yale, Stanford, and Princeton are compared to each other, and likewise for elite liberal arts colleges such as Swarthmore, Bowdoin, and Middlebury. Making comparisons only within these narrow groups ensures that estimates are based on variation over time between close peer institutions.²²

The primary design examines the effect of endowments on each outcome of interest: spending by category, enrollment, financial aid, admissions, socioeconomic and racial diversity, and institutional rankings.

$$Outcome_{i,t} = \alpha_i + \alpha_{g,y} + \beta \ln(Endowment)_{i,t} + \varepsilon_{i,t} \quad (1)$$

Endowment is the three-year rolling average of endowment levels, the relevant value under institutional endowment spending rules. Because actual endowments are endogenous to spending and new gifts, they are instrumented for using simulated endowments that vary solely in response to investment returns. The specification includes institution fixed effects and thus examines variation in the outcome within the institution over time. Fixed effects are included for each year at the group level, where groups are based on initial Carnegie classification (college or university) and narrow ranking ranges of 10 institutions to comparisons of close peer institutions. The coefficient of interest β reflects the effect of a 100 percent increase in the relevant three-year average endowment on the outcomes. Standard errors are clustered at both the institution and year levels.

Differences in investment returns provide variation in endowments that are not a direct function of endogenous expenditure decisions or alumni giving. The variation is valid if we assume that peer institutions have similar goals for their endowments, and variation in returns stems from unanticipated shocks in investment markets. As a test of this assumption, I first examine if, among grouped institutions, the design is balanced in terms of baseline institutional characteristics and pre-trends in these characteristics. Table 1

²²Goetzmann and Oster (2014) find that close competitor institutions attempt to mimic each other's investment strategies, and often chase the investment strategies of successful competitors. This suggests that competitor institutions have similar investment objectives, providing additional justification for making comparisons within, rather than across, these groups.

presents the relationship between cumulative returns during the sample period and a rich set of institutional characteristics (within the ranking groups introduced above). This reveals that returns are not strongly correlated with baseline expenditures (overall and across a range of spending categories), enrollment, student demographics, admissions selectivity, list price tuition, and aid generosity. Similarly, Table 2 reveals that returns are not strongly correlated with pre-existing trends in these characteristics of the institutions and student populations. This suggests that differences in cumulative returns do not reflect baseline differences in institutional characteristics or pre-existing trajectories and the design is balanced.

III.3 Robustness and Alternative Designs

Three methods are used to test the robustness of the estimates. First, the primary specification is replicated while including the interaction of year with measures of: 1) baseline endowment per student; 2) pre-trend in investment returns; 3) baseline outcome level; and 4) pre-trend in the outcome. Estimates using this alternative specification are presented alongside the baseline specification in order to highlight the extent to which there is bias due to pre-existing differences across peer institutions. Generally, controlling for baseline differences and pre-trends has only modest effects on the estimates. Second, I examine the sensitivity of the estimates to alternative approaches to grouping peer institutions. While the primary design groups colleges and universities with similar baseline rankings, I alternatively group institutions by their baseline endowments per student and baseline outcomes. Finally, higher investment returns may reflect greater willingness to take investment risk on the part of institutions. To examine if the effects are driven by differences in risk preferences across institutions that are correlated with the outcomes of interest, I group institutions according to the variance of their returns during the sample period. Grouping colleges and universities with similar variances in investments, but who experienced different average returns, will reveal if the estimates are being driven by institutions with more or less risky profiles.

Results are presented for two alternative designs. The primary analysis is conducted using all years for which endowments are observed, starting in 2003, which maximizes statistical power. As an alternative, I restrict attention to returns starting with the Great Recession. The recession represents a large and unexpected negative shock that resulted in an average negative return for endowments of more than 20 percent, significantly shaping cumulative returns in the decade that followed. The standard deviation in returns across institutions during the recession averaged 7.5 percent, relative to a maximum of 5.0 percent during other years, and the recession is likely to represent a significant deviation from expected investment risk.

Further, using the recession as the starting point for the analysis allows for the use of additional years of pre-period returns and outcomes as controls. The second alternative design exploits only short-run changes in endowments. Specifically, I estimate how outcomes change over five-year periods relative to concurrent changes in endowments stemming from investment returns. This approach is appealing to the extent that it more precisely captures the link between endowments and outcomes, but will not capture changes in outcomes that take time to materialize.²³

III.4 Investment Returns and Simulated Endowments

This section examines how annual and cumulative investment returns affect endowments and, in turn, how simulated endowments are constructed as instruments for actual endowments. If endowment investment returns are spent rapidly, then large changes in spending and other outcomes could occur shortly after the returns are realized. Alternatively, if colleges adhere to their fixed-percent spending rules, then returns will be retained in the endowment and generate persistent increases in future spending. I first examine the extent to which investment returns in each of the prior six years affect the current year change in endowment level.

$$AnnualPercentEndowChange_{i,t} = \alpha_{g,y} + \sum_{t=0}^5 \gamma_t AnnualPercentReturn_{i,t} + \varepsilon_{i,t} \quad (2)$$

The annual change in endowment and annual return are measured as percent changes. The coefficient on the current year return (T=0) reveals the extent to which current investment returns are retained in the endowment. The coefficients on prior years (T=-1 through T=-5) reveal whether, for example, returns are temporarily retained in the endowment and then spent quickly in subsequent years.

Without controlling for year effects, the coefficient γ_0 reveals that approximately 90 percent of investment returns are retained in the endowment. This indicates that endowment investment returns are nearly fully retained in endowments. However, identification in this study exploits only differential returns across institutions. Thus, Table 3 examines the extent to which annual returns affect endowments while controlling for year fixed effects. The inclusion of year effects controls for endowment changes that are common across all institutions due to overall market conditions. The results reveal that the majority of differential investment returns are retained in endowments. There is also no evidence of significant negative effects of

²³For example, endowment increases can generate immediate changes in spending, which may allow an institution to increase aid generosity and attract stronger students or a more diverse freshman class. However, institutional capacity may take longer to expand and improving an institution's academic reputation among prospective students might take several years.

prior year investment returns, indicating that the increases in the endowment are persistent. These results are robust to making comparisons only among peer institutions through the inclusion of ranking group-by-year fixed effects. Further, controlling for baseline endowments and pre-trends in investment returns reveals that endowment changes are not driven by pre-existing differences on these dimensions.

The annual return estimates suggest that cumulative returns, rather than recent returns, shape endowments. The following specification is used to examine this explicitly.

$$\text{Log}(\text{Endowment}_{i,t}) = \alpha_i + \alpha_{g,y} + \beta \text{CumulativeReturnPercent}_{i,t} + \sum_{t=0}^5 \gamma_t \text{AnnualPercentReturn}_{i,t} + \varepsilon_{i,t} \quad (3)$$

The coefficient of interest β will capture how cumulative returns affect endowment growth, while the γ_t coefficients reveal if recent years have additional independent explanatory power. The estimates in Table 3 indicate that cumulative prior returns strongly shape endowment levels and that there is no additional benefit of considering specific prior year returns. That is, cumulative returns represent a sufficient statistic for prior annual returns. The results are robust to making comparisons only among peer institutions and to controlling for baseline endowments and pre-trends in investment returns. Overall, the evidence is consistent with colleges and universities retaining the majority of investment returns in their endowments, such that high investment returns lead to substantial real growth in endowments.²⁴

With an understanding of these dynamics in hand, annual returns are used to compute a simulated endowment that can be used as an instrument for the actual endowment. Specifically, annual returns are applied to the baseline endowment and then this value is reduced by a fixed percent to reflect average annual spending out of the endowment. The result is a predicted endowment in each year that varies over time across institutions only because of differences in their investment returns. These simulated endowments are averaged over the prior three years to generate a proxy for the endowment measure used in spending rules. Table 4 examines the predictive power of the simulated instruments for the actual endowments. This is the first stage for the instrumental variables strategy. The estimates reveal strong predictive power, consistent with the estimated effects of annual returns on year-to-year changes in endowments. The first stage estimates reveal that a 1 percent change in the simulated three-year average endowment is associated with an approximately 0.8 percent change in the actual three-year average endowment. The power of this

²⁴Hoxby (2014) poses that research universities and the most selective colleges may justify retaining endowment wealth in the context of high market returns because it will open the door to even greater research (and possibly human capital) investment in the future.

relationship remains strong when including ranking group-by-year fixed effects and when controlling for baseline endowments and pre-trends in investment returns.²⁵

IV The Effect of Endowments on Institutional and Student Outcomes

IV.1 Expenditures and Enrollment

Table 5 presents estimates of the effect of endowments on total core operational spending.²⁶ Instrumenting using simulated endowments reveals large and highly significant effects. Specifically, on average, doubling the size of an endowment increases spending by about 25 percent. This result holds when comparing only peer institutions and when controlling for pre-existing trends in returns.²⁷ This finding is consistent with institutions following spending rules, which dictate that increases in endowments should mechanically generate increases in spending. The magnitude of the estimates reveal the important role that endowments play in overall institutional spending, which is especially noteworthy in light of the large differences in cumulative endowment returns across institutions documented in Section 2. It is important to note that changes in spending represent the net effect of higher endowments. That is, if larger endowments alter the tuition that colleges charge or other sources of revenue, the estimated changes in expenditures will reflect these mechanisms.²⁸

Little is known about how endowment wealth causally affects institutional spending across operating categories. In surveys, colleges and universities report using endowment revenue to fund institutional aid for students. However, such surveys are self-reported and may not account for crowd-out of other funding sources. That is, documenting the effects of endowment spending, where revenue from endowments is fungible with revenue from other sources (such as tuition payments), is ultimately an empirical question and not an accounting exercise. Thus, I estimate the effect of endowments on various categories of expenditures,

²⁵Table A1 examines the robustness of the first stage relationship between predicted endowments and actual endowments. The primary design is replicated for alternative groupings of colleges and universities with peer institutions. Specifically, institutions are grouped based on having the same: a) baseline per-student endowments; b) pre-sample investment returns; and c) variance in investment returns during the sample period. Simulated endowments are strongly predictive of actual endowments for each of these alternatives.

²⁶Core spending includes instruction, academic support, student services, auxiliary student services, administration, and research. It excludes spending associated with university hospitals, external public service, and operations independent of the primary mission of the institutions.

²⁷Tables A2 and A3 examine the robustness of the relationship between endowments and institutional spending. The relationship remains strong for an array of alternative methods of grouping peer institutions, including those with the same baseline levels and trends in per-student spending.

²⁸Estimates indicate that higher endowments generate positive, but not statistically significant increases in other sources of revenue. Specifically, there is no evidence of increased tuition revenue and modest increases in new alumni giving.

shedding light on college priorities and highlighting how endowments may affect the desirability of the institution for prospective students.²⁹ Tables 6 and 7 present the change in expenditures per student for core operating categories, including instruction, academic support, student services, institutional support (administration), and research. On average, a doubling of the endowment is associated with an increase in spending of approximately 20,000 dollars per student, with the largest increases in instruction, student services (including auxiliary services), and institutional support. Estimates based on natural logs indicate significant increases for instruction and student services, and even larger increases for institutional support. These estimates are based on comparisons of institutions with the same Carnegie classification and the same baseline ranking. Controlling for baseline endowments and trends in returns, as well as the baseline level and trends in spending, does not meaningfully alter the estimates. The robustness of the estimates indicates that they are not driven by pre-existing trends in spending.³⁰ In contrast to survey results, these estimates capture the incidence of changes in endowment wealth on spending across operational categories.³¹

An important question is whether institutions with larger endowments use their increased spending to expand enrollments and thus increase access to selective higher education. In particular, institutions could potentially increase enrollment while maintaining the quality of faculty and student experience through increased expenditures and investment in hiring and facilities. Institutions could also attempt to expand while maintaining student quality by increasing aid packages to attract stronger students. Conversely, colleges with less endowment growth might be forced to increase enrollments to generate additional revenue. That is, large endowments may provide institutions with the financial freedom to remain small (if desired) as they are less reliant on tuition revenue. The estimates in Table 8 indicate that larger endowments do not lead to increased enrollments. Specifically, doubling the endowment leads to a small and statistically insignificant reduction in student enrollments. This result holds for overall enrollment, undergraduates, and incoming freshman cohorts.³² That is, it does not appear that greater endowment wealth leads colleges and universities to provide education to larger numbers of students, as might be afforded by additional infrastructure,

²⁹Previously, the only causal evidence about the effect of endowment income on spending categories comes from Brown et al. (2014), who find evidence that endowment funds may be used to preserve administrative positions but not faculty positions in the short-run during economic downturns.

³⁰Tables A2 and A3 present estimates for alternative methods of grouping colleges and universities. Pairing institutions with those of similar baseline endowment and spending levels and trends produces estimates that are nearly identical to those produced by the primary design. The results are also robust to grouping institutions by the variance of their investment returns.

³¹The results are informative for understanding the potential effects of endowment taxes. In response to the tax placed on the largest endowments by the Tax Cuts and Jobs Act of 2017, institutions reported potential cuts to financial aid, as well teaching and research and other operations (Lorin, 2019; Selig, 2020; Seltzer, 2020).

³²This is consistent with the finding in Bound and Turner (2007) that the most selective public institutions are “least likely” to expand enrollments in response to larger state cohorts.

increased hiring, or the ability to recruit and support students with more generous aid. These results are robust to controlling for baseline endowment and enrollment levels and pre-trends in enrollment.³³ Overall, while institutions spend more in response to growing endowments, they do not expand access.

IV.2 Financial Aid and College Cost

Institutions with larger endowments could maintain or increase spending levels while deriving less revenue from tuition and room and board. Indeed, institutions report spending approximately half of endowment revenue on institutional grant aid. Greater institutional generosity could take the form of smaller increases in list prices that apply to all students, expanding the fraction of students who receive institutional aid, or increasing institutional aid packages. Each of these changes would reduce the net price of college. Wealthier institutions could also enroll higher fractions of low-income students, which would be revealed through increases in the fraction of students receiving federal grant aid. Thus, I examine the effect of changes in endowments on list price, the percent of students receiving aid, average aid levels conditional on receipt, estimated net price, and the fraction of students receiving federal aid.³⁴

Colleges and universities could use increased endowment wealth to reduce their tuition and room and board prices, thereby reducing the net price without altering aid levels. Alternatively, colleges with higher endowments have greater spending and may become more desirable, which could be used to demand higher prices. The estimates in Table 9 indicate that institutions with larger endowments do not reduce tuition or room and board. Indeed, the point estimates are positive but statistically insignificant, and relatively unchanged by including pre-trends. Additionally, grouping institutions based on their baseline endowment and enrollment levels and trends produces consistently modest and insignificant estimates (Table A5). It does not appear that colleges and universities use endowment wealth to reduce list prices. Thus, any change in cost for students overall would need to take the form of greater grant aid, either through expanding eligibility for aid or providing more generous packages.

Table 10 reveals that increases in endowments result in no increase in the fraction of students receiving institutional aid. Indeed, when controlling for pre-trends, there is a statistically significant reduction in the fraction of students receiving institutional aid. Further, there is a reduction in the fraction of students

³³The estimates are also robust to grouping institutions with those that have the same baseline enrollment levels and enrollment trends (Table A4).

³⁴More generous institutional aid could also lead to a smaller fraction of students taking out loans, so I examine this as an additional outcome of interest. However, changes in the fraction of students taking out loans could also reflect changes in the composition of enrolled students, and thus the results are interpreted in the context of changes in the fraction of student eligible for federal aid.

receiving federal aid, which suggests that wealthier colleges and universities are, if anything, reducing the fraction of low-income students they serve. In conjunction, the results reveal that institutions are not expanding aid by admitting more low-income students or by expanding the fraction of students receiving institutional aid. Estimates do, however, reveal a statistically significant reduction in the fraction of students taking loans. This reduction could reflect increased generosity of institutional aid, but also may reflect the change in the composition of students toward those who are less likely to need financial assistance.

Table 11 reveals a modest increase in the amount of per-student institutional aid conditional on receipt. Specifically, doubling the endowment increases institutional grant aid by approximately \$3,000, or about 13 percent relative to average levels. The lack of an increase in the fraction of students receiving institutional aid and the modest increase in the amount of aid suggest that a small fraction of endowment revenue is dedicated to financial aid. As a back of the envelope exercise, I note that approximately 76 percent of students receive institutional aid, indicating that the amount of institutional aid per enrolled student increases by about \$2,300 when the endowment doubles. Thus, after accounting for the reduction in the fraction of students receiving aid, only about 10 percent of the \$20,000 increase in per-student spending is allocated to institutional financial aid. These findings stand in contrast to surveys in which colleges and universities report that half of endowment revenue is allocated to financial aid. Combining the fraction of students receiving each type of aid, the generosity of aid conditional on receipt, and list tuition and room and board provides an approximation of net price per student. Estimates indicate that these net prices do not decrease with endowment growth.

The financial aid estimates result in two primary conclusions. First, it appears that larger college endowments lead to only slightly more generous institutional aid packages. Second, the estimates reveal that larger endowments do not cause colleges to serve more low-income students who are eligible for grant aid. Most notably, there is no increase in the fraction of incoming students eligible for Pell Grants, and, conditional on receiving a grant, the average amount is not higher. Likewise, there is a reduction in the fraction of students receiving any aid or grant aid from other sources. The estimated effect of endowments on the fraction of students receiving aid, per-student aid amounts, and the fraction of low-income students served is robust to grouping institutions that serve similar fractions of low-income students in the baseline period or that have similar pre-trends in the fraction of low-income students they serve (Tables A6 and A7).

IV.3 Admissions and Student Composition

This section examines whether or not larger endowments lead institutions to increase the racial diversity of their incoming classes. This could stem from, for example, more generous aid packages, providing a higher quality product that attracts more diverse applicants, or spending on outreach programs. Alternatively, colleges and universities could use increased aid and quality to achieve other goals, such as becoming more selective, potentially making it more difficult for underrepresented groups to gain admission.

As shown in Table 12, institutions with growing endowments reduce the number of students they admit, and the robustness of the estimates reveals that this result does not stem from pre-existing trends in selectivity. However, institutions with larger endowments have higher freshman admission yield rates suggesting an increase in desirability. The increase in yield rates could stem from numerous factors, including the ability of the institution to offer more generous aid, greater per-student spending on instruction and student services, greater spending on infrastructure projects, and possibly increased prestige. The reduction in admissions and increase in yield of admitted students are offsetting and produce no net increase in freshman enrollment. That is, colleges with larger endowments are able to maintain cohort sizes while increasing selectivity.³⁵ Evidence of increased selectivity and higher yields is also evident in the admissions scores of students who enroll. Both average SAT and ACT scores are higher for incoming cohorts, though the increase is not precisely estimated or statistically significant. Overall, the estimates suggest that colleges and universities that experience endowment growth are able to become more selective, but do not increase the size of their freshman cohorts.

Larger endowments result in somewhat more generous institutional aid, which institutions could use to attract more low-income students. Institutions could also dedicate additional spending to increase outreach to these students. Conversely, colleges and universities with growing endowments appear to become more selective, which may make them less likely to admit lower-income students and students of color. Table 13 presents estimates of the effect of endowments on the racial composition of enrolled freshmen. The estimates reveal positive coefficients for Asian and White students and negative coefficients for Hispanic and Black students. The overall decrease in enrollment of students of color is statistically significant and non-trivial in magnitude relative to baseline enrollments. A potential concern is that institutions with differing demographic compositions, or with different trends in demographic composition, experience differing

³⁵The reduction in admissions and increase in the yield rate are robust to grouping institutions by their baseline levels and pre-trends in selectivity (Table A8).

endowment investment returns and thus endowment growth. However, the results are robust to accounting for differential changes by baseline racial composition and trends in racial composition prior to the sample period.³⁶ Thus, the evidence is that private institutions with growing endowments become more selective at the expense of expanding access to underrepresented student populations. This result is consistent with the finding in the prior section that endowment wealth reduces the fraction of enrolled students who are eligible for federal grant aid.

One potential explanation for the lack of increased enrollment and diversity in response to endowment wealth are restrictions on the use of endowment funds or the inability of institutions to convert endowments into liquid assets. However, several analyses of this question indicate that a significant fraction of endowment wealth is unrestricted and liquid (Conti-Brown, 2011; Brown et al., 2014). That is, endowments are comprised of both traditional endowments that must be preserved, and other assets that institutions have the freedom to spend (Ehrenberg, 2009).³⁷ The results in this study are also not consistent with an explanation based on restrictions on endowments. Specifically, there is clear evidence that endowment wealth is used to increase spending across a wide range of operational categories. This, in conjunction with institutions' freedom to redirect general funds, suggest that most institutions can use wealth to increase overall enrollment or to support more low-income and underrepresented students. An alternative explanation for the failure of institutions to increase diversity is that they are unable to attract additional low-income applicants or students of color. However, such an explanation is hard to reconcile with evidence of increased selectivity, increased yields, the potential to allocate resources to recruitment and more generous financial aid packages, and evidence in the literature that there is a supply of high ability low-income students who are not attending elite colleges (Pallais and Turner, 2006).

³⁶Additionally, grouping institutions with similar baseline student demographics and trends produces estimates consistent with those in the primary specification. The estimates in Table A9 indicate negative effects on enrolling students of color across five alternative methods of pairing institutions.

³⁷Prior to 2008, states generally followed the Uniform Management of Institutional Funds Act, which dictated that non-profit institutions could not spend endowment funds if they fell below the level of the initial principal. This could, in times of significant down markets, significantly restrict the ability of an institution to spend from endowment funds. By 2012, this law had been replaced in nearly every state by the Uniform Prudent Management of Institutional Funds Act, which allows for prudent spending of underwater endowments, but also dictates that the future spending power, and not the baseline principal, must be preserved. There is evidence that the new law made endowments more liquid and resulted in greater spending during the Great Recession in states where it had been adopted (Anderson, 2019).

IV.4 Institution Rankings

Larger endowments may cause colleges and universities to achieve higher U.S. News and World Report rankings. This is relevant to the analysis for two reasons. First, these high-profile rankings represent a potential mechanism by which endowment growth and the resulting increase in per-student spending may affect institutional and student outcomes. For example, greater spending directly factors into ranking formulas, and the resulting rankings improvements could increase freshman yields and admissions selectivity. Second, improving institutional rankings could be an objective of college and university administrators, and thus an outcome of interest in response to endowment growth. That is, institutions may explicitly try to improve their rankings as a means to increase their desirability to alumni, faculty, and students, and thus to strengthen their academic and financial standing.

U.S. News and World Report publishes the most well-known ranking of colleges and universities in the United States. The rankings are calculated separately for national research universities and liberal arts colleges. Factors receiving weight in the rankings include a reputation score derived from a survey of peer institutions, retention and graduation rates, faculty resources (such as class size), admissions selectivity measures, financial resources such as spending on instruction and student services, and alumni giving rates. Each of these factors can be directly or indirectly affected by the increased resources associated with endowments. As examined above, larger endowments directly increase per-student spending on instruction and student services, which mechanically increases institutional rankings. Likewise, greater spending on instruction leads to improved faculty resource measures.³⁸ The estimates also reveal evidence that larger endowments lead to increased selectivity and higher admissions yields. These outcomes are likely to stem directly from increased spending (e.g., through greater aid packages or offering a more desirable college experience) as well as indirectly due to the increase in institutional rankings. In turn, greater spending and increased selectivity can affect outcomes such as student retention which also lead to higher rankings.³⁹

Table 14 presents the estimated effect of endowment growth on college and university rankings using the primary research design. Overall, higher endowments substantially improve rankings, with the effects largely driven by liberal arts colleges. The effects are largest for lower-ranked colleges in the sample (those that started the sample period with a national ranking between 50 and 100), which likely reflects the limited

³⁸Additional estimates reveal that larger endowments reduce student-to-faculty ratios overall and for liberal arts colleges in particular. This stems from a combination of increased faculty numbers and the previously estimated reduction in student enrollment.

³⁹Estimates reveal statistically significant evidence of increased two-year retention at liberal arts colleges.

scope for ranking gains among the highest ranked institutions in the baseline period. The average effect of endowments on rankings for research universities has the same sign but is smaller and statistically insignificant. Overall, along with the impact on increased spending, the effect of endowment wealth on rankings is the most definitive in the analysis.

IV.5 Alternative Designs

This section considers two alternative research designs that also use variation in endowment investment returns. The first exploits only variation beginning with the Great Recession, the largest shock to financial markets during the sample period. The second estimates the effects of shorter-run changes in endowments on concurrent changes in the outcomes of interest in a rolling design.

The Great Recession represents the most unanticipated shock to investment returns during the past 20 years, and significantly shaped cumulative returns in the decade that followed. In order to exploit this, I replicate the primary design using only investment returns that occur during and after the recession. The estimates presented are based on specifications that control for pre-trends in investment returns and the outcomes of interest during the five years prior to the recession. Table A11 reveals that simulated endowments based on annual investment returns are strongly predictive of actual changes in endowments. That is, the negative returns associated with the Great Recession did not attenuate the strong relationship between investment returns and endowment levels. Institutions that were exposed to the most affected asset classes during the recession and subsequent boom years experienced corresponding changes in their endowments. Instrumental variables estimates show that the resulting changes in endowments had a large effect on core operating expenditures, with a 100 percent change in the endowment changing spending by approximately 25 percent. The most statistically significant increases in spending were allocated to student services and institutional support (Table A12). The analysis reveals no effect of endowments on enrollment overall, for undergraduates, or for freshmen (Table A13). There is also no evidence that wealthier institutions reduced tuition, expanded aid to more students, or enrolled lower-income students who were eligible for federal aid (Table A14). Increases in institutional aid are similar in magnitude to those for the full sample, but are statistically insignificant and do not result in significant reductions in net price. Examining the demographics of incoming freshman reveals a reduction in the enrollment of students of color, and an offsetting increase in Asian and White students (Table A15). Finally, institutions that experienced endowment increases achieved higher U.S. News and World Report rankings, with the results driven by liberal arts colleges (Table A16).

Overall, using variation starting with the Great Recession produces a pattern of results that is consistent with those based on the full sample period.

The second alternative design examines shorter-run changes in the outcomes in response to concurrent endowment changes. Specifically, I examine five-year rolling changes in the outcomes in response to five-year changes in endowments, where three-year endowment average changes are instrumented for using annual investment returns. This design benefits from relating concurrent changes in outcomes and endowments, potentially strengthening the causal connection. However, the design will not capture changes in the outcomes that require time to materialize. For example, institutions may not be able to adjust the number of students they enroll in the short run due to the need for additional buildings to handle capacity. The analysis reveals that simulated changes in endowments based on annual investment returns are highly predictive of actual endowment changes, and that endowments shape institutional spending (Table A17). Spending is allocated to instruction and, to a greater extent, student services and institutional support (Table A18). However, there is no evidence that institutions increase enrollment, reduce tuition, or increase the fraction of students receiving aid (Tables A19 and A20). Consistent with the primary design, there is evidence that colleges and universities modestly increase institutional grant aid, but there is no significant decrease in estimated net price. Larger endowments lead to increased admissions selectivity and reduced enrollment of students of color (Table A21). Wealthier institutions do, however, experience significantly improved U.S. News and World Report rankings (Table A22). Overall, the two alternative designs produce evidence that is consistent with the primary design.

V Conclusion

There is little causal evidence about how private colleges and universities use their endowment revenue in practice and, specifically, whether they use it to expand access by increasing the number of students they enroll or increasing the economic and racial diversity of their student populations. In surveys, institutions report that half of endowment revenue is used to fund institutional aid, allowing them to reduce the financial burden of college for students, and an additional one-quarter is allocated to academic programs and faculty. However, self-reported expenditures from endowment revenue are unlikely to account for the fungible nature of revenue sources and do not capture the causal impact of changes in spending.

To examine the net, causal effect of endowments on institutional and student outcomes, this study

exploits variation in endowments solely generated by investment returns. Variation in returns over time and across close peer institutions reveal that a significant fraction of investment income is retained in the endowment, generating persistent increases in subsequent spending in accordance with institutional spending rules. However, the estimates reveal that institutional aid for students accounts for only about 10 percent of the overall increase in spending caused by endowment growth. Further, colleges and universities with larger endowments do not increase enrollment overall to expand access to elite education and do not increase the fraction of low-income students or students of color they serve. Specifically, colleges and universities whose endowments grew due to high investment returns over the last twenty years enrolled fewer students who were eligible for federal Pell Grants and smaller percentage of Black and Hispanic students. Instead, wealthier institutions offset higher admissions yields by reducing the number of admitted students, thus becoming more selective. As a result of increased spending and greater selectivity, institutions with growing endowments achieved higher national rankings. The analysis is robust to accounting for differential baseline institutional and student characteristics, pre-trends in the outcomes of interest, and to using alternative methods of grouping peer institutions.

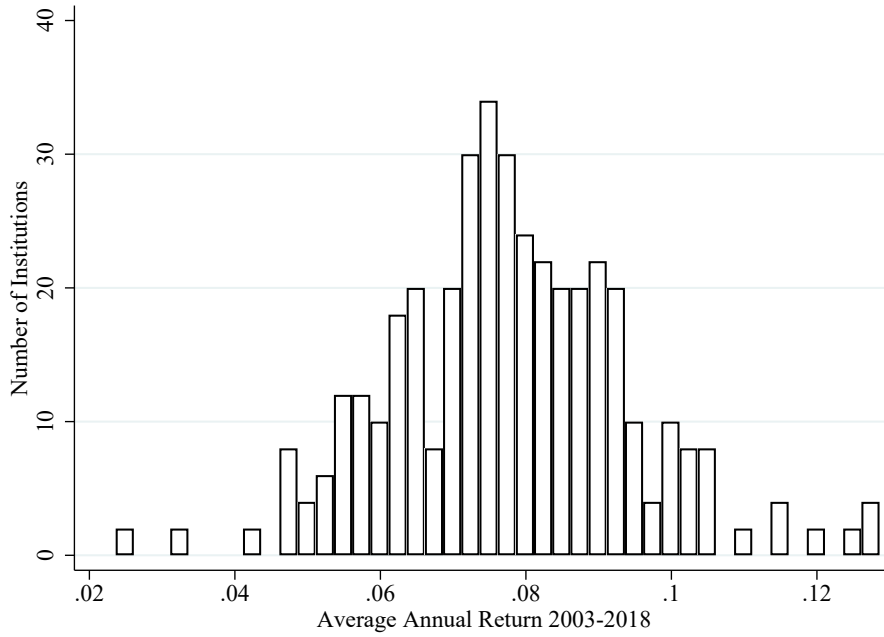
The estimates in this study provide some of the first evidence of the net effect of endowment wealth and revenue on institutional spending across categories and the effects of this spending on the size and compositions of the population of students served. The pattern of results is informative about the objective functions of private post-secondary institutions and the incentives they face, with little evidence that increasing access overall or for low-income and underrepresented populations is a priority.

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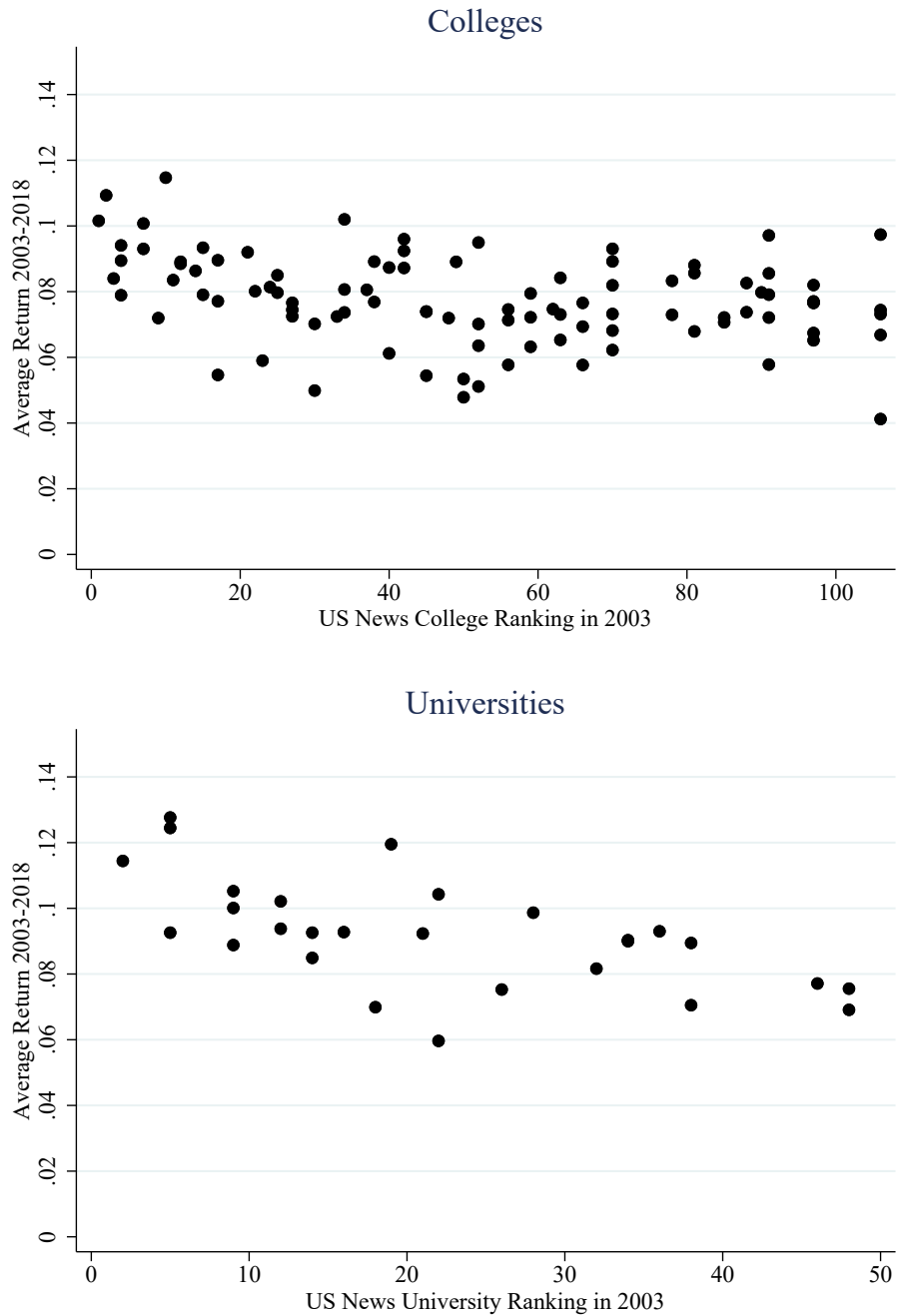
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FIGURE 1
Distribution of Average Annual Investment Returns by Institution



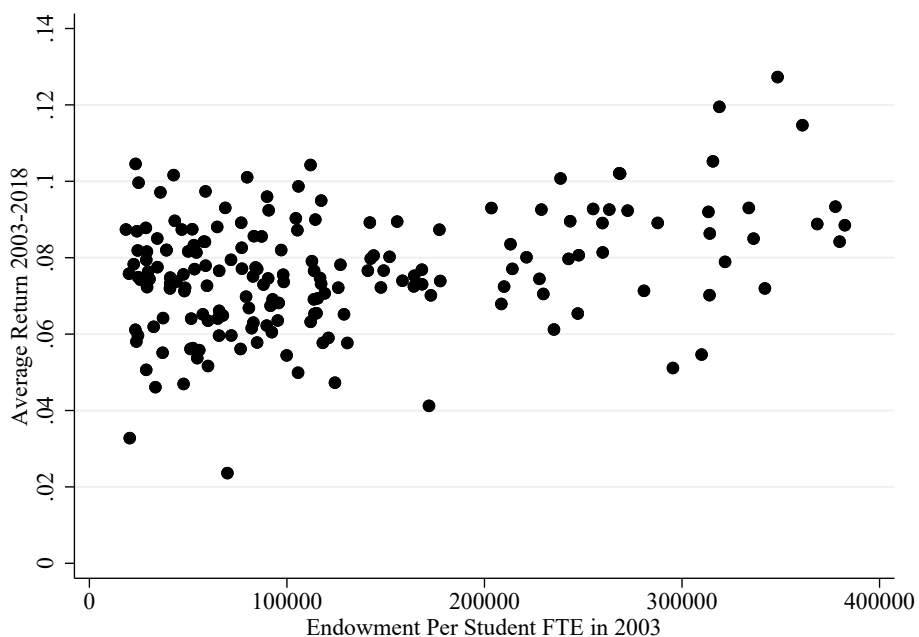
Note: The figure presents the distribution of average annual endowment investment returns between 2003 and 2018. The sample includes 200 institutions categorized as liberal arts colleges and research universities by the Carnegie Classification of Institutions of Higher Education. Attention is restricted to private colleges and universities with endowments of at least \$20,000 per student at the beginning of 2003. Annual percent returns are measured using investment return totals and endowment levels reported by the National Center for Education Statistics Integrated Postsecondary Education Data System.

FIGURE 2
Average Annual Investment Returns by Baseline Ranking



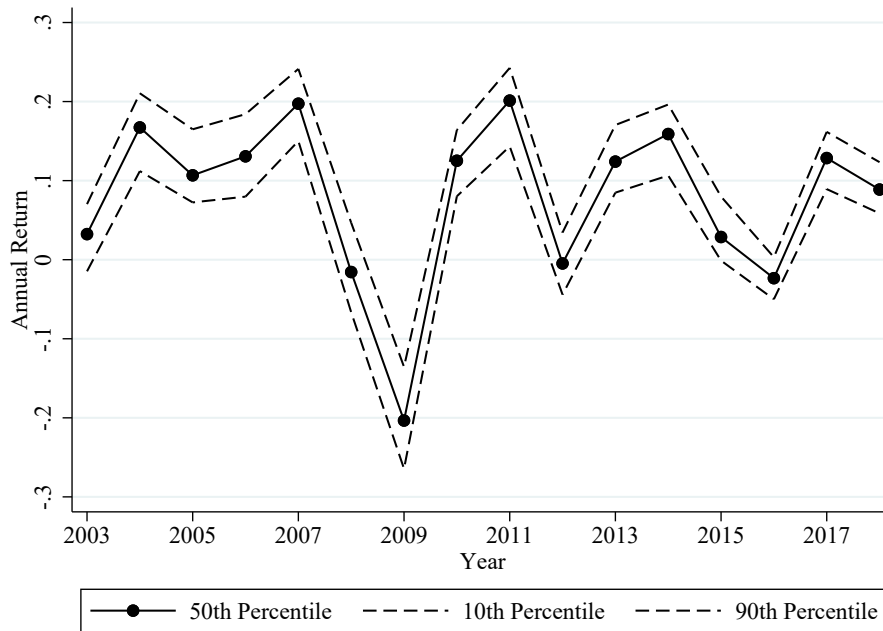
Note: The figures present the average investment returns between 2003 and 2018 for colleges and universities by their baseline U.S. News and World Report rankings. Rankings are measured in 2003 and attention is restricted to the top 100 colleges and top 50 research universities. Liberal arts colleges and research universities are identified using the Carnegie Classification of Institutions of Higher Education. Attention is restricted to private institutions with endowments of at least \$20,000 per student at the beginning of 2003. Annual percent returns are measured using investment return totals and endowment levels reported by the National Center for Education Statistics Integrated Postsecondary Education Data System.

FIGURE 3
Average Annual Investment Returns by Baseline Endowment Per Student



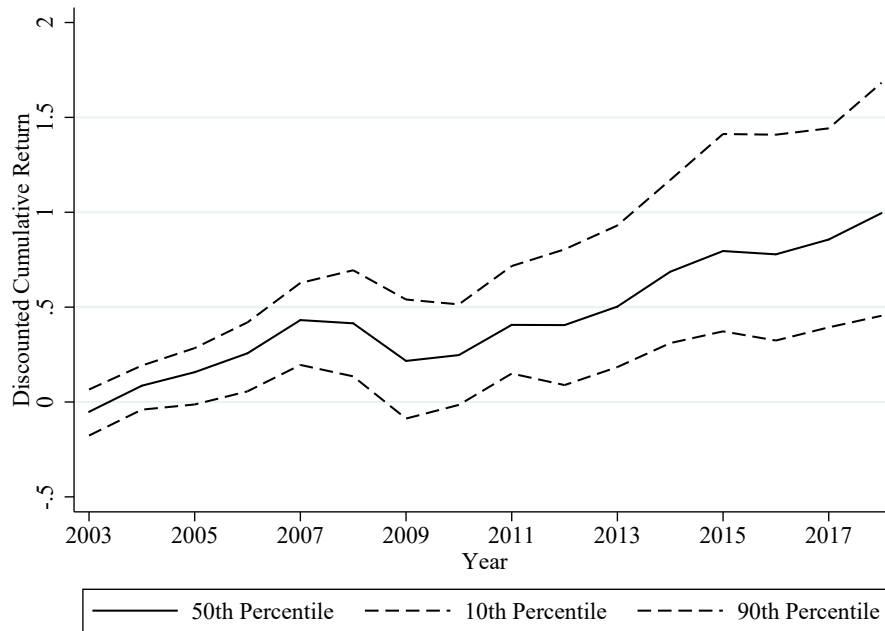
Note: The figure presents the average annual endowment investment returns for colleges and universities by their baseline endowment levels. Average annual returns are measured from 2003 to 2018. Baseline endowment levels per student are measured in 2003. Liberal arts colleges and research universities are identified using the Carnegie Classification of Institutions of Higher Education. Attention is restricted to private colleges and universities with endowments of at least \$20,000 per student at the beginning of 2003. Annual percent returns are measured using investment return totals and endowment levels reported by the National Center for Education Statistics Integrated Postsecondary Education Data System.

FIGURE 4
Annual Investment Returns Over Time



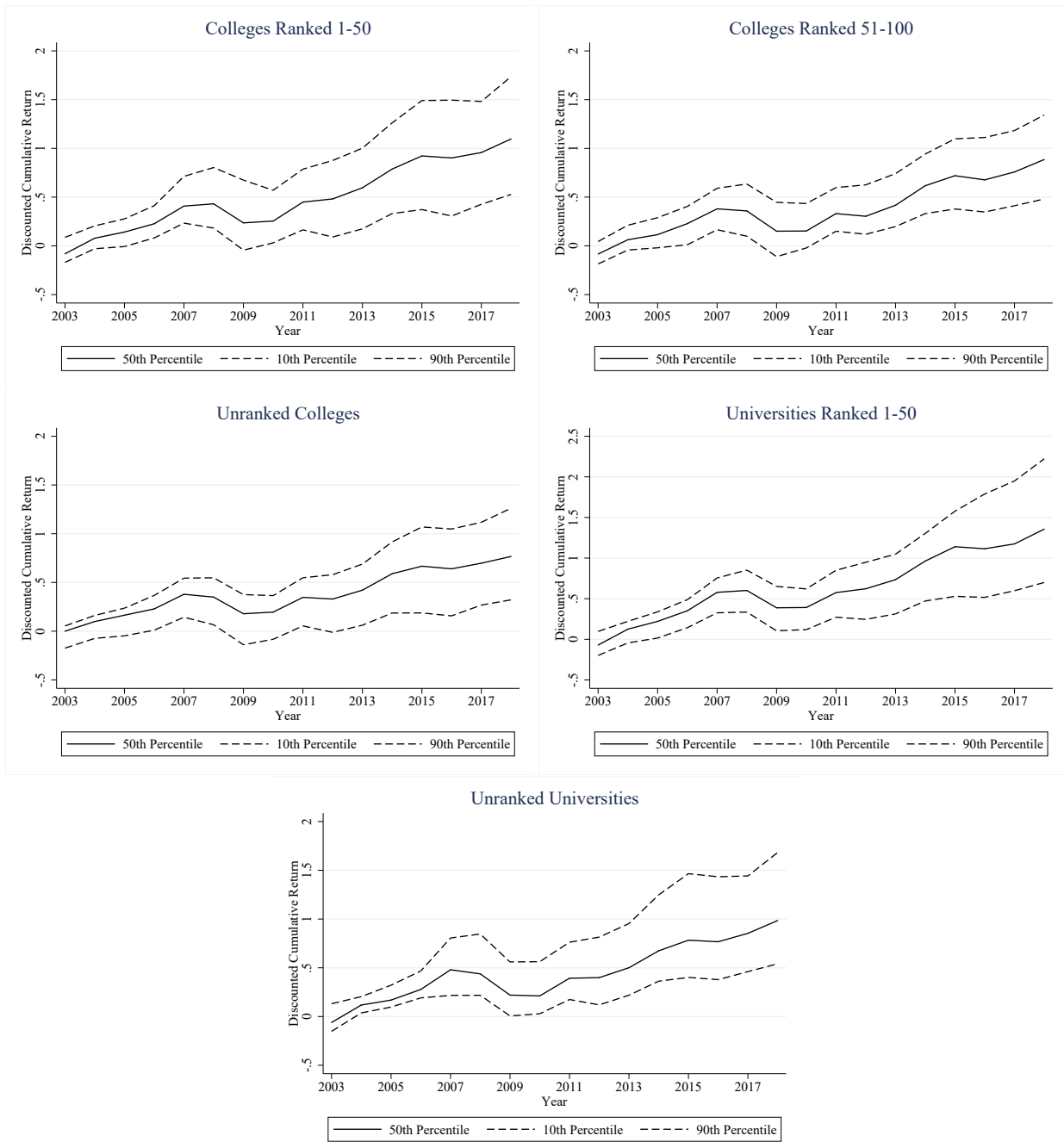
Note: The figure presents endowment investment returns by year from 2003 to 2018. The 10th, 50th, and 90th percentiles of returns are presented in each year. Liberal arts colleges and research universities are identified using the Carnegie Classification of Institutions of Higher Education. Attention is restricted to private colleges and universities with endowments of at least \$20,000 per student at the beginning of 2003. Annual percent returns are measured using investment return totals and endowment levels reported by the National Center for Education Statistics Integrated Postsecondary Education Data System.

FIGURE 5
Cumulative Investment Returns Over Time



Note: The figure presents the discounted cumulative endowment returns from 2003 to 2018. The 10th, 50th, and 90th percentiles of cumulative returns are presented in each year for the institutions in the sample. Liberal arts colleges and research universities are identified using the Carnegie Classification of Institutions of Higher Education. Attention is restricted to private colleges and universities with endowments of at least \$20,000 per student at the beginning of 2003. Annual percent returns are measured using investment return totals and endowment levels reported by the National Center for Education Statistics Integrated Postsecondary Education Data System.

FIGURE 6
Cumulative Returns Over Time by College Type and Ranking



Note: The figures present the discounted cumulative endowment returns from 2003 to 2018 for colleges and universities by their baseline rankings. The 10th, 50th, and 90th percentiles of cumulative returns are presented in each year for the institutions in the sample. Liberal arts colleges and research universities are identified using the Carnegie Classification of Institutions of Higher Education. Attention is restricted to private colleges and universities with endowments of at least \$20,000 per student at the beginning of 2003. Annual percent returns are measured using investment return totals and endowment levels reported by the National Center for Education Statistics Integrated Postsecondary Education Data System. U.S. News and World Report rankings are measured in 2003.

TABLE 1
Relationship Between Baseline Characteristics and Cumulative Returns

	Mean	Coeff	Std Error	P-value
<i>Expenditures Per Student</i>				
Total Core Spending	57,135.24	1,832.81	(3,429.96)	0.59
Instruction	21,705.80	1,071.50	(1,089.85)	0.33
Academic support	5,967.29	-468.08	(1,134.49)	0.68
Student service	6,581.09	279.43	(646.53)	0.67
Auxiliary enterprises	7,980.35	420.16	(861.81)	0.63
Institutional support	8,988.84	-628.89	(761.39)	0.41
Research	5,911.87	1,158.68	(1,459.00)	0.43
<i>Enrollment (Full-Time Equivalent)</i>				
Total	4,824.33	-47.84	(480.48)	0.92
Undergraduate	3,277.21	3.93	(346.31)	0.99
Freshman	791.10	8.40	(71.59)	0.91
<i>Freshman Demographics</i>				
Percent Asian	7.23	0.69	(0.89)	0.44
Percent White	65.31	-3.19	(3.13)	0.31
Percent Hispanic	7.13	0.45	(0.64)	0.49
Percent Black	6.88	-1.15	(1.73)	0.51
<i>Admissions</i>				
Admissions rate	52.11	-0.57	(2.19)	0.80
Admissions yield	30.13	1.40	(2.12)	0.51
Median SAT	1,249.50	13.31*	(7.69)	0.09
Median ACT	27.33	0.28	(0.25)	0.27
<i>List and Net Price</i>				
List price	51,226.01	592.05	(980.65)	0.55
List tuition	39,700.17	1,050.51	(861.35)	0.22
List room and board	11,525.85	-458.46	(301.23)	0.13
Estimated Net price	32,502.40	1,629.35	(1,100.34)	0.14
<i>Freshman Financial Aid</i>				
Percent receiving aid	81.99	-5.09*	(2.86)	0.08
Percent taking loans	53.37	-3.39*	(1.79)	0.06
Average federal aid	5,662.99	143.18	(247.35)	0.56
Average state aid	4,206.87	144.28	(547.20)	0.79
Average institutional aid	23,053.54	552.35	(631.80)	0.38
Average loan amount	6,910.33	-152.77	(331.49)	0.65

Note: This table examines the relationship between college and university characteristics measured in the baseline year (2003) and cumulative investment returns between 2003 and 2018. The second column presents the coefficient from a regression of each characteristic on the discounted cumulative return. Colleges and universities are grouped by their baseline year ranking by the U.S. News and World Report. Core spending includes instruction, academic support, student services, administration, and research. It excludes spending associated with university hospitals, external public service, and operations independent of the primary mission of the institutions. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 2
Relationship Between Pre-trends in Characteristics and Cumulative Returns

	Mean	Coeff	Std Error	p-value
<i>Expenditures Per Student</i>				
Total	1,146.57	386.23	(550.37)	0.48
Instruction	413.17	285.92	(186.22)	0.13
Academic support	192.04	-31.87	(124.47)	0.80
Student services	208.90	121.82	(101.78)	0.23
Auxiliary enterprises	28.28	8.77	(150.97)	0.95
Institutional support	222.72	34.53	(106.60)	0.75
Research	175.53	-11.35	(114.93)	0.92
<i>Enrollment (Full-Time Equivalent)</i>				
Total	63.46	-11.90	(14.69)	0.42
Undergraduate	40.32	-3.94	(11.22)	0.73
Freshman	8.60	-1.66	(2.39)	0.49
<i>Freshman Demographics</i>				
Percent Asian	0.01	0.13*	(0.08)	0.09
Percent White	-0.90	-0.38	(0.50)	0.45
Percent Hispanic	0.07	-0.10	(0.06)	0.12
Percent Black	0.07	0.05	(0.06)	0.43
<i>Admissions</i>				
Admissions rate	-1.08	0.67	(0.62)	0.28
Admissions yield	-0.00	-0.00	(0.00)	0.80
Median SAT	3.73	2.87*	(1.72)	0.10
Median ACT	0.01	0.01	(0.04)	0.85
<i>List and Net Price</i>				
List price	1,123.10	46.29	(127.15)	0.72
List tuition	893.19	58.89	(121.06)	0.63
List room and board	229.91	-12.61	(26.88)	0.64
Estimated Net price	873.35	215.27	(205.58)	0.30
<i>Freshman Financial Aid</i>				
Percent receiving aid	0.59	-0.89*	(0.53)	0.10
Percent taking loans	-0.55	-0.14	(0.56)	0.80
Average federal aid	116.94	-103.79	(162.68)	0.52
Average state aid	-107.87	-142.84	(129.48)	0.27
Average institutional aid	424.18	67.93	(186.65)	0.72
Average loan amount	74.72	96.44	(117.79)	0.41

Note: This table examines the relationship between the trend in college and university characteristics prior to the baseline year (2003) and cumulative investment returns between 2003 and 2018. The second column presents the coefficient from a regression of the pre-trend for each characteristic on the discounted cumulative return. Colleges and universities are grouped by their baseline year ranking by the U.S. News and World Report. Core spending includes instruction, academic support, student services, administration, and research. It excludes spending associated with university hospitals, external public service, and operations independent of the primary mission of the institutions. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 3
Investment Returns and Changes in Endowment Levels

	Percent Change in Endowment			Ln Endowment Level		
	(1)	(2)	(3)	(4)	(5)	(6)
Cumulative Returns				0.430*** (0.058)	0.426*** (0.063)	0.408*** (0.059)
Percent Return Year T=0	0.688*** (0.052)	0.676*** (0.054)	0.671*** (0.052)	0.111 (0.091)	0.129 (0.106)	0.153 (0.104)
Percent Return Year T=-1	0.007 (0.025)	0.003 (0.031)	-0.001 (0.033)	0.011 (0.078)	0.028 (0.088)	0.053 (0.086)
Percent Return Year T=-2	0.041 (0.035)	0.044 (0.038)	0.040 (0.038)	0.025 (0.068)	0.046 (0.072)	0.070 (0.070)
Percent Return Year T=-3	0.001 (0.038)	-0.006 (0.040)	-0.010 (0.039)	0.021 (0.067)	0.039 (0.069)	0.060 (0.064)
Percent Return Year T=-4	-0.037 (0.035)	-0.026 (0.038)	-0.030 (0.039)	0.005 (0.072)	0.027 (0.076)	0.047 (0.073)
Percent Return Year T=-5	0.012 (0.028)	0.010 (0.032)	0.005 (0.032)	-0.018 (0.072)	-0.007 (0.068)	0.007 (0.064)
Mean Dep	0.04	0.04	0.04	19.64	19.64	19.64
Observations	3,486	3,486	3,486	3,472	3,472	3,472
Year FEs	X			X		
US News Grp by Year FEs		X	X		X	X
Initial Endow by Year			X			X
Pre-trend Return by Year			X			X

Note: This table presents estimates of the effect of investment returns on endowment levels. Columns 1 through 3 examine the effect of annual returns in each of the prior six years on annual changes in endowment levels. Returns in the current year are identified as T=0 and in the five prior years as T=-1 to T=-5. Columns 4 through 6 include institution fixed effects and examine the effect of cumulative investment returns on the natural log of endowment levels. Columns 1 and 4 include year fixed-effects to account for changes in endowments that are common across all institutions. Columns 2 and 5 includes college and university group-by-year fixed effects, where groups are based on baseline U.S. News and World Report rankings. Columns 3 and 6 allow for differential trends across institutions by baseline endowment levels and prior investment returns. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 4
First Stage: Actual and Simulated Endowments

	Ln Actual Endowment (3-Yr Avg)		
	(1)	(2)	(3)
Ln Simulated Endowment (3-Yr Avg)	0.849*** (0.100)	0.836*** (0.107)	0.796*** (0.100)
Mean Dep	19.63	19.63	19.63
Observations	3,474	3,474	3,474
Year FEs	X		
US News Grp by Year FEs		X	X
Initial Endow by Year			X
Pre-trend Return by Year			X

Note: This table presents estimates of the effect of changes in simulated endowment levels on changes in actual endowment levels. Simulated endowments are created using annual investment returns. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Thus, the simulated and actual endowment levels in this analysis are three-year rolling averages. Each specification includes institution fixed effects. Column 1 includes year fixed-effects to account for percent changes in endowments that are common across all institutions. Column 2 includes college and university group-by-year fixed effects, where groups are based on baseline U.S. News and World Report rankings. Column 3 allows for differential trends across institutions by baseline endowment levels and prior investment returns. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 5
Effect of Endowments on Core Operational Spending

	Ln Core Operational Spending		
	(1)	(2)	(3)
Ln Endowment (3-Yr Avg)	0.267*** (0.042)	0.253*** (0.052)	0.244*** (0.059)
Mean Dep	10.81	10.81	10.81
Observations	3,474	3,474	3,474
Year FEs	X		
US News Grp by Year FEs		X	X
Initial Endow by Year			X
Pre-trend Return by Year			X

Note: This table presents estimates of the effect of endowments on core operational spending. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Core spending includes instruction, academic support, student services, administration, and research. It excludes spending associated with university hospitals, external public service, and operations independent of the primary mission of the institutions. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Column 1 includes year fixed-effects to account for percent changes in spending that are common across all institutions. Column 2 includes college and university group-by-year fixed effects, where groups are based on baseline U.S. News and World Report rankings. Column 3 allows for differential trends across institutions by baseline endowment levels and prior investment returns. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 6
Expenditure Per Student by Category

	Core Expenses	Instruction	Academic Support	Student Services	Aux Enterprise	Institutional Support	Research
<i>College Type Groups</i>							
Ln Endowment (3-Yr Avg)	19,671*** (5,372)	6,064** (2,144)	487 (1,163)	2,364*** (672)	3,999** (1,734)	5,055*** (1,249)	1,702 (1,114)
Mean Dep Observations	57,135 3,474	21,705 3,474	5,967 3,474	6,581 3,474	7,980 3,474	8,988 3,474	5,911 3,474
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>							
Ln Endowment (3-Yr Avg)	19,803*** (5,662)	6,492** (2,579)	-251 (1,279)	2,466*** (737)	4,024** (1,670)	4,473*** (1,273)	1,764 (1,187)
Mean Dep Observations	57,135 3,474	21,705 3,474	5,967 3,474	6,581 3,474	7,980 3,474	8,988 3,474	5,911 3,474

Note: This table presents estimates of the effect of endowments on expenditures for core operating categories. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 7
Expenditure Per Student by Category: Natural Log

	Core Expenses	Instruction	Academic Support	Student Services	Aux Enterprise	Institutional Support	Research
<i>College Type Groups</i>							
Ln Endowment (3-Yr Avg)	0.253*** (0.052)	0.176** (0.065)	0.162 (0.122)	0.284** (0.102)	0.199* (0.107)	0.457*** (0.109)	0.249 (0.147)
Mean Dep	10.81	9.82	8.40	8.68	8.84	9.01	6.79
Observations	3,476	3,476	3,476	3,476	3,476	3,476	3,476
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>							
Ln Endowment (3-Yr Avg)	0.250*** (0.055)	0.219*** (0.066)	0.061 (0.142)	0.264** (0.103)	0.203* (0.110)	0.368*** (0.107)	0.226* (0.127)
Mean Dep	10.81	9.82	8.40	8.68	8.84	9.01	6.79
Observations	3,476	3,476	3,476	3,476	3,476	3,476	3,476

Note: This table presents estimates of the effect of endowments on the natural log of expenditures for core operating categories. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 8
Student Enrollment (Full-Time Equivalents)

	Natural Log		
	Total	Undergrad	Freshman
<i>College Type Groups</i>			
Ln Endowment (3-Yr Avg)	-0.063 (0.043)	-0.055 (0.046)	-0.060 (0.053)
Mean Dep	4,824.33	3,277.21	791.10
Observations	3,476	3,476	3,476
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>			
Ln Endowment (3-Yr Avg)	-0.064 (0.047)	-0.050 (0.047)	-0.053 (0.055)
Mean Dep	4,824.33	3,277.21	791.10
Observations	3,476	3,476	3,476

Note: This table presents estimates of the effect of endowments on student enrollment. Total, undergraduate, and freshman enrollment are measured in terms of full-time equivalents, with part-time students counting for 0.5 FTEs. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 9
List Price Tuition and Room and Board

	Total List Price	Tuition	Room and Board
<i>College Type Groups</i>			
Ln Endowment (3-Yr Avg)	763.62 (1,389.99)	63.55 (1,080.62)	700.07 (494.28)
Mean Dep	51,226.01	39,700.17	11,525.85
Observations	3,434	3,434	3,434
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>			
Ln Endowment (3-Yr Avg)	508.18 (1,604.90)	105.09 (1,267.41)	356.97 (500.26)
Mean Dep	51,226.01	39,700.17	11,525.85
Observations	3,434	3,434	3,434

Note: This table presents estimates of the effect of endowments on list price tuition and room and board. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 10
Percent of Freshman Receiving Aid

	Any Aid	Federal Grants	State Grants	College Grants	Loans
<i>College Type Groups</i>					
Ln Endowment (3-Yr Avg)	-2.591 (2.798)	-4.093 (2.437)	-1.031 (4.659)	-3.501 (3.321)	-7.815** (2.806)
Mean Dep	81.99	20.88	23.77	76.32	53.37
Observations	3,473	3,473	3,473	3,473	3,473
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>					
Ln Endowment (3-Yr Avg)	-5.614* (2.847)	-6.034** (2.771)	-5.270 (4.769)	-6.301* (3.354)	-9.153*** (2.918)
Mean Dep	81.99	20.88	23.77	76.32	53.37
Observations	3,473	3,473	3,473	3,473	3,473

Note: This table presents estimates of the effect of endowments on the rate of receipt of financial aid. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 11
Average Aid and Net Price

	Federal Grants	State Grants	Institutional Grants	Loans	Net Price
<i>College Type Groups</i>					
Ln Endowment (3-Yr Avg)	-629.82 (678.54)	-787.31 (506.69)	3,104.62** (1,428.90)	-522.11 (586.91)	-9.71 (1,484.00)
Mean Dep	5,662.99	4,206.87	23,053.54	6,910.33	32,502.40
Observations	3,473	3,473	3,473	3,473	3,472
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>					
Ln Endowment (3-Yr Avg)	-616.50 (501.51)	-579.14 (557.58)	2,906.26* (1,550.77)	-305.24 (529.32)	539.05 (1,584.38)
Mean Dep	5,662.99	4,206.87	23,053.54	6,910.33	32,502.40
Observations	3,473	3,473	3,473	3,473	3,472

Note: This table presents estimates of the effect of endowments on average amounts of financial aid received by incoming freshmen (conditional on receipt). Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 12
Admissions Selectivity

	Natural Log			Median Score	
	Admits (1)	Enroll (2)	Yield (3)	SAT (4)	ACT (5)
<i>College Type Groups</i>					
Ln Endowment (3-Yr Avg)	-0.253** (0.113)	-0.060 (0.053)	5.745* (3.038)	24.184 (19.257)	0.741 (0.532)
Mean Dep	7.64	6.35	30.13	1,249.50	27.33
Observations	3,441	3,476	3,441	2,980	2,723
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>					
Ln Endowment (3-Yr Avg)	-0.255* (0.123)	-0.034 (0.059)	6.676** (3.072)	13.461 (20.557)	0.502 (0.554)
Mean Dep	7.64	6.35	30.13	1,249.50	27.33
Observations	3,441	3,476	3,441	2,980	2,723

Note: This table presents estimates of the effect of endowments on admissions, enrollments, yield rates, and admissions exam scores (when reported by institutions). Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 13
Race of Incoming Freshman: Percent of Cohort

	Asian (1)	White (2)	Hispanic (3)	Black (4)	Other (5)	White, Asian (6)	Black, Am Ind, Hispanic (7)
<i>College Type Groups</i>							
Ln Endowment (3-Yr Avg)	0.680 (0.874)	3.565 (2.537)	-3.399* (1.666)	-1.686 (1.255)	0.840 (2.002)	4.245* (2.366)	-5.431** (2.008)
Mean Dep	7.90	70.33	7.76	7.40	6.62	78.22	15.63
Observations	3,476	3,476	3,476	3,476	3,476	3,476	3,476
<i>College Type Groups with Endowment and Outcome Baselines and Pretrends</i>							
Ln Endowment (3-Yr Avg)	0.899 (0.908)	2.637 (2.535)	-3.308* (1.825)	-1.846 (1.261)	1.335 (2.189)	3.509 (2.295)	-5.231** (2.070)
Mean Dep	7.90	70.33	7.76	7.40	6.62	78.22	15.63
Observations	3,476	3,476	3,476	3,476	3,476	3,476	3,476

Note: This table presents estimates of the effect of endowments on the racial composition of incoming freshmen. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. The “Other” race category includes students who are American Indian, foreign, or whose race is unknown. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution’s baseline endowment per student, pre-trend in investment returns, baseline level of the outcome of interest, and the pre-trend in the outcome of interest. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE 14
US News and World Report Ranking

	Overall	All	Colleges (by 2003 rank)			Universities (by 2003 rank)		
			#1-25	#26-50	#51-100	All	#1-25	#26-50
<i>College Type Groups</i>								
Ln Endowment (3-Yr Avg)	-14.274*** (3.801)	-18.341*** (4.375)	-9.066** (3.616)	-20.744*** (6.561)	-33.634*** (9.420)	-1.262 (6.994)	-8.209 (6.895)	-9.328 (12.265)
Mean Dep	58.70	67.40	13.65	42.70	78.35	38.54	11.78	40.04
Observations	2,956	2,058	375	346	658	898	299	224
<i>College Type Groups with Endowment Baseline and Pretrends</i>								
Ln Endowment (3-Yr Avg)	-14.282*** (4.090)	-18.450*** (4.639)	-8.275** (3.799)	-25.278** (10.364)	-31.114*** (9.596)	0.190 (8.162)	0.756 (8.209)	-14.750 (28.482)
Mean Dep	58.70	67.40	13.65	42.70	78.35	38.54	11.78	40.04
Observations	2,956	2,058	375	346	658	898	299	224

Note: This table presents estimates of the effect of endowments on U.S. News and World Report rankings. Simulated endowment levels based on annual investment returns are used to instrument for actual endowment levels. Under institutional rules, spending from the endowment is based on average endowment levels over the prior three years. Each specification includes institution fixed effects as well as year-by-comparison group fixed effects. Institutions are grouped according to their classifications (college or university) and their baseline U.S. News and World Report rankings. The second panel controls for the interaction of year with each institution's baseline endowment per student and pre-trend in investment returns. Standard errors are clustered at the institution and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.