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Where Does the Money Go? College Endowments and Their Influence on Expenditures towards Financial Aid

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Where Does the Money Go?
College Endowments and Their Influence on
Expenditures towards Financial Aid

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Submitted in Partial Fulfillment
of the
Prerequisite for Honors in Economics
under the Advisement of Professor Phillip Levine

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Abstract

In 2017, Congress passed the Tax Cuts and Jobs Act, which imposes a tax of 1.4 percent on the investment returns of highly endowed colleges and universities. One motivation for the law was that these colleges have not sufficiently used their extensive resources to reduce the high prices students pay. My thesis examines the relationship between changes in endowment values and colleges' overall spending and spending by category, with a particular focus on financial aid. I take advantage of the exogenous variation in endowment values generated by the 2008 financial crisis to establish a causal relationship. I find that changes in endowment values consistently result in changes in non-financial aid expenditures in the same direction. In the context of the 2008 financial crisis, falling endowments caused colleges to cut overall spending and spending in each category. However, colleges continued to support low-income students by providing financial aid to even more of them. My results imply that the tax is unlikely to be effective, since the income loss it generates is unlikely to prompt colleges to increase endowment spending, or spending on financial aid without an increase in students' financial need.

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1. Introduction

College endowments are an integral component to the financing of higher education institutions' operations. Colleges and universities use endowments in addition to students' tuition and annual gifts to fund their operations. Along with other types of expenditures, endowment spending may also facilitate access to higher education by spending on financial aid. In fiscal year 2017, higher education institutions effectively spent 4.4 percent of their endowments on student financial aid, faculty research, maintenance of facilities, and other institutional operations. Institutions with endowments above \$1 billion are even more reliant on endowments for operational financing, effectively spending 4.8 percent of their endowments in 2017 (Seltzer, 2018a).

However, endowments are not like checking accounts from which colleges can withdraw funds at will. They are permanent sources of funds, which college leadership uses to invest in financial markets and generates subsequent liquid returns to finance college operations. In 2017, colleges enjoyed investment returns averaging 12.9 percent (Seltzer, 2018a). From 1996 to 2012, colleges' aggressive investment in stocks (as opposed to bonds) and less conventional investments (timber, oil and gas, etc.) unlocked endowment growth that overcame inflation and depreciation pressures, and continued to grow exponentially (Eaton, 2017).

In recent years, colleges, especially colleges with a big endowment, have been under fire for accusations that they "hoard" money and are not using their endowments to lower the cost of attending college. Between 2008 and 2018, published tuition and fees at private nonprofit four-year institutions increased at an average rate of 2.4 percent per year beyond inflation (Ma et al.,

2017). Meanwhile, payout from endowments remained constant at around 4.4 percent (Seltzer, 2018a).

As an attempt to create incentives for colleges to increase their endowment payouts, Congress passed the Tax Cuts and Jobs Act in 2017, which imposes a tax of 1.4 percent on the investment return of colleges with more than 500 students and \$500,000 in endowment per student, breaking the corporate tax exemption that non-profit colleges' endowments had been enjoying. This law may subject about 30 colleges and universities to endowment taxes within the first five years, and as many as 80 institutions over the next fifteen years (Seltzer, 2018b). Such a tax would mean that Harvard University would have to pay \$43 million on its endowment returns in 2017, had those earnings been taxed (Halper, 2018). Colleges have reacted fiercely to the tax, claiming that this law imposes constraints on their ability to fund institutional operations and provide access to low-income students through financial aid funding (Seltzer, 2018a; Halper, 2018). This claim implies that having a more sizable endowment causes colleges to spend more on financial aid. Yet the validity of this claim has not been rigorously proven.

There is surprisingly very limited literature in Economics that studies endowment funds and how they are actually spent. Most reports on endowments and spending on financial aid takes for granted the causality and only looks at correlational relationships to conclude that colleges are not spending enough. The few existing studies on this topic mainly examine either endowment payouts on an aggregate level or investment strategies using endowment funds. Brown et al. (2014) is the only empirical work that closely examines the relationship between endowment size and a college's spending. They found that colleges respond to negative shocks by reducing spending, but do not increase spending in response to positive shocks. However,

their study investigates annual *aggregate* endowment payout, and offers little insight into how endowments affect colleges' expenditures across different spending categories.

This thesis seeks to answer precisely that question. What do colleges use their endowments for? In particular, when college endowments grow, do they spend more on financial aid? The findings of this project have broad implications for public policy. If, indeed, having a big endowment causes colleges to fund more students, taxing colleges' endowments would reduce the accessibility of higher education to low-income students.

Existing theories on the role endowments play in higher education finance have implications for how it should be spent. If endowments exist to guarantee colleges of a stream of income *in perpetuity*, I should expect to see little change in endowment spending in the short-run, even in response to economic shocks. If endowments exist primarily as a "rainy day fund" that colleges can fall back on in times of crisis, I should expect to see increases in endowment spending after endowment values fall due to negative shocks. It is worth noting that endowment shocks are correlated with shocks to other sources of income such as tuition and gifts. This correlation implies that endowments might be limited in their ability to serve as "rainy day funds." Some economists also argue that economic reasons fail to convincingly explain why endowments exist, and propose non-economic explanations, such as prestige (as signaled through the size of the endowment).

In order to investigate the causal effect that endowments have on colleges' spending breakdown, I use the 2008 financial crisis to introduce exogenous variation. The problem with using a descriptive comparison across colleges with different endowment levels is that colleges with endowments of different sizes may be different in important ways, which might be responsible for the different levels of endowment spending. For instance, colleges take different

approaches with respect to investing their endowments at a point in time. A college that is trying to increase endowment spending might invest more aggressively and adjust its portfolio according to market conditions, so this adjustment is endogenous.

In order to address this problem, I will exploit exogenous variation in endowment levels caused by the financial crisis. Since endowment funds are routinely invested in financial market (or in investments whose returns are typically correlated with those in financial markets), highly endowed colleges would have been hit hard by the financial crisis. The finances of colleges with a smaller endowment would not have been as strongly affected. These details generate exogenous variation in changes in endowment levels across schools that differ by endowment size prior to the financial crisis. This exogenous variation provides an avenue to determine the effect of endowment levels on different spending categories within the same institution over time. Because of its random nature, the financial crisis had effects on actual spending that are unlikely to manifest themselves in ways other than through the money available through the endowment.

I use institution-level panel data from the Integrated Postsecondary Education Data System (IPEDS), developed by the National Center for Education Statistics. The IPEDS data set provides me with rich information from the 2005-2006 to the 2016-2017 academic years on an extensive array of institutional characteristics, including financial aid, endowment values, and other financial characteristics of 94 liberal arts colleges with endowment per capita of at least \$50,000 in 2005-2006. Focusing only on liberal arts colleges allows me to examine institutions that have a simpler business model that is not complicated by divided commitments (revenue-generating sports teams, professional schools, etc.). Focusing on those with at least some meaningful endowment is important because only these schools were meaningfully affected by

the financial crisis. I can also control for time-invariant characteristics that are unique to an institution (such as location, stated mission and values), and any year-specific national events that affected all institutions. My identification therefore examines changes in spending within the same institution over time.

I find that decreases in endowment values are consistently accompanied by decreases in net tuition revenue, the amount of tuition collected from students after accounting for any types of aid, and private gifts, grants and contracts, the amount of private donations made to a college. The decrease in tuition revenue results from the fact that the financial crisis caused families to suffer losses in income and wealth and so reduced their ability to finance a college education. The decrease in private gifts, grants and contracts stems from the fact that these donations are highly correlated with market conditions. The triple decreases in endowment wealth, tuition revenue and private donations create pressures on colleges to cut expenses. A one-dollar decrease in endowment values results in an 8-cent decrease in total spending for all colleges. Colleges also choose to cut spending in less essential spending categories, such as academic support and student service expenses, so that they do not have to cut down as much on instruction expenses.

I also examine the impact on financial aid spending, as proxied by percentage of students who receive some financial aid and the average amount of institutional aid received per student. During the financial crisis, a reduction in endowment values caused colleges to increase overall spending on financial aid because they admitted more students who had become eligible for financial aid, and not by increasing average amount of aid per student. This pattern remains consistent even when broken down by meet-full-need status. This suggests that at least in the

short run, colleges would not seek to reconcile losses in endowment values by hurting low-income students.

My findings have important implications for the endowment tax policy debate. Overall, it is unlikely that the tax will fulfill its promise of incentivizing colleges to spend more. In fact, my findings suggest that colleges would respond to the tax imposition with budget cuts. My results also suggest that if students' financial needs increase, colleges are committed to meeting those needs even when their endowments fall. This implies that the tax imposition is limiting colleges' ability to help their low-income students.

2. Background

A university endowment is a fund that is made up of money originally donated to a college to serve the institution (Sherlock et al., 2018). It can hold cash or property, with different types of long-term and short-term investments. It is invested in different types of financial instruments, and the returns from those investments are used to finance university operations, capital expenditures, special projects, and reinvestment. An endowment usually includes different funds that were created from different agreements between the donors and the institution.

There are four types of endowments: unrestricted, term, quasi and restricted. If a donation is made to a university without any restrictions and can be used at the discretion of the recipient institution, that is an unrestricted endowment (Kenton, 2018). Term endowments are endowments that require the principals to remain intact for a specified amount of time, and can only be spent after that time period has passed. A quasi-endowment is a donation made to dedicate towards a cause or a specific purpose. Typically, the principal is retained in the endowment, while the earnings or returns are distributed according to the donor's wish. Restricted endowments are endowments whose principals are held in perpetuity, while the returns from their investment are distributed based on the donor's request. The total value of an endowment is the sum of all of these four types. In my empirical analysis, I use this total value as the endowment size.

Up until the Tax Cuts and Jobs Act, endowments were exempted from taxation for one of two reasons. Either that an endowment is part of a non-profit organization or a government entity, hence has tax-exempt status, or it itself serves charitable and educational purposes, which

makes up the 501(c)(3) status (cited in Sherlock et al., 2018). Investment earnings were also tax exempt.

The Tax Cuts and Jobs Act imposes a 1.4 percent tax on the returns of investment of endowments of colleges with more than \$500,000 per student for colleges with more than 500 students, applicable to tax years starting January 1, 2018.¹ Net investment income is defined as the sum of gross investment income and capital gain, less expenses associated with that income. Gross investment income is widely defined, ranging from interests, dividends, rents, and royalties. According to Congress' Joint Committee on Taxation, the tax is expected to raise an annual revenue of \$200 million for the government, and \$1.8 billion in revenue over the 10-year period, from 2018 to 2027, over which the Act is effective (Sherlock et al., 2018).

College endowments are not subject to a payout requirement, unlike private foundations and non-profit organizations, which are subjected to an annual payout requirement of 5 percent to prevent accumulation of tax-exempt funds (Sherlock et al., 2018). This difference stems from the fact that the endowment has 501(c)(3) status, and so does not fall under the category of private foundations. Private foundations are also subjected to a tax of as much as 2 percent on net investment income, which serves as private foundations' share of the cost of government oversight of the sector (as cited in Sherlock et al., 2018). It is likely that Congress' decision to impose a tax on endowment funds through the Tax Cuts and Jobs Act also serves a similar purpose, which might indicate a future increase in oversight over how universities spend their endowments.

Most university endowments adhere to a payout policy that applies to a multi-year moving average of endowment values (Brown et al., 2014; Brown and Tiu, 2013). Therefore, there is a distinction between two forms of "payout rate": one being the "policy payout rate,"

¹ For the full text of the Bill, see <https://www.congress.gov/bill/115th-congress/house-bill/1>

which is the rate specified in the spending policy and applied to a moving average of prior years' endowment value; the other being the actual payout rate, calculated as the amount of dollar payout divided by the endowment value of the current year. Since the policy payout rate takes into account endowment values of previous years, financial shocks during the current year should not disrupt the payout value during that same year, but will have an effect on the payout values in the following years through the moving average formula, hence smoothing out variations in the payout amounts across the years (Brown et al., 2014; Brown and Tiu, 2013).

From 2008 to 2017, on average, colleges and universities paid out between 4.2 to 4.6 percent of their endowment values (Seltzer, 2018a). In 2017, universities with the largest endowments (of over \$1 billion) paid out 4.8 percent on average, almost one-percentage point above those with the smallest endowments (of less than \$25 million). They also relied on their endowments to finance as much as 12.1 percent of their operating budgets. For institutions with endowments of \$51 million to \$100 million that figure was 6.2 percent (as cited in Sherlock et al., 2018). Institutions with bigger endowments are also more likely to increase real endowment payout over time, and tend to be more consistent with their annual payouts (Seltzer, 2018a). This is not surprising, since institutions with smaller endowments probably face more financial pressures and have less resources to rely on, which means they need to adjust their payouts more frequently and more dramatically to respond to market conditions. Private institutions also exhibit higher average payout rates than public institutions, partly because the former group tends to have endowments of larger sizes (Sherlock et al., 2018).

Endowment wealth is also heavily concentrated in a small group of elite research universities and liberal arts colleges. In fiscal year 2017, 27 private colleges and universities with at least \$1 billion dollars in endowment assets account for more than 75 percent of total

endowment wealth; Harvard, Yale, Princeton, Stanford and the Massachusetts Institute of Technology alone accounting for more than 22 percent (Sherlock et al., 2018). Endowment wealth is also concentrated among private doctoral-granting universities, of which the average endowment per student was \$360,787, double that of private bachelor's-granting institutions (\$190,314), and more than ten times that of public doctoral-granting universities (\$27,092) (Sherlock et al., 2018).

3. Literature

The theoretical literature on endowments and their role in higher educational finance is quite rich. Tobin (1974) put forward the view that endowments exist to smooth income. That is, the university has an obligation to generations in perpetuity, and so has to make sure that future generations can enjoy the activities that the present generation can enjoy. An implication of this is that endowment spending should not change much, even in response to shocks, because short-term shocks are negligible given the long horizon of perpetuity (Brown et al., 2014).

Hansmann (1990) provides an extensive review of potential explanations for the existence of endowments. Among the eleven possible explanations he described, the most significant four include: “to maintain intergenerational equity,” the idea that the university has an obligation to ensure that future generations can enjoy the same activities that the current generation do; to smooth “lumpy funding,” the idea that the university uses endowments to maintain a constant level of spending across time; to provide liquidity in the form of easily accessed returns; and “to provide insulation from outside demands,” the idea that by being financially independent, universities are able to shield their decision-making from the whims of the market.

However, Hansmann eventually concluded that none of the explanations are adequate, a position with which Hoxby (2013) agrees. She proposed an alternative model that renders the university’s role as that of a venture capitalist. The university, from the perspective of a venture capitalist, faces an investment dilemma (Hoxby, 2013; Brown and Tiu, 2013). It can choose to invest in activities that either boost human capital, such as research funding and paying professors, or boost financial capital, since money from endowments can be used to invest in financial markets and generate financial returns. There is an intertemporal aspect to this problem:

the university has to allocate its resources such that it can guarantee the availability of resources for today's generation versus tomorrow's generation. Part of the problem for the university is to get alumni and other affiliated parties that have benefited from its investment to give back so that it has more resources to support future generations. Hoxby argues that endowments exist to help solve this problem by providing an avenue for affiliated parties to aid the university with its social venture capitalist role.

Merton (1993) supports the view that endowments serve as a device to hedge against shocks in costs, which is closer to a classic intertemporal consumption-leisure problem. The role of the endowment is to make sure that in a time when negative shocks hit, the university has ample resources to cushion the effects of the shock, and in a time of positive shocks, the university does not overspend. This implies that we would expect endowment payouts to increase during a bad market time, and to decrease during a good market time. Black (1976) implicitly supports this view, considering the endowment fund as "just one of the university's source of income."

However, empirical literature has documented that this phenomenon happens rarely. Brown et al. (2014) found that in bad times, universities spend less from their endowments, but in good times, there is no distinguishable change in endowment payout. They also found that a factor that drives endowment payout is the "president's benchmark," which is the ratio of the current endowment size to its size at the beginning of the president's tenure. The idea behind this is that university leadership wants to maintain (and increase) the size of the endowment from what they inherited, and so they are sensitive about taking money from the endowment in times of crisis, which is already shrunken due to bad financial market timing. This provides some evidence for the view that universities have been accumulating money for purposes other than

economic ones. This is consistent with Conti-Brown's observation (2010) that in a time of crisis, instead of using more money from the endowment to maintain the existing level of spending, universities instead choose to cut budgets and lay off staff, despite the fact that the endowment remains sufficiently sizable to allow for maintaining the current level of spending. Conti-Brown concluded that universities' behavior with respect to endowment payouts thus cannot be explained wholly by economic reasons, and theorized that endowments (and their sizes) serve as an indicator of institutional prestige, which makes maintaining a big size important. This is supported by Hansmann's suspicion that economic motives do not sufficiently explain why endowments exist (Hansmann, 1990). Dinerstein et al. (2014) further found that during the crisis, private institutions used fiscal stimulus funds to replace spending from endowments, which allowed for a ten-cent decrease in endowment spending for every dollar of stimulus federal research funds. To put it more crudely, universities have been "hoarding" money.

Other factors that can influence endowment spending include payout policies (Brown and Tiu, 2013) and investment returns as a function of asset allocation (Goetzmann and Oster, 2013). Brown and Tiu (2013) found that the bigger the size of a college endowment and the smaller the returns, the more likely it is that the college would change its stated payout policy. Payout policies are followed by changes in investment allocation, not the other way around. Goetzmann and Oster (2013) further found, somewhat surprisingly, that the determinant of colleges' allocation of investment assets is not the performance of those assets, but the performance of portfolios that belong to a college's near competition schools and single closest competitor. For example, the endowment portfolio of Harvard University is more likely to be re-allocated if it underperforms that of Yale University, than if it underperforms itself in the previous years (Goetzmann and Oster, 2013).

Given the time-enduring nature of the university's investment problem (Hoxby, 2013; Brown and Tiu, 2013), there is little reason to expect that the university would frequently change its endowment payout policies and investment strategies. However, Brown and Tiu (2013) found that between 2003 and 2011, university leadership changes both endowment payout policies and investment strategies too frequently to be consistent with theoretical behavior. More interestingly, in response to the recent financial crisis, endowments with access to temporary payouts were more likely to retain their existing payout policies, while those without such access were more likely to change their permanent payout policies, which provides some evidence that colleges do use endowments to get access to financial resources to accommodate the financial losses of their returns and increase in costs during the downturn.

While both public and private universities and colleges theoretically provide financial aid, in reality such phenomenon is much more common at private institutions than at public ones. According to Kane (1999), in the 1992-1993 school year, only 11 percent of full-time students at public institutions received any institutional grant aid, while private institutions increasingly provided grant aid to a larger share of their student body. Private institutions have the ability to re-channel funds from fiscal stimulus to keep tuition down and aid up for their students, which means they have more flexibility in terms of how they spend money than public institutions, which are bound by states policies that came with the subsidies (Bettinger and Williams, 2013). Dinerstein et al. (2014) also documented that institutions do adjust their spending in responses to changes in revenue sources. This provides the basis for me using only private schools.

4. Data

4.1. Data Overview

I use a panel data set called the Integrated Postsecondary Data System (IPEDS), developed by the National Center for Education Statistics, which is part of the US Department of Education. These data have been extensively used in studies related to education and endowments, including Brown, Dimmock and Weisbenner (2012), Brown et al. (2014), and Long (2014). The data set provides detailed information on an extensive array of institutional characteristics, including college finances, endowment values and financial aid. With this data set, I am able to determine revenue, expense and spending decisions at the institution level.

I restrict my sample to 94 private liberal arts colleges with endowment per capita above \$50,000 in fiscal year 2006, and use data on these colleges from fiscal year 2006 to 2017. I include only those colleges that report all expenses for all years in the twelve-year period. I focus on private liberal arts colleges for several reasons. Firstly, public institutions' financing structures are complicated due to the heavy involvement of federal and state funding, whose effects would potentially interact with that of institutional endowments on spending decisions. Bettinger and Williams (2013) found that public universities might use state policy to hedge against federal policy, while taking advantage of federal policy in times of recession to hedge against strained state budgets. The state and federal subsidies also come with strings attached, in the form of state and federal heavy involvement in the university's decision-making regarding setting tuition prices and which students to accept. Because I want to strictly look at how *institutional* endowment influences spending, including public universities would have underestimated the relationship because there are so many other factors at play for public

universities. Private institutions also have the most flexibility in terms of how they allocate their funds (Sarubbi and Pingel, 2018). Thus, focusing on private institutions allows me to isolate the effects of endowments from the effects of public funding.

Secondly, I focus on liberal arts colleges because their overarching commitment to providing an undergraduate education ensures straightforward internal financing structures. Big research universities have a number of different goals and have to allocate their resources across different groups of constituents (undergraduate students, graduate students, professional students, major sports teams, research institutes, etc.). This large scope of commitment complicates the financing structures and decision making within these universities, and therefore blurs the connection between endowments and expenditure. Thus, focusing on liberal arts colleges allows me to more cleanly examine the effects of endowments on spending.

Indiscriminately including all liberal arts colleges would introduce noise to my sample, since the majority of these small institutions do not have a sizable endowment, and mainly rely on tuition revenue to fund their operations. This means that there are not a lot of effects of endowments on spending decisions anyway. To prevent this problem, I further restrict my sample to include only the schools with endowment per capita in 2006 of at least \$50,000, because only endowments of at least such amounts would have been meaningfully affected by the financial crisis.

4.2. Trends in Expenditure, Endowments and Revenue from 2006 to 2017

Figure 1 illustrates the trend in average total expenditure per student at liberal arts colleges over the twelve-year period. During the period leading up to the financial crisis, colleges consistently increased spending per capita. Total spending per student peaked in 2009, right

before the financial crisis, and dropped dramatically in the two following years, suggesting that college leadership was extremely sensitive to economic shocks, making adjustments almost immediately as they saw how the market conditions were unfolding. As the financial crisis officially ended and financial markets stabilized and began to rebound, colleges gradually returned to their upward trend in total spending, and by 2014, total spending per capita rose to almost the same level as it was before the crisis.

Figure 2 demonstrates the close relationship between endowment values and the stock market. Because colleges heavily invest their endowments in the stock market and because their alternative investments often have returns that are correlated with the stock market, endowments grow when market conditions are positive. An improvement in the stock market increases the endowment today, but that increase is not captured in the data until the next round of annual surveys are carried out. As a result, I adjusted values for the S&P 500 forward by a year to line up its movements with those of average endowment per student.

A natural question to follow is whether all colleges with endowments of different sizes are affected in the same way when the stock market fluctuates. Figure 3 shows that the patterns of change are certainly very similar, if not almost identical, across the board. This suggests that endowments are managed in similar ways across colleges, which means that they generally track the same movements as the market develops. This interpretation is consistent with findings from Goetzmann and Oster (2013) and Seltzer (2018a): schools follow each other's steps when it comes to endowment portfolio allocation, and asset allocations remained virtually unchanged across institutions of all sizes from 2008 to 2017.

While the patterns are very similar, the levels of returns are not identical. When broken up by quartiles of their endowment values in 2006, the colleges with endowments in the top

quartiles receive slightly higher returns when the market is strong compared to colleges with endowments in the bottom quartiles. One explanation for this is that the most heavily endowed colleges had the most capital to invest in the financial markets, providing them with access to investments with higher returns, albeit with greater risk, than institutions with smaller endowments. This is illustrated in Figure 4, which shows that annual returns at higher endowment schools are more volatile over time.

Figure 5 illustrates the trajectory of spending at colleges in different endowment quartiles over the twelve-year period. Across the board, all colleges dramatically slashed spending immediately as the financial crisis hit. The greatest decline in spending immediately following the crisis occurred at schools with the largest endowment values beforehand. Since they lost the most money in the crisis, they cut spending the most. Total spending generally resumed its previous path as the crisis waned. Spending at colleges in the bottom endowment quartile lagged somewhat relative to the others. That is most likely because they are more reliant on tuition revenue, which is strongly dependent on income, and income growth remained sluggish for several years following the crisis.

This proposition is supported in Figure 6, which shows the trend of net tuition revenue by 2006 endowment quartiles. Though generally right before the crisis, colleges saw their net tuition revenue peak, the drop is the sharpest for colleges with smaller endowment values. Colleges with the largest endowments only witnessed a mild drop in net tuition revenue, even at the height of the crisis. In the immediate post-crisis period, colleges with above median endowment levels saw their net tuition revenue pick right up, while colleges with endowments below the median continued seeing their revenue unchanged or dropping even further.

This indicates that wealthier schools are not only less reliant on tuition revenues – they also have wealthier students who can afford the high price of a private undergraduate education even during the financial crisis, a period during which many families suffered wealth losses and could no longer finance their children’s higher education. In contrast, less heavily-endowed colleges face the dual problem of being very reliant on tuition revenue to finance their operations, and of having students who do not have similar financial capacity as those at heavily-endowed colleges.

Figure 7 focuses specifically on one aspect of spending on financial aid, namely the percentage of students receiving aid. If endowments have a significant effect on financial aid, I would expect to see some positive correlation between the movements of endowment values and the percent of students receiving any financial aid. That does not seem to be the case, however. In fact, at the height of the crisis, the most heavily-endowed colleges, which suffered the greatest losses in endowment values during the crisis, actually experienced increases in percent of students receiving any financial aid. This might have been driven by the fact that since many families lost their ability to finance their children’s education due to the crisis, their financial needs became greater and more students became eligible for financial aid. This is consistent with the increase in demand for Pell grants during the crisis that Long (2014) found. Since many of these heavily-endowed colleges have meet-full-need financial aid policies, the increase in demonstrated need was met, resulting in the increase in percent of students receiving aid.

4.3. Summary Statistics

Table 1 provides the description of all variables that I include in my econometric analysis and table 2 reports summary statistics of those variables.² The average college in my sample has an endowment of \$280 million and annually spends \$86.7 million in total, more than a third of which is spent on instructional expenses. More than half of its total annual expenses are financed by its net tuition revenue, private gifts, grants and contracts (\$38.6 million and \$15.3 million, respectively, on average). Research expenses are negligible, which is consistent with the fact that liberal arts colleges primarily focus their resources on undergraduate education. Figure 8 provides a detailed breakdown of expenditures at these colleges across the most significant spending categories: instruction, research, academic support, student service, institutional support, public service, auxiliary enterprises, independent operations, and other expenses.

Because I am especially interested in the relationship between endowments and spending on financial aid, ideally I would want to have data that directly report the amount of institutional funds colleges spend on financial aid each year. While the IPEDS data set does not directly report this information, it does report the average amount of institutional aid awarded to students, and the percentage of students receiving any financial aid each year. These variables very closely reflect the amount colleges spend on financial aid and so they are reasonable proxies for expenditures on financial aid.

At these 94 liberal colleges, typically 89 percent of the students receive some amount of financial aid; each aided student receiving almost \$24,000 of institutional aid, on average. In my sample of liberal arts colleges, 38.3 percent have a meet-full-need policy, which means these schools are committed to providing any student with an amount of financial aid that matches her

² All numbers are inflation-adjusted and converted in 2017 dollars.

demonstrated need, if accepted (note that this does not necessarily imply that the admission process is need-blind, which means that financial need is not taken into account in the admissions decision). Table 3 provides a breakdown of all liberal art colleges in my sample by quartiles of the size of their 2006 endowments, indicating which of them meet full need.

5. Econometric Specification

The question I seek to address is whether changes in endowment spending have a causal effect on spending in a variety of dimensions at liberal arts colleges. The main specification I estimate takes the form:

$$\text{Spending}_{cit} = \beta_0 + \beta_1 * \text{Endow}_{it-1} + \alpha_i + \alpha_{t-1} + \varepsilon_{it-1} \quad (1)$$

where Spending_{cit} is spending in dollar value on category c at institution i in year t , Endow_{it-1} is the size of the endowment at the same institution in the previous year, α_i controls for time-invariant fixed effects at said institution, α_{t-1} controls for fixed effects in the same year as the endowment, and ε_{it-1} is a random error term. The coefficient of interest is β_1 , the effect of endowment size on spending on the categories of interest.

The inclusion of institution fixed effects means that we compare differences in the dependent variable to differences in endowment sizes within institutions. Any differences in the dependent variable driven by time-invariant characteristics of an institution, such as geographic location, stated mission and values, and the like are controlled for. I also include time fixed effects, which capture all factors that influence all institutions in a particular year. These controls allow for variations in endowment sizes to be the primary driver of variations in spending within a particular category within the same institution along the years from 2006 to 2017. For example, I am comparing how changes in Wellesley College's endowment affect different types of spending differentially from other schools over the same period.

However, OLS estimates of the above equation may be biased because it might overlook the fact that these colleges may be different in their approach to investing their endowment at a point in time, which might be responsible for the different levels of endowment spending. For example, schools that are trying to increase their spending might invest more aggressively.

Different schools also adjust their spending policies differently, which is endogenous in this regression.

The financial crisis, however, provides a means to use an instrumental variables approach to overcome this problem. The goal of this approach is to find an instrumental variable that is correlated with endowment value in a particular school and year, but unlikely to be uncorrelated with spending across categories at that school and year.

The robustness of these instrumental variables depends heavily on their correlation with the independent variables in the first stage equation. I begin analysis of the effect of the financial crisis on endowment sizes by proxying the financial crisis with data on the average annual returns of the S&P 500, which accounts for overall market conditions. The question of whether the financial crisis is a good instrument for endowment size then hinges on the correlation between the S&P 500 and endowment size. We include a variable for the S&P 500, a variable for the endowment size of the 94 schools in 2006, long before the crisis hit, and interact these two variables to allow for the effects of the business cycle on schools' initial endowment. The instrumental variable I use is the interaction between the S&P 500 and the endowment values in 2006. This interaction provides estimates for endowment values had schools kept their portfolios the same as in 2006. The worry is that as the financial market was going through chaos, schools were trying to respond to those fluctuations, and these responses are endogenous. So by using this interaction, I am essentially estimating the effect of the endowment on spending if the endowment was solely dependent on the stock market, which is exogenous. The first stage regression is as follows:

$$\text{Endowment}_{it} = \theta_0 + \theta_1 * \text{S\&P500}_{t-1} + \theta_2 * \text{Endow2006}_i + \theta_3 * (\text{S\&P500}_{t-1} * \text{Endow2006}_i) + v_{it-1}$$

Including institution and time fixed effects allows me to capture the effects of the first order S&P500 and Endow2006 variables, the former being institution-specific, and the latter being time-invariant. Then, an equivalent first stage regression is:

$$\text{Endowment}_{it-1} = \theta_0 + \theta_1 * (\text{S\&P500}_{t-1} * \text{Endow2006}_i) + \varphi_i + \varphi_{t-1} + v_{it-1} \quad (3)$$

The second stage equation is:

$$\text{SpendCat } Y_{it} = \beta_0 + \beta_1 * \widehat{\text{Endowment}}_{it-1} + \alpha_i + \alpha_{t-1} + \varepsilon_{it-1} \quad (4)$$

6. Results

Table 4 reports OLS and IV estimates of the impact of changes in endowment values on the overall budget at liberal arts colleges. The estimate of the coefficient on the interaction between the S&P 500 and endowment values in 2006, θ_1 , in equation (3), the first stage in the IV specification, is statistically significant at the 1-percent level with an F-statistic of 73.91, thus ensuring the relevance of my instrument. Overall, the endowment value has a positive effect on net tuition revenue, private gifts, grants and contracts, and total expenses. In particular, in my preferred IV estimates, every dollar increase in the endowment causes colleges to increase total spending by 7.9 cents.

Changes in endowment values, though, are correlated with changes in gifts and net tuition revenue. When times are good, all three components of the budget increase together. We also see that a one-dollar increase in the endowment is associated with a 2.3-cent increase in net tuition revenue and 1.5-cent increase in revenue from private gifts, grants and contracts (although this last estimate is not statistically significant). Of the 7.9-cent increase in total spending, the remainder, 4.1 percent, presumably comes from endowment spending. This estimate is consistent with typical rates of endowment spending that schools report (Seltzer, 2018a).

Table 5 summarizes the impact of changes in endowment values on seven main spending categories. The endowment value has a significant positive effect on most categories of spending. For every dollar increase in the endowment, instructional expenses increase by 2.5 cents, academic support and student service expenses increase by 1.3 cents each, and institutional support and auxiliary enterprises expenses increase by 1.2 cents each.

My identification strategy is based on variation in endowment values from the financial crisis, a period in which endowment values actually fell. In this context, then, as endowment

values decreased, colleges cut total spending and spending on the aforementioned categories. This result suggests that colleges do not use endowments as a “rainy day fund.” Reductions in the endowment cause colleges to adjust spending down to accommodate its diminished value. This result provides evidence that refutes both Tobin and Merton’s predictions, and supports Conti-Brown’s findings (Tobin, 1974; Merton, 1993; Conti-Brown, 2010). The coefficient on research expense is not significant, which implies that I cannot statistically distinguish whether the estimated effect of endowment changes on research spending is zero. This insignificance is consistent with the liberal arts colleges’ emphasis on undergraduate instruction and reduced emphasis on research.

Table 6 presents estimates of the effect of endowment values on financial aid outcomes. In the preferred IV specification, as endowment values decline, the percent of students who receive any financial aid increases. In particular, every \$10 million decrease in the endowment results in a 7.7-percentage point increase in the percent of students receiving any aid. This can be explained by the fact that as the financial crisis causes endowment values to decrease, it simultaneously causes families to lose wealth, hence increasing the number of students who qualify for aid. Schools do not appear to have admitted fewer low-income students as a result to save money. In fact, they enrolled more of them. Changes in endowment levels do not have a statistically significant effect on the average amount of institutional aid each student receives, just the number of students receiving aid. At least in the short-run and under those circumstances, colleges did not disadvantage low-income students even when their wealth suffered.

Next, I examine the impact of endowments on colleges that commit to a meet-full-need (“MFN”) policy versus those that do not (“non-MFN”). Schools that meet full need were subject

to greater demand for financial aid funds during the financial crisis because they do not have the ability to alter their financial aid budget. Students need what students need; that need will increase during a recession. Schools that do not meet full need are under no such obligation.

Table 7 reports the OLS and IV estimates of the impact of endowment values on the overall budget between these two types of colleges. Overall, the endowment has a positive and significant relationship with tuition revenue, and private gifts, grants and contracts for non-MFN colleges, but not for MFN colleges. With every dollar increase in endowment values, MFN colleges increase their total spending by 5 cents, consistent with the 5-percent endowment payout rule of thumb that colleges generally abide by. The fact that MFN colleges do not see their net tuition revenue change as their endowment values drop is an indicator that their students come from wealthier background that allow them to afford a college education even in times of market distress. For non-MFN colleges, the increase of 15.4 cents in total spending associated with every dollar increase in the endowment can be completely explained by the total of a 5.5-cent increase in net tuition revenue, 5.8-cent increase in private gifts, grants and contracts, with the remaining 4.1 cents coming from annual endowment payouts, as I discussed earlier. The same calculation for MFN colleges also generates a similar endowment spending rate of 4.3 percent, which suggests that the difference in spending between the two types of colleges does not stem from different levels of endowment spending but from different levels of other revenue sources, namely net tuition revenue and private gifts, grants and contracts, which are more strongly correlated with endowment values at non-MFN colleges.

Tables 8 reports the OLS and IV estimates of the impact on colleges across spending categories by MFN status. Changes in endowment values are very important for non-MFN colleges: the effect of endowments on total expense for non-MFN colleges is three times bigger

than that for MFN colleges; on instruction expense, the effect is seven times bigger; on academic support, student service and auxiliary enterprises expenses, it is more than twice as big. This result is surprising. Colleges that commit to a meet-full-aid policy tend to have bigger endowments and so are more sensitive to changes in endowment values. As a result, I would expect them to slash spending more dramatically when their endowment falls. This result might suggest that even in times of crisis, MFN colleges use some of their endowments to cushion the effects of the shocks so that they do not have to slash spending as much as non-MFN colleges. It is quite interesting to see that MFN colleges cut back more on academic support and student service expenses so that they do not have to cut back as much on instruction expenses, while the opposite is true for non-MFN colleges. This can be explained by the fact that MFN colleges tend to be higher-ranked schools and it is important for them to protect their reputation for providing a good education.

The results for financial aid outcomes indicate that whether a college commits to a meet-full-need policy does not make a difference regarding its spending on financial aid. Specifically, in table 9, the estimates for percent of students receiving any aid are not statistically significant in any specification. Since the overall effect among all colleges is negative and significant, it is likely that the problem in this disaggregated analysis is about loss of power. In the smaller samples, I am not able to generate sufficient precision to clearly delineate the separate impacts.

However, non-MFN colleges also appear to provide greater support for their low-income students who do receive aid when the financial crisis damaged their endowments. At these institutions, every 10-million-dollar decrease in endowment values results in an increase of \$303 in the average amount of institutional aid received per student. This result provides additional evidence that colleges tried to do “the right thing” even as their wealth was suffering losses.

7. Conclusion

In this paper, I investigate whether endowment levels have a causal relationship on liberal arts colleges' expenditures by categories, especially expenditures on financial aid. Using an instrumental variables identification strategy, I find that changes in endowment values consistently result in changes in non-financial aid expenditures in the same direction. In the context of the 2008 financial crisis, drops in the value of endowments caused colleges to cut overall spending in each category. However, colleges continued to support low-income students. Indeed, they provided financial aid to even more students despite their lost wealth.

My findings are consistent with Brown et al.'s findings and provide evidence that rejects both Tobin and Merton's theories of the role of the endowment (Tobin, 1974; Merton, 1993; Brown et al., 2014). Overall, colleges do not use their endowments to smooth spending in times of crisis. The effects of a decrease in endowment values are exacerbated by decreases in other streams of revenue, namely net tuition revenue and private gifts. These losses subject colleges to heightened financial constraints and prompt them to cut spending. This is not true, however, for spending on financial aid. Apparently, spending decisions are not solely dependent on endowment sizes. College leadership makes strategic spending decisions to cater to specific goals of the college, and de-emphasizes less essential aspects of the college's operations. Financial aid appears to be the component of a college's spending that it values most highly.

My results have meaningful implications for the endowment tax policy debate. While the tax is intended to stimulate endowment spending, the decrease in income resulting from the tax imposition is likely to cause colleges to cut spending, instead of spending more to avoid the tax. Colleges are likely to hold the line on financial aid spending, but are unlikely to spend more on

financial aid without an increase in student need. Overall, the impact of the tax is unlikely to accomplish the goals of its supporters.

8. Tables

Table 1. Description of variables.

Variable	Description
Net tuition revenue	Amount of tuition and education fees, net of any state, local or institutional grants.
Endowment	Endowment values at the beginning of the fiscal year.
Private gifts, grants and contracts	Total amount of non-governmental gifts, contribution non-exchange transactions and amounts reimbursable under the the terms of a grant or contract. Examples include bequests, pledges, research projects and training programs.
Total expense	Total amount of spending during the fiscal year.
Instruction expense	Expenses for both credit and non-credit educational activities related to general academic instruction conducted by the teaching faculty.
Research expense	Expenses for activities dedicated to research purposes, including institutes and research centers, as well as individual and project research.
Academic support expense	Expenses for services that support instruction, research or public service purposes, such as expenses for libraries, museums, academic development, and academic administration.
Student service expense	Expenses for admissions, registrar activities and activities that aim at personal and professional development for students, such as career guidance, counseling, financial aid administration, and student health services.

Institutional support expense	Expenses for the daily operational support of the institution, such as administrative services, legal and fiscal operations, and public relations.
Public service expense	Expense for activities dedicated to public service, including community services.
Auxiliary enterprises expense	Expenses for the operation of services to students, staff and faculty, such as residence halls, food services, college stores, room and boards, etc.
Independent operations expense	Expenses for operations unrelated to the primary missions of the institution (instruction, research, public service) but might indirectly contribute to the advancement of those missions, such as information technology expenses.
Other expenses	Expenses spent on categories not listed above.
Percent of students receiving any aid	Percentage of the student body who receive some amount of financial aid.
Average amount of institutional aid received per student	Average amount of financial aid each student who qualifies for aid receives.
Meet Full Need	Dummy variable that accounts for whether an institution is committed to meeting full demonstrated need.

Table 2. Summary Statistics of Main Variables (in millions of 2017\$).

Variable	Observations	Median	Mean	Std. Dev.	Min	Max
Net tuition revenue	1,128	38.6	42.9	24.7	4.4	151
Endowment	1,128	280	463	473	49.9	2,450
Private gifts, grants and contracts	1,128	15.3	20.8	18.4	0.3	239
Total expense	1,128	86.7	95.9	52.7	17	300
Instruction expense	1,128	30.4	35.8	20.8	0.026	106
Research expense	1,128	0.7	1.6	2.3	0	13.1
Academic support expense	1,128	8.4	9.9	7.4	0	47.5
Student service expense	1,128	13	14.1	7	0.011	48.7
Institutional support expense	1,128	14.5	16.5	9.3	0.018	59.5
Public service expense	1,128	0	0.6	1.2	0	8.1
Auxiliary enterprises expense	1,128	15	16.3	9.9	0	71.8
Independent operations expense	1,128	0	0.054	0.5	0	6.2
Other expenses	1,128	0	0.8	3.9	-2.4	82.3
Percent of students receiving any aid	1,128	89	81	19	35	100
Average amount of institutional aid received per student	1,128	0.024	0.025	0.008	0.004	0.047
Meet Full Need	1,128	0	0.383	0.486	0	1

Table 3. Liberal Arts Colleges by the size of their 2006 endowments.

Bottom Quartile	2nd Quartile	3rd Quartile	Top Quartile
Wesleyan College (\$53 million)	Washington College (\$157 million)	Bates College (\$260 million)*	DePauw University (\$568 million)
St. John's College (\$71 million)	Transylvania University (\$160 million)	The College of Wooster (\$273 million)	Mount Holyoke College (\$579 million)*
Pitzer College (\$76 million)*	Randolph College (\$167 million)	Gettysburg College (\$274 million)	College of the Holy Cross (\$584 million)*
Hiram College (\$79 million)	Hanover College (\$178 million)	Rhodes College (\$280 million)	Denison University (\$601 million)
Cornell College (\$79 million)	Hobart William Smith Colleges (\$178 million)	St Olaf College (\$283 million)	Bryn Mawr College (\$630 million)*
Emory & Henry College (\$91 million)	Kalamazoo College (\$181 million)	Willamette University (\$286 million)	Colgate University (\$631 million)*
Presbyterian College (\$102 million)	Ohio Wesleyan University (\$182 million)	Sewanee-The University of the South (\$317 million)	Macalester College (\$647 million)*
Westminster College (\$108 million)	Hendrix College (\$188 million)	Spelman College (\$324 million)	Carleton College (\$678 million)*
Millsaps College (\$113 million)	Wheaton College (\$189 million)	Franklin and Marshall College (\$348 million)*	Wesleyan University (\$709 million)*
Sweet Briar College (\$115 million)	Barnard College (\$192 million)*	Southwestern University (\$351 million)	Bowdoin College (\$726 million)*
Alma College (\$119 million)	Albion College (\$196 million)	Occidental College (\$351 million)*	Hamilton College (\$749 million)*
Hollins University (\$127 million)	Kenyon College (\$198 million)*	Agnes Scott College (\$359 million)	Lafayette College (\$795 million)*
Lycoming College (\$127 million)	Goucher College (\$200 million)	Wheaton College (\$369 million)	Vassar College (\$843 million)*
Roanoke College (\$128 million)	Centre College (\$203 million)	Union College (\$374 million)*	Oberlin College (\$884 million)*
Randolph-Macon College (\$130 million)	Illinois Wesleyan University (\$205 million)	Whitman College (\$391 million)	Middlebury College (\$906 million)*
Beloit College (\$133 million)	Connecticut College (\$207 million)*	Claremont McKenna College (\$420 million)*	Smith College (\$1300 million)*
Wittenberg University (\$135 million)	Lawrence University (\$236 million)	Wabash College (\$423 million)	Amherst College (\$1449 million)*
Austin College (\$135 million)	Skidmore College (\$247 million)	Reed College (\$425 million)	Swarthmore College (\$1461 million)*
Ursinus College (\$138 million)	Harvey Mudd College (\$250 million)*	Earlham College (\$475 million)	University of Richmond (\$1516 million)*
Hampden-Sydney College (\$142 million)	Scripps College (\$253 million)*	Trinity College (\$477 million)*	Wellesley College (\$1601 million)*
Saint Johns University (\$143 million)	University of Puget Sound (\$253 million)	Davidson College (\$484 million)*	Pomona College (\$1632 million)*
Wofford College (\$147 million)	Drew University (\$256 million)	Haverford College (\$495 million)*	Williams College (\$1692 million)*
Allegheny College (\$151 million)	Dickinson College (\$259 million)	Colby College (\$532 million)*	Grinnell College (\$1745 million)*
Birmingham Southern College (\$155 million)		Furman (\$539 million)	

* indicates institutions with meet-full-need policy.

Table 4. Impact of Endowment on Overall Budget for All Liberal Arts Colleges.

	OLS	IV
Net tuition revenue	0.014*** (0.004)	0.023*** (0.005)
Private gifts, grants and contracts	-0.00241 (0.0109)	0.0151 (0.0170)
Total expense	0.062*** (0.011)	0.079*** (0.010)

Note: The estimate on the instrument in the first-stage is 0.00031, with a standard error of 0.00004, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 73.91.

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 5. Impact of Endowment on Spending Categories for All Liberal Arts Colleges.

	OLS	IV
Instruction expense	0.017*** (0.003)	0.024*** (0.004)
Research expense (x100)	0.044 (0.042)	0.027 (0.064)
Academic support expense	0.009*** (0.002)	0.013*** (0.002)
Student service expense	0.010*** (0.002)	0.013*** (0.002)
Institutional support expense	0.009*** (0.002)	0.012*** (0.003)
Public Service (x100)	0.095 (0.076)	0.118 (0.072)
Auxiliary Enterprises	0.011** (0.005)	0.012** (0.005)

Note: The estimate on the instrument in the first-stage is 0.00031, with a standard error of 0.00004, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 73.91.

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6. Impact on Financial Aid for All Liberal Arts Colleges.

	OLS	IV
Percent of students receiving any aid	-0.049 (0.033)	-0.078** (0.039)
Average amount of institutional aid received per student	-5.6 (25.9)	13.6 (28.2)

Note: All coefficients are for every \$10,000,000 increase in endowment. The estimate on the instrument in the first-stage is 0.00031, with a standard error of 0.00004, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 73.91.

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Impact of Endowment on Overall Budget for Colleges that Meet Full Need vs. Ones that Do Not.

	Meet Full Need		Not Meet Full Need	
	OLS	IV	OLS	IV
Net tuition revenue	0.001 (0.004)	0.002 (0.005)	0.039** (0.017)	0.055** (0.024)
Private gifts, grants and contracts	-0.013 (0.015)	0.005 (0.026)	0.014 (0.030)	0.058** (0.023)
Total expense	0.044*** (0.013)	0.050*** (0.010)	0.119*** (0.035)	0.154*** (0.040)

Note: In the IV specification for MFN schools, the estimate on the instrument in the first-stage regression is 0.00029, with a standard error of 0.00005, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 38.99. In the IV specification for non-MFN schools, the estimate on the instrument in the first-stage regression is 0.000289, with a standard error of 0.00010, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 8.84.

Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 8. Impact of Endowment on Spending Categories for Colleges that Meet Full Need vs. Ones that Do Not.

	Meet Full Need		Not Meet Full Need	
	OLS	IV	OLS	IV
Instruction expense	0.008*** (0.002)	0.008** (0.004)	0.042*** (0.011)	0.060*** (0.010)
Research expense (x100)	0.021 (0.052)	-0.009 (0.084)	0.292** (0.120)	0.197 (0.204)
Academic support expense	0.007*** (0.002)	0.011*** (0.003)	0.017** (0.007)	0.026*** (0.006)
Student service expense	0.009*** (0.002)	0.011*** (0.003)	0.017*** (0.006)	0.030*** (0.005)
Institutional support expense	0.004* (0.002)	0.004 (0.004)	0.019*** (0.006)	0.021** (0.009)
Public Service (x100)	0.000317 (0.000245)	0.079* (0.042)	0.643 (0.466)	0.988* (0.558)
Auxiliary Enterprises	0.011 (0.007)	0.012 (0.008)	0.013*** (0.003)	0.024*** (0.009)

Note: In the IV specification for MFN schools, the estimate on the instrument in the first-stage regression is 0.00029, with a standard error of 0.00005, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 38.99. In the IV specification for non-MFN schools, the estimate on the instrument in the first-stage regression is 0.000289, with a standard error of 0.00010, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 8.84.

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9. Impact on Financial Aid for Colleges that Meet Full Need vs. Ones that Do Not.

	Meet Full Need		Not Meet Full Need	
	OLS	IV	OLS	IV
Percent of students receiving any aid	-0.025 (0.044)	0.007 (0.053)	-0.030 (0.110)	-0.093 (0.207)
Average amount of institutional aid received per student	6.6 (22.2)	13.2 (33.6)	-200 (143)	-303* (184)

Note: In the IV specification for MFN schools, the estimate on the instrument in the first-stage regression is 0.00029, with a standard error of 0.00005, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 38.99. In the IV specification for non-MFN schools, the estimate on the instrument in the first-stage regression is 0.000289, with a standard error of 0.00010, significant at the 1% level. The F-statistic for the first-stage regression in the IV is 8.84.

Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

9. Figures

Figure 1: Average Total Expenditure per Student at Liberal Arts Colleges over Time (in 2017 Dollars)

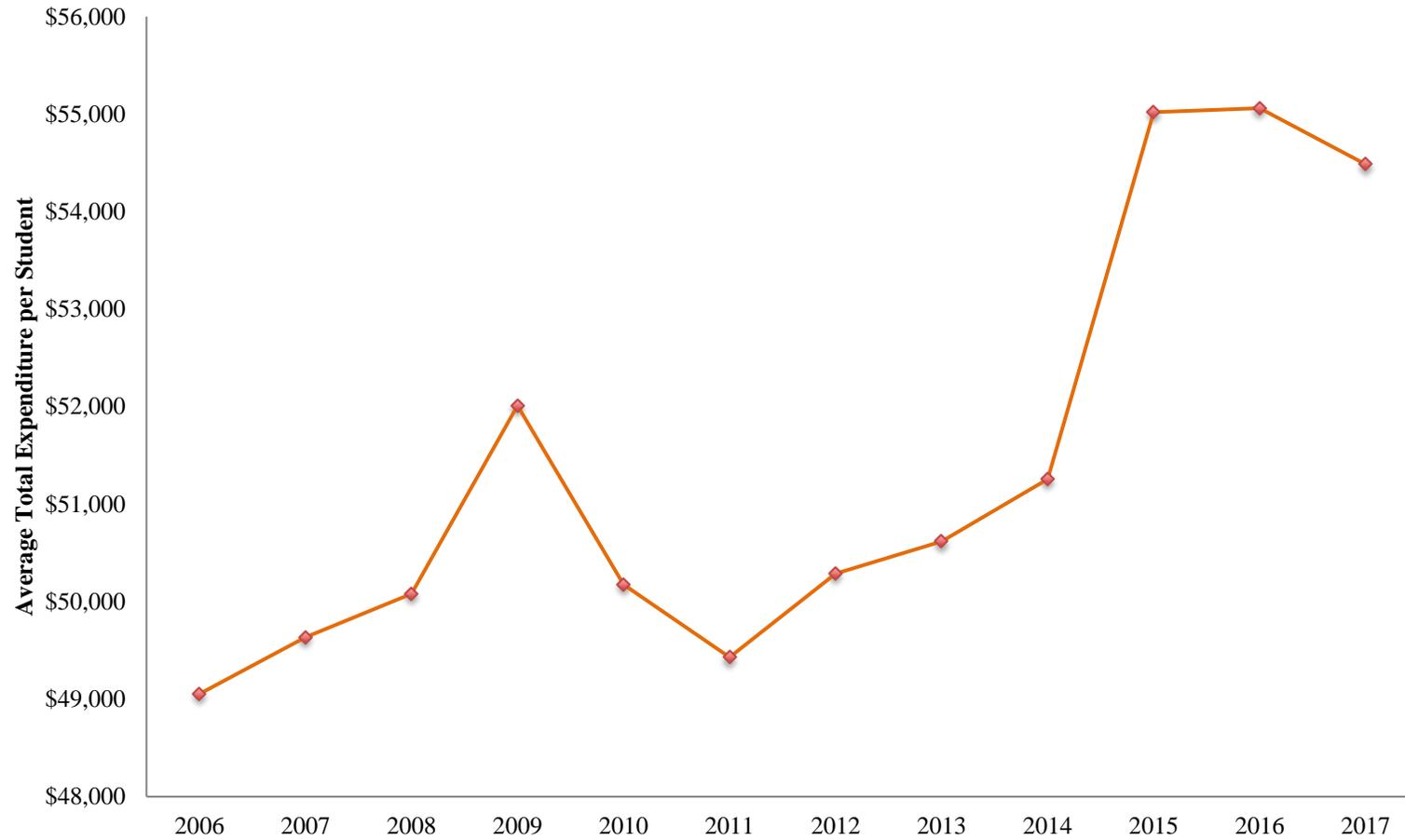


Figure 2: Average Endowment per Student (in 2017 Dollars) vs. S&P 500



**Figure 3: Annual Percentage Change in Endowment Value
by 2006 Endowment Quartiles**

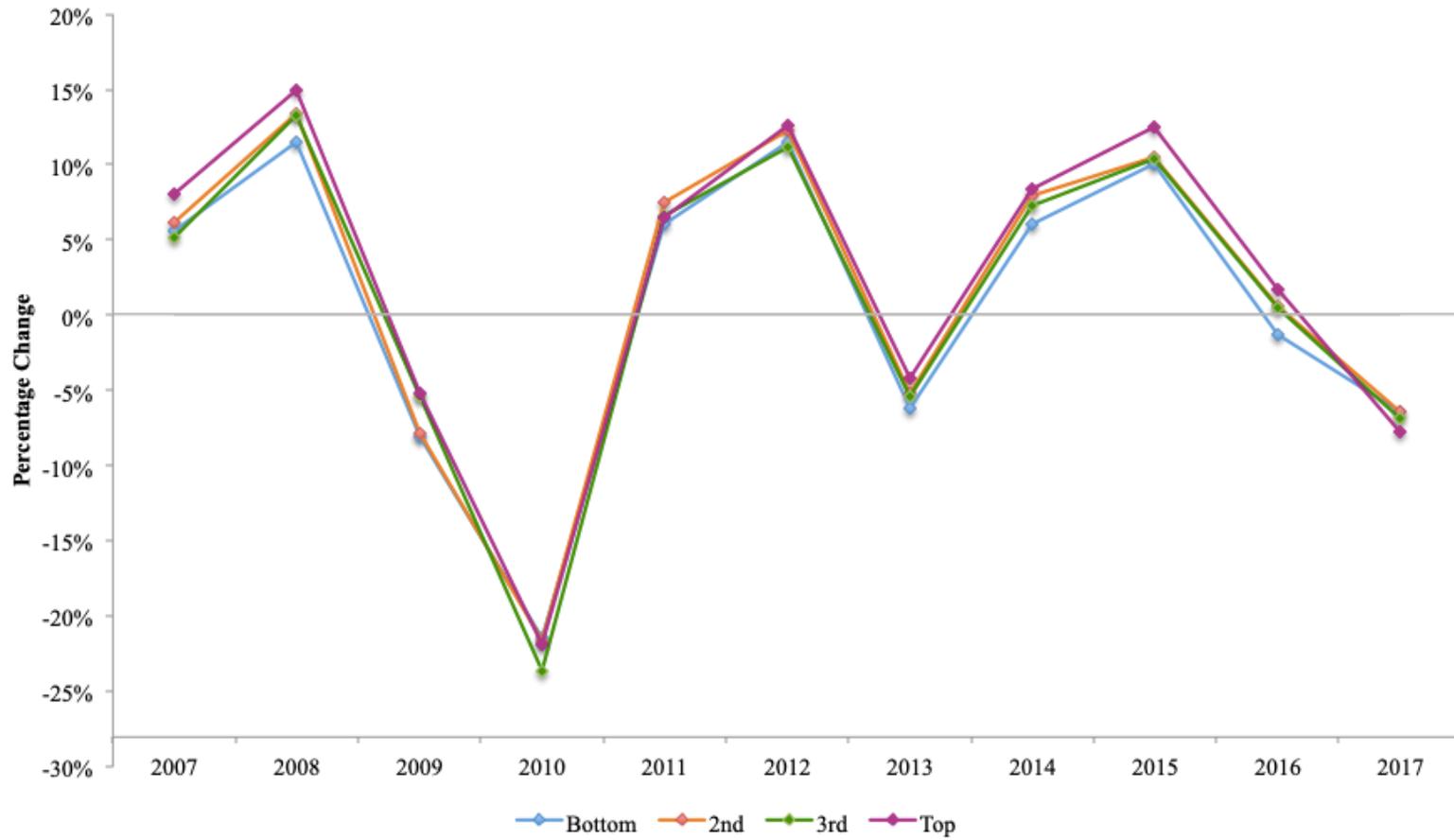


Figure 4: Annual Absolute Change in Endowment Value per Student by 2006 Endowment Quartiles

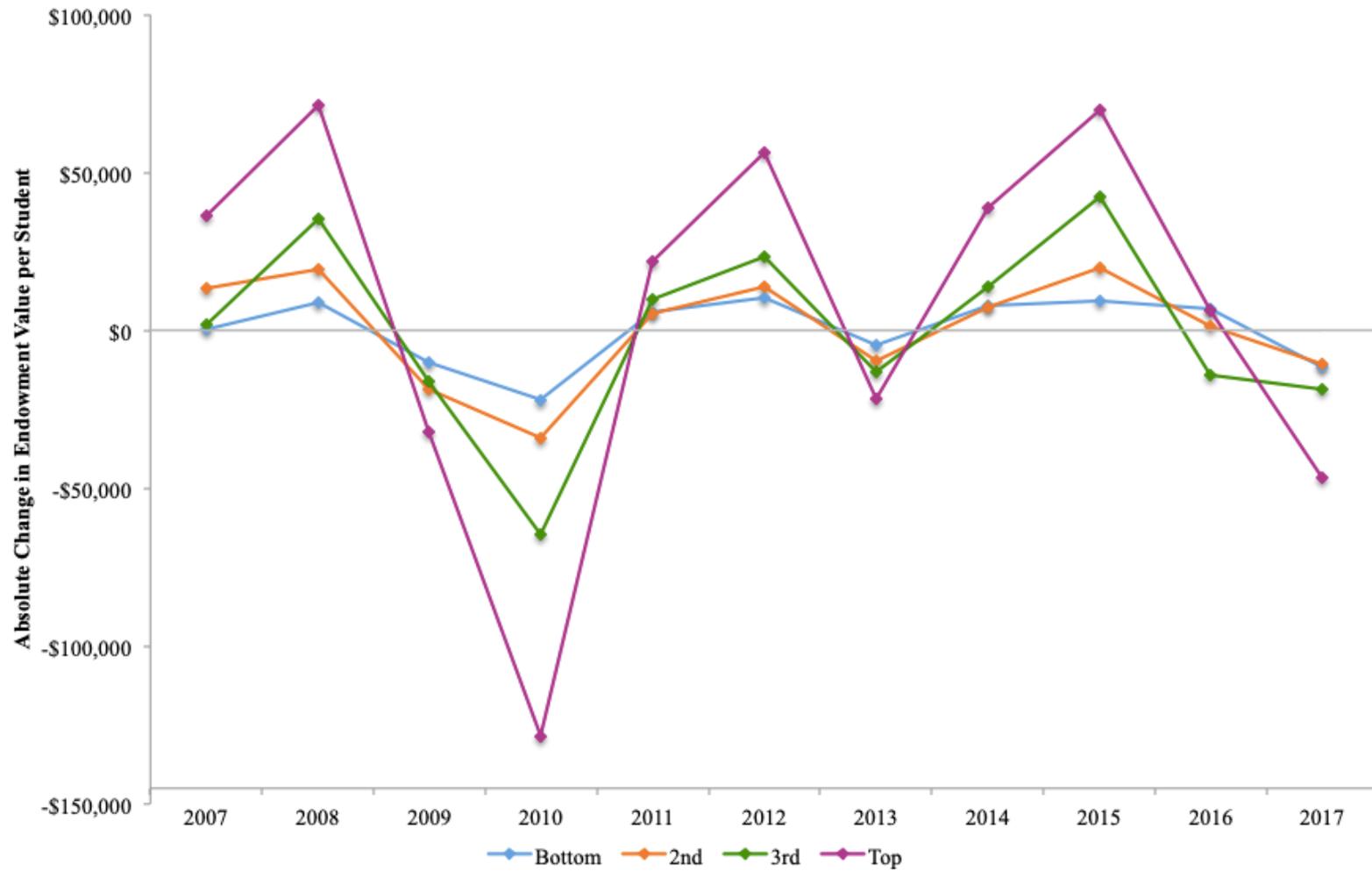


Figure 5: Annual Percentage Change in Total Spending by 2006 Endowment Quartiles



**Figure 6: Annual Percentage Change in Net Tuition Revenue
by 2006 Endowment Quartiles**

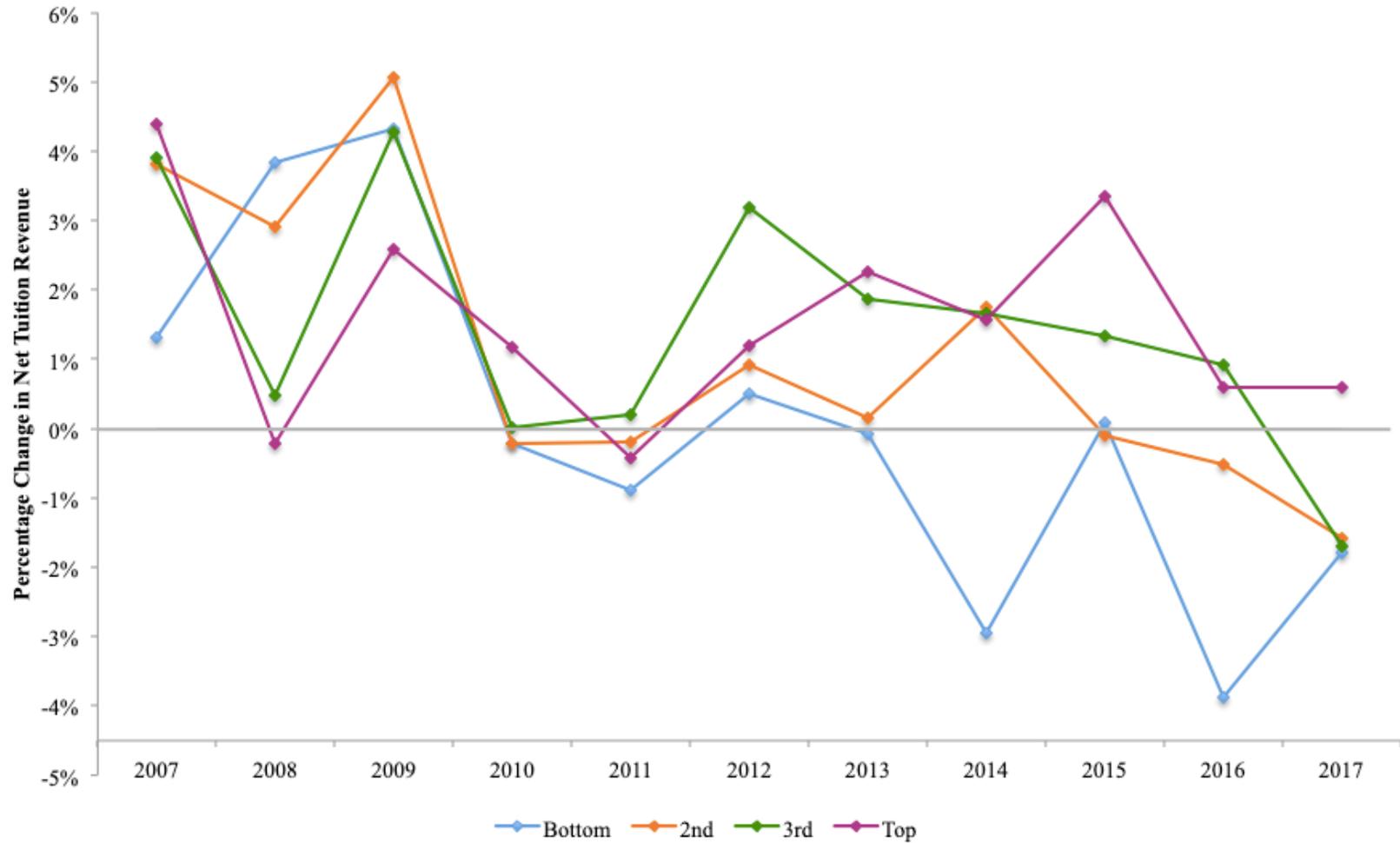


Figure 7: Annual Change in Percent of Students Receiving Any Financial Aid by 2006 Endowment Quartiles

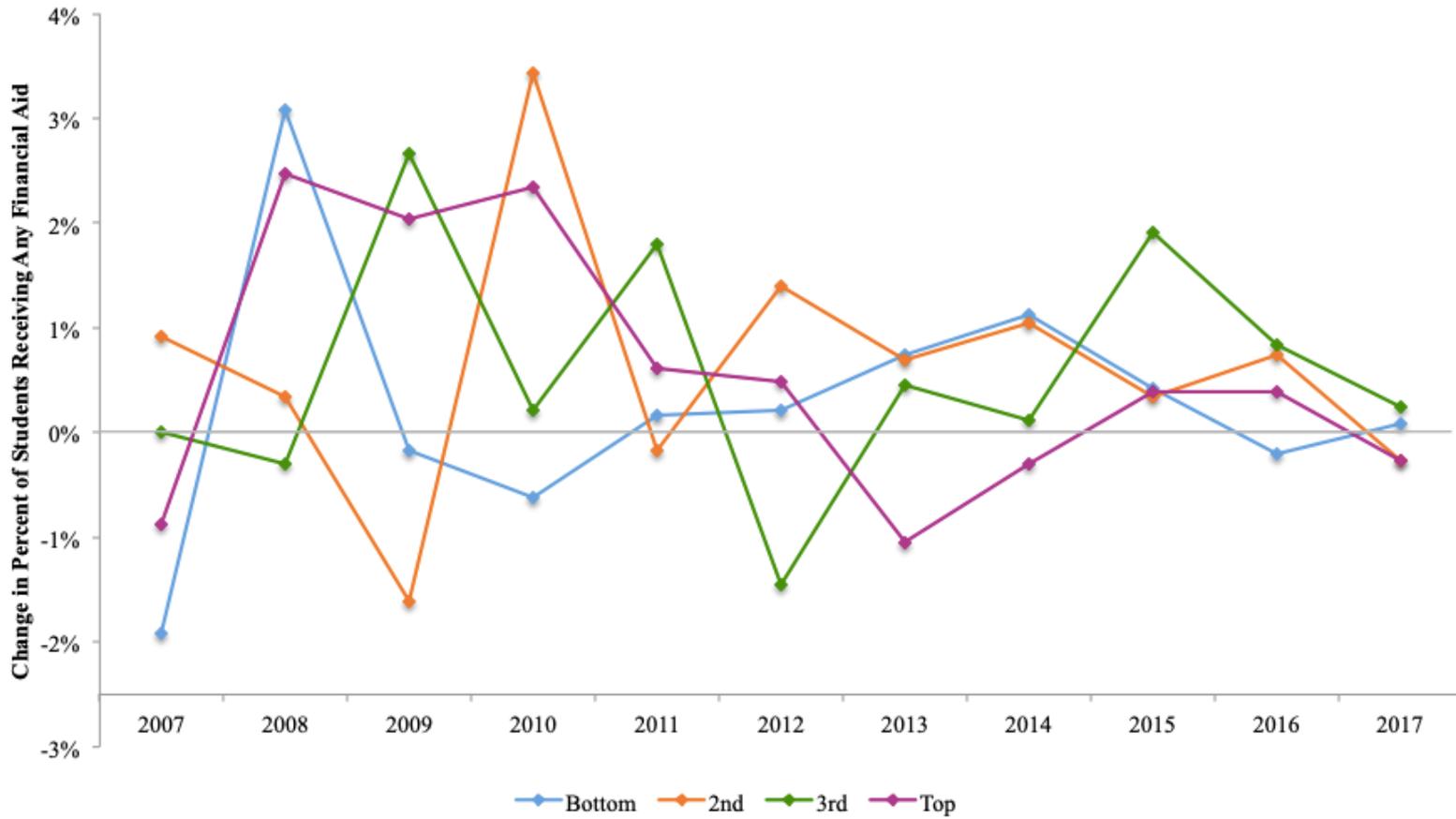
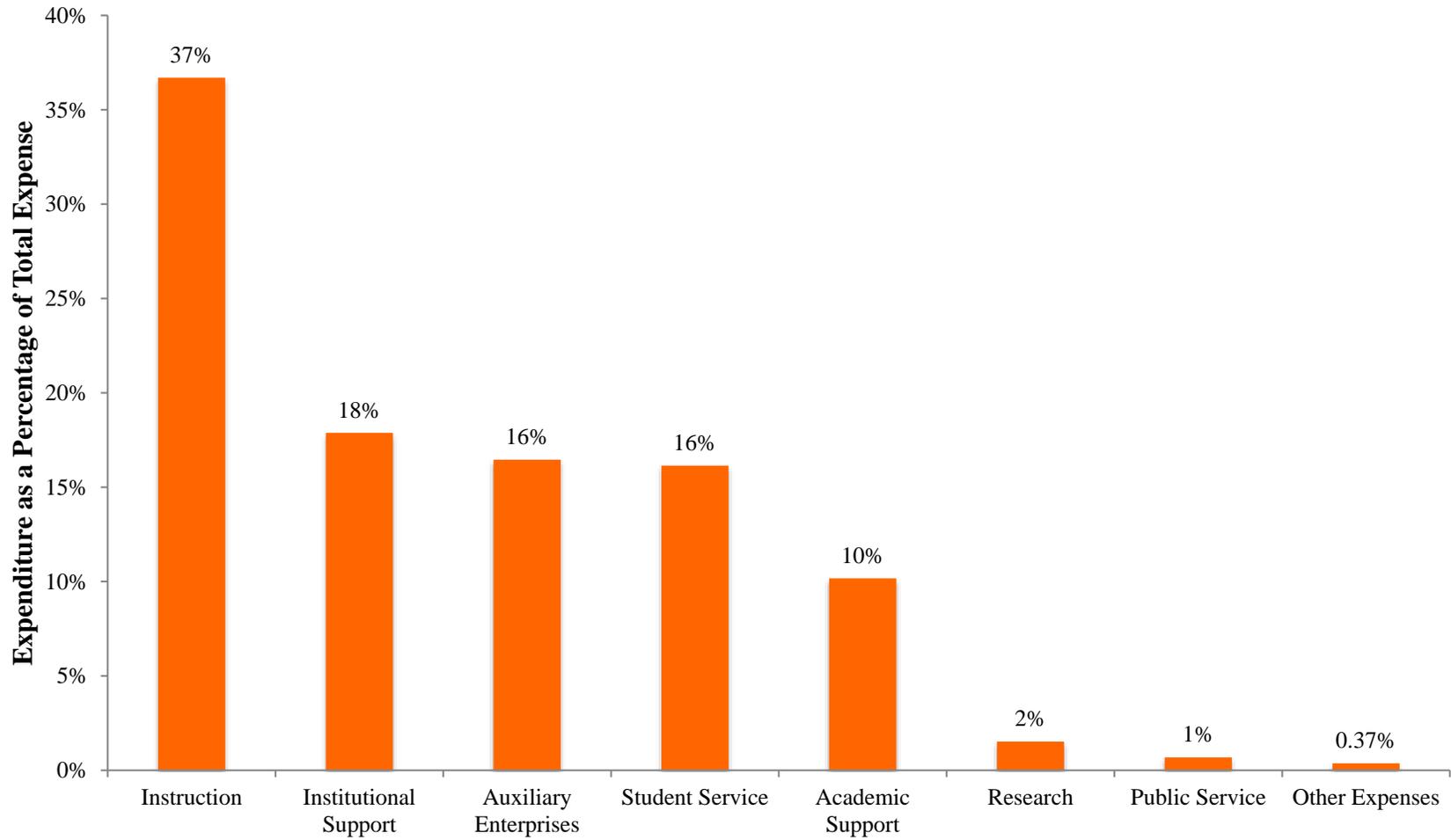


Figure 8: Expenditure per Student as a Percentage of Total Expense in 2016-2017 by Expense Category (in 2017 Dollars)



10. References

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