Do the Rich Know Better? – Evidence from University Endowments

By Tuo Chen*

This paper studies capital return inequality among university endowments. It combines university-level data on endowment size, capital returns, and portfolio allocations into a unified dataset. Using panel data regression, I show a strong impact of size on investment return. Everything else the same, the biggest endowment has a capital return 8 percent higher than the smallest endowment. However, after adjusting for risk using Sharpe ratios, the strong positive correlation turns negligible or even negative. This result suggests that the higher return of bigger endowments can be attributed to risk compensation rather than to an informational premium.

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Capital return inequality (i.e., capital of bigger size has a higher return) is an accelerating force of the capital income inequality and thus worsens the wealth inequality. However, there exists very limited literature on this topic, and even fewer papers exploring the reasons for the situation due to the lack of data. Therefore, the question naturally arises, how serious is the capital return inequality? If it is, why does bigger capital outperform smaller capital?

Based on the data of university endowments in North America, this paper observes that the biggest university endowments exceed the smallest ones by 8 percent in terms of capital return. This can be explained by the hypothesis that bigger university endowments have more information about the financial market (the information channel), or that they just invest more proportionally in risky assets and thus on average achieve a higher capital return (the risk channel). The university endowment data dictates that the risk channel is the main contributor to the performance of the university endowments, while the information channel has a negligible im-

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pact. More specifically, after controlling for the risk using Sharpe ratios, bigger university endowments no longer reflect superior performance. Even after explicitly introducing the information channel, the risk channel still dominates.

Thanks to its unique structure and detailed data, National Association of College and University Business Officers (NACUBO) data enables me to investigate the severity of capital return inequality and to make distinctions between the information channel and the risk channel. It is a panel data set consisting of three pieces of material from 2000 to 2013: sizes,[1] capital returns,[2] and portfolio allocations. By regressing the capital returns on the sizes, I can quantify the capital return inequality. The panel data structure helps to introduce the university fixed effect, which can be considered as a control for unobserved variables, such as the reputation effect or network effect of universities. The panel regression result shows that if we keep the same fixed effect and only vary the sizes, then the biggest endowment is predicted to have a capital return rate 8 percent higher than the smallest one. To explain this huge capital return inequality, I follow NACUBO and Commonfund (2013) and link the eleven categories of assets in the portfolio

[1]The size is measured by the market capitalization of the endowment.

[2]The capital return is the total net rate of return on investment, where *total* means the inclusion of asset appreciation and *net* means the exclusion of management fees.

allocations to benchmark indexes of the financial market. Then the weighted variance of the portfolio captures the risk channel, which can be used to compute the risk-adjusted performance: the Sharpe ratio. Furthermore, the absolute value of the difference between the actual return and the weighted portfolio return can serve as a proxy for the information channel. The assumption is that if an endowment with only public information invests exactly in the benchmark indexes, then the weighted portfolio return should be the same as the actual return. Hence the deviation of the latter from the former implies how much private information an endowment possesses. The panel regression of the Sharp ratios on the sizes gives a non-significant negative coefficient. And adding the information channel into the regression does not change the result. This demonstrates that the risk channel is the dominant channel.

Why does this paper focus on the institutional investors rather than the households as the primary concern of the capital return inequality is on the latter? It is because NACUBO has a panel data feature and more detailed categorizations of financial assets in comparison to available household data, such as that from the Survey of Consumer Finance (SCF). Although the SCF is a high-quality survey,[3] it cannot proper panel data because of the

[3]While this is a generally held belief, there are papers that express doubts about the accuracy of the SCF, such as the work of Johnson and Moore (2008)

randomization of the household selection (Bricker and Sabelhaus (2015)). Therefore, it is not possible to use the SCF data to identify the change in capital return for household i across two consecutive observations. For a university endowment in the NACOBO data, however, capital return history is well documented, which helps to introduce the university fixed effect and control for the heterogeneity besides the size of capital. Moreover, the eleven explicit categories for assets in NACUBO exhaust all the possible financial asset holdings of the university endowments, while "it is not possible, in general, to make direct separate estimates of the financial characteristics of the individuals in the survey households..." (CodebookSCF (2014)).

There are other papers that also draw inferences about inequality from institutional investors. Piketty (2014) also uses NACUBO data to explain how capital income inequality is aggravated by the capital return inequality and why. Without using the extensive micro-level data, Piketty compares the capital returns of three university endowments (Harvard, Yale, and Princeton) to that of the average university endowment in North America. He reaches the same conclusion that capital return inequality is severe. But the limitation of the data prevents him from further investigating quantitatively how much impact the size has on capital return, which is what this paper does. Nevertheless, he hypothesizes that the endowments of those elite universities have a higher capital return simply because they have the money to hire the best management teams and thus know more about the market. In other words, he argues that larger university endowments possess an informational advantage relative to smaller ones. The online appendix of Saez and Zucman (2016) includes the data on private foundations obtained from the IRS tax form PF-990. It demonstrates the same pattern of bigger private foundations outperforming the smaller ones on average.[4]

This article is linked to four strands of literature. First, the findings contribute to the literature on capital return inequality, which is still an underexplored subject compared to other inequality problems, such as income inequality and wealth inequality. A recent paper by Fagereng et al. (2016) employs the Norwegian administrative data, in which one can observe both the capital income and wealth holdings of households. They find that the positive correlation between the capital return and size can explain the gap between the actual wealth and imputed wealth through the capitalization method. My paper not only shows more direct evidence of the capital return inequality, but also goes a step further by identifying the channel behind it.

Second, the capital return inequality sheds some doubts on the capitalization method used in Saez and Zucman (2016), where the key assumption is

[4] It is included in the Table C14: Foundation real returns by wealth class, 1986-2010.

that the capital return is homogeneous across the wealth distribution. The fact that bigger capital earns a higher return will cause a upward bias of the imputed wealth inequality by capitalization method. This is confirmed by Fagereng et al. (2016) that the imputed wealth has a much higher Gini coefficient than actual wealth. But it needs more research on since there are two important differences between Saez and Zucman (2016) and mine. First, the IRS tax data only captures realized capital income, while the capital return in the NACUBO data is the total return including unrealized capital gain for which no tax is paid. It might be true that bigger capital has a lot of unrealized capital gain. In addition, the observed IRS categorization of financial assets is very coarse compared to that of NACUBO: The former basically divides financial assets into fixed incomes and equities, while NACUBO divides assets into eleven categories.

Third, this article engages in the discussion of why capital return varies across investors and favors the risk channel instead of the information channel. Fama (1971) and Eugene F. Fama (1973) show both theoretically and empirically that riskier assets have a higher expected return on average, and that the financial market is efficient in the sense that price fully reveals information. Thus, the information channel should not play a role in capital return inequality. Yitzhaki (1987) explains the fact that larger investors invest proportionally more wealth in riskier assets due their lower relative risk aversion, while Gomes and Michaelides (2005) attribute it to the fixed cost of risky assets. However, Arrow (1987) argues with a simple model that large investors tend to purchase more private information because information is less costly for them than their smaller counterparts when it comes to comparing wealth. Thus, they know better about the market and enjoy a higher rate of return. More recent works, such as those by Piketty (2014) and Kacperczyk, Nosal and Stevens (2014) share the same idea.

Fourth, the capital return inequality enriches the findings of the return to scale of mutual funds. Joseph Chen (2004) shows that the return declines with mutual fund size, which can be explained by the interaction of liquidity and organizational diseconomies. However, Reuter and Zitzewitz (2010) and Pastor, Stambaugh and Taylor (2015) find that size has no impact on mutual fund performance using the regression discontinuity and the panel regression with fixed effect respectively. The difference of mutual funds and endowment funds may come from the fact that a mutual fund is much bigger in size on average than university endowments on average. The mean asset size in Pastor, Stambaugh and Taylor (2015) is $1,564 million, while that of NACUBO is only $440 million.

The rest of the paper is organized as follows: Section 1 discusses the data source and the merging strategy; Section 2 demonstrates the existence of capital return inequality; Section 3 then proves that the higher capital return of larger capital is mainly driven by taking more risk rather than by having more information; Section 4 shows other evidence as a robustness check; and Section 5 concludes the paper.

I. The Data

The paper's data comes from the National Association of College and University Business Officers (NACUBO). It is in panel data format, spanning across the year 2000 to 2013. The entity of the observation is in university endowment levels. The data consists of three pieces of information: the size of endowments measured in market value, the total net returns on investment, and the portfolio allocation weights. (Hereafter, I will refer to them respectively as the endowment size data, the capital return data, and portfolio allocation weights, and altogether as the endowment data, the NACUBO data or the NACUBO endowment data.) The total net return on investment is used interchangeably with the capital return in this paper. *Total* means that the return includes both realized and unrealized capital gain. And *net* means that the management fee is excluded from the return. This endowment data is collected annually by NACUBO based on the self-reporting files of endowments.

Before data analysis, the NACUBO data is needed to be unified.[5] One inconvenient feature of the NACUBO endowment data is that there is no other universal identifier except for the names of the university endowments.

However, the names are not strictly consistent. Roughly, there are three types of inconsistencies. 1. Abbreviation: For example, the State University of New York is sometimes recorded as SUNY. 2. University name changes: For example, before 2012, Mercyhurst University was called Mercyhurst College. 3. Prefix or suffix problems: For example, Dartmouth College is sometimes recorded as Trustees of Dartmouth College. If we use the traditional way of matching observations, we would not get a satisfactory result. Here I employ the fuzzy merge command “reclink” in Stata to match a large part of the endowments. Then I check manually to see if there are any incorrect matches and make the necessary corrections.

Table 1 and Table 2 show the general statistics of the NACOBO data. The number of the observations increases for all three pieces of data. This trend is a result of NACUBO’s survey strategy. Once an endowment participates

[5]Although NACUBO has unified the annual capital return data in one Excel sheet, the other two pieces of data remain separated by year. Therefore I merge the endowment size data and the portfolio allocation data for each year with the capital return data, resulting in twenty-eight merges.

in the survey, it will get a reminder the following year to take part agin.[6] The incentive for the endowments to participate in the survey is the benefit that they can access the data set for research and comparison. The accuracy of the data is very good. Since most of the annual reports of endowments are publicly available, it is easy to cross check the figures in the NACUBO endowment data against those of the reports for any given endowment. Moreover, the number of observations is not exactly the same for all three pieces of data. The capital return data has fewer observations than the endowment size data and the portfolio allocation data.

There is a noticeable decrease in the observations in the endowment size data and portfolio allocation data from year 2009 to 2010. This gives rise to the concern of an attrition problem caused by endowment bankruptcy during or after the great recession. But it is not a real problem. First, although we do not have the data for the university bankruptcy rate, we know it is a rare event. Second, even though we attribute all the attritions to university bankruptcy, it does not bias the results very much. Table 4 shows the number of endowments that appear in the data set in year t but disappear in year $t + 1$ and $t + 2$.[7] Generally, the attrition problem is not

[6] A first-time participant can complete the survey on the NACUBO website.

[7] For year 2012, we just count the number of endowments that appear in the data set in year 2012 and then disappear in year 2013.

very severe since the attrition percentage is rarely above 5 percent.[8]. We do see that the attrition problem is slightly more severe in year 2009. However, the attrition is not concentrated only in one group. In face, 2.55 percent attrition comes from the endowments smaller than $10 million, 4.5 percent from endowments smaller than $1 billion and larger than $10 million, and 0.4 percent from the biggest group.

II. Quantifying Capital Return Inequality

In this section, I prove that the capital return inequality exists and is actually very severe by using the capital return data and the endowment size data.

Figure 1 shows the ten-year average annual nominal return for endowment groups with different sizes. This data is collected from NACUBO's annual reports, not calculated by university-level data. The history spans from 1988 to 2013, much longer than the unified data set.[9] This figure roughly proves the existence of the capital return inequality. There is a clear rank of capital return: Groups of bigger endowments are almost always above the groups of smaller ones. The differences of capital return between the

[8]This attrition percentage can be seen as the upper bound of the endowment bankruptcy since endowments also drop out of the data set for other reasons.

[9]I use the group return data from NACUBO's annual reports, not calculated from university-level data, even after 2000 is to maintain consistency. In actuality, the two are very similar.

largest endowment and the smallest ones are quite stable, varying between 2 percent and 4 percent.

The next step is to quantify the capital return inequality more precisely. More specifically, I check whether an increase in endowment size results in an increase in capital return and by how much. To see this, I run the panel regression specified in equation (1):

$$RTN_{it} = \alpha_i + \beta_1 \ln ENDOW_{it} + \Sigma_{t=2000}^{2012} \delta_t year_t + \varepsilon_{it} \tag{1}$$

RTN_{it} is the total net investment return of endowment i in year t. α_i is the endowment fixed effect, which accounts for the unobserved variables, such as the reputation effect or the network effect of universities. The year dummy $year_t$ accounts for the macroeconomic variation, such as economic booms and recessions. $\ln ENDOW_{it}$ is the log value of endowment size. ε_{it} is the error term.

The parameter of interest is β_1. In order to solve the problem of serial correlation, the estimation employs White's heteroskedasticty-consistent estimator, following Arellano (1987). In the baseline specification column 1 of Table 5, which is the panel regression with fixed effect, $\hat{\beta}_1 = 0.822$. The standard error is clustered by endowments, and the result is statistically significant at a level of 95 percent.

How should the severity of the capital return inequality be interpreted? Take one of the smallest endowments in 2013, Georgia Perimeter College, with an endowment size equal to \$1.17 million, and enlarge its size to the level of Harvard University, which is \$32.3 billion. The predicted capital return would increase by 8.4 percent. If we use the average capital return rate, 5.8 percent, in Table 1 for both endowments, the capital income difference is \$187.3 million. However, if we assume that Harvard University has a capital return that equals to $5.8\% + \frac{8.4\%}{2} = 10\%$,[10] and that Georgia Perimeter College $5.8\% - \frac{8.4\%}{2} = 1.6\%$,[11] the predicted capital income difference would be close to \$323 million, which by itself is almost three hundred times the size of the endowment of Georgia Perimeter College. Thus, the capital return inequality exacerbates the capital income inequality.

There are some concerns about equation (1). First, why do I use the regression with fixed effect as baseline specification instead of random effect? It is because the fixed effect can fix the omitted-variable bias. University endowments have different investment philosophies, reputation, network and management teams, etc. All these characteristics are potentially correlated

[10] The endowment of Harvard University had a capital return rate of 11.3 percent in year 2013.

[11] The endowment of Georgia Perimeter College had a capital return rate of 5.79 percent in year 2013.

with the size of the endowment. Thus, the regression without fixed effect could bias the estimation of coefficient β_1. Pastor, Stambaugh and Taylor (2015) include the fixed effect using the same argument. Moreover, the Hausman test favors the fixed effect specification. Nevertheless, I include the result of the panel regression without fixed effect as well in estimation for equation (1). Although the coefficient of interest declined to $\hat{\beta}_1 = 0.513$ as in column 2 of Table 5, it does not change the qualitative result. The predicted capital return difference between Harvard University and Georgia Perimeter College is still 5.2 percent.

Another valid concern is that the significance of $\hat{\beta}_1$ may be due to some mechanical mechanism rather than any interesting economic explanation. It is true that a higher capital income in year t results in a higher capital return and a bigger endowment size in year t when keeping everything else the same, including the endowment size in year $t-1$. However, this argument has amplified the role of investment income in determining the size of an endowment by ignoring the expenditure or other sources of the variation of the size. If we assume that the endowment of Yale University has accumulated all its capital income without consumption or any other variation in size from 2000 to 2013, its endowment should have been $34 billion in 2013, even slightly bigger than the size Harvard University's endowment, which is \$32.3 billion at the same time. However, the actual size of Yale's endowment in 2013 was \$21 billion. Moreover, column 3 of Table 5 shows the result of panel regression with the lagged size variable $\ln ENDOW_{it-2}$, where the coefficient $\hat{\beta}_1$ drops from 0.513 to 0.43, but still remains both economically and statistically significant. Even with $\hat{\beta}_1 = 0.43$, the predicted return increase would be about 4 percent if the size of Georgia Perimeter College's endowment becomes as big as Harvard's.

Third, the attrition problem may cause selection bias: In other words some endowments leaving the data set because of bankruptcy could give a biased estimation of β_1. However, as I have discussed in the previous section, attrition could hardly be a problem after the financial crisis of 2008, which is probably the period most prone to the issue. Even if attrition is a severe problem, as long as the endowments that disappeared from the data set were relatively small in size, the true β_1 could be even bigger than $\hat{\beta}_1$. Only when the bankrupt endowments are relatively large ones does my estimation have an upward bias.

As a robustness check, I also run the panel regression with fixed effect using subperiod and subsample. The results are reported in columns 4 and 5 of Table 5. The estimated $\hat{\beta}_1$ is even larger than the baseline specification.

To conclude, the existence of the capital return inequality is consistent with Piketty (2014)'s finding. Moreover, I can quantify that the capital return inequality is very severe.

III. Risk Channel vs. Information Channel

In this section, I show that the risk channel is the major reason for capital return inequality by using the portfolio allocation data.

Table 2 shows that the portfolio allocation data consists of eleven specified asset types and one unspecified asset type. They are respectively domestic equities, fixed income, international equities, private equity, marketable alternatives, venture capital, real estate, energy and natural resources, commodities, distressed debt, short-term securities and cash, and others. On average, university endowments invest most heavily in domestic equities and fixed income, which account for more than 60 percent together. But there is a clear trend suggesting the decreasing importance of these two assets. Moreover, the weight of international equities, private equity and marketable alternatives is increasing.

A. Synthetic Return

This subsection shows how to impute the synthetic return based on the portfolio allocation and publicly available benchmark indexes, and how it helps alleviate the concern over the missing data. The next subsection adds that the synthetic return can also be used to construct a proxy for the information channel.

According to NACUBO and Commonfund (2013), I assign eleven benchmark indexes to match asset types.[12] Table 6 shows the match between the asset types and the benchmark indexes. All the indexes are widely used and well accepted by the financial market. For example, the S&P 500 index serves as a proxy to the domestic equities, the Barclays US Aggregate index proxies the fixed incomes, and MSCI World ex-USA proxies the international equities.

Table 7 presents the annual returns of all assets, except for private equity and venture capital.[13] The benchmarks of these two assets are both from Commonfund, an institutional investment firm that delivers investment solutions for nonprofits organizations, including university endowments. Commonfund collaborates with NACOBU[14] but does not share their data with outsiders. Since different private equity and venture capital funds may have very different strategies, it would be inaccurate to use a random private equity or venture capital fund whose data is publicly available.

[12]We do not assign any index to the unspecified asset type for two reasons: First, the weight of this asset is under 2 percent; Second the NACUBO data does not clearly define what *other* means.

[13]But the raw data is in quarterly frequency.

[14]The NACUBO endowment reports are compiled by Commonfund.

Synthetic return is calculated using equation (2), meaning that it is the weighted average of market returns.

$$RTN_{it}^{syn} = \Sigma_a R_{at} W_{it}^a, \tag{2}$$

where R_{at} is the return of benchmark index for asset a at time t, and W_{it}^a is the portfolio weight of asset a of endowment i at time t.

Table 9 compares actual return and synthetic return. Only the data of the subperiod from 2003 to 2013 is used. This is because 1) the benchmark data for energy and natural resources is missing from 2000 to 2002; and 2) the definition of portfolio allocation data is very different in years 2000 and 2001 from the rest of the years. Synthetic return is calculated in two ways: by treating the missing returns of private equity and venture capital as zero or replacing them with the return of index for commodities. The result in Table 9 demonstrates that the statistics of the synthetic return and the actual return are very similar. Moreover, if we replace the dependent variable RTN_{it} in equation (1) with RTN_{it}^{syn} and run the same regression, the coefficient $\hat{\beta}_1$ is very close. The upper panel of Table 9 shows this with all the endowments from 2003 to 2013. If we ignore the missing data of private equity and venture capital, and set them to zero, the coefficient $\hat{\beta}_1$ is 0.7, not far from the benchmark case where $\hat{\beta}_1$ is 0.955. And if we assign the return of commodities to private equity and venture capital, the coefficient increases slightly to 0.72.

The lower panel of Table 9 focuses on the endowments with a size below 1 billion dollars. The coefficient $\hat{\beta}_1$ with the synthetic return is even closer to that of the actual return, which is 1.01 in this specification. This result suggests that the similarity between the synthetic return and the actual return is higher if we exclude the biggest endowments. One possible explanation is that bigger endowments deviate more from benchmark indexes than smaller ones.

The takeaway message of this subsection is that the missing returns of private equity and venture capital will not affect the result very much. This is due to the fact that the weights of private equity and venture capital in portfolio allocation are tiny. Although there is an upward trend for private equity, the weight has not surpassed 5 percent yet. The weight of venture capital is rarely above 2 percents, which is almost at the same level as the asset categorized as *others*.

B. Controlling for the Risk Channel

In this subsection, I explore whether the risk channel contributes to the capital return inequality. The risk of an endowment in investment activity is defined as the volatility of the portfolio, which is calculated by the weighted volatility of the excess return of benchmark indexes.

Risk-adjusted performance is used to check how important the risk channel is. The idea is that if the risk-adjusted performance of endowments is still positively correlated with the size, it means that besides the risk channel, the information channel also contributes to the higher return of larger endowments. However, if the positive correlation disappears after I replace the return with the risk-adjusted performance, then we can conclude that the risk channel dominates the contribution to the capital return inequality.

The most used risk-adjusted performance is the Sharpe ratio. The Sharpe ratio is first introduced as a criteria of fund performance in Sharpe (1966), calculated as in equation (3):

$$SR_i = \frac{RTN_i - Rf}{\sigma_i} \tag{3}$$

Rf is the risk-free interest rate, $RTN_i - Rf$ is the risk premium, and σ_i

is the standard deviation of capital return rate of portfolio i. Sharpe (1994) revised the Sharpe ratio by letting $\sigma_i = \sqrt{Var(RTN_i - Rf)}$, the standard deviation of the excess return of portfolio i. In this paper, the revised Sharp ratio is used.

For each endowment, I calculate the annual Sharpe ratio by equation (4).

$$SR_{it} = \frac{RTN_{it} - Rf_t}{\sigma^E_{it}} \tag{4}$$

where, Rf_t is the return of the US government's three-month treasury bills, and $(\sigma^E_{it})^2 = \Sigma_a \Sigma_b \sigma^E_{abt} W^a_{it} W^b_{it}$.[15] In computing the standard deviation of the excess return of endowment i, all the variance and covariance of the excess return of different benchmarks are included. σ^E_{abt} is the covariance of the excess return of benchmark a and b in year t if $a \neq b$, and the variance of the excess return of benchmark a if $a = b$. W^a_{it} is the portfolio allocation weight of asset a.

Since the Sharpe ratio is a theoretical measure on which a rational fund manager is supposed to rely in order to construct the optimal portfolio allocation, it would make more sense to use the ex ante Sharpe ratio, meaning

[15] Here I use the temporal variation as the proxy for the risk of assets. Alternatively, I can follow Flavin and Yamashita (2002) to construct the cross-sectional risk measure of assets.

the return and the standard deviation are all measured by ex ante probabilities. However, it is almost impossible to get the expected value in practice. The Sharpe ratio we employ in this paper is the ex post measure.

To construct the standard deviation of each endowment, I estimate the covariance and variance of the excess returns of the benchmark indexes. The estimation method is Exponentially Weighted Moving Average(EWMA), as expressed in equation (5).

$$m^E_{a\tau+1} = \lambda m^E_{a\tau} + (1-\lambda)(R_{a\tau} - Rf_\tau)$$

$$u_{a\tau} = (R_{a\tau} - Rf_\tau) - m^E_{a\tau}$$

(5)

$$(\sigma^E_{a\tau+1})^2 = \lambda(\sigma^E_{a\tau})^2 + (1-\lambda)u^2_{a\tau}$$

$$\sigma^E_{ab\tau+1} = \lambda\sigma^E_{ab\tau} + (1-\lambda)u_{a\tau}u_{b\tau}$$

where λ is the decay parameter, $m^E_{a\tau}$ is the moving average of the excess return of benchmark a, and $u_{a\tau}$ is the deviation of the excess return of asset a from its mean. The initial values of iteration, m^E_{a0}, σ^E_{a0}, and σ^E_{ab0}, are the long run values.[16]

Another thing to notice is that the time period is in quarterly frequency in equation (5). However, the Sharpe ratio needs to be in annual frequency for panel regression. I then take the average of the variance and covariance within a year as the annual values that enter the computation of σ_{it}^{E} in equation (4).

There is a concern that the missing data of private equity and venture capital will induce an upward bias in estimating the endowment portfolio volatility, because endowments may use private equity or venture capital to hedge the risk they face in other types of assets. Therefore, the return of these two assets should be negatively correlated with other assets. However, this concern is unnecessary. Recent academic research shows that private equity and venture capital provides few hedging benefits: Welch (2014) proves that the diversification illusion of private equity comes from the fact that private equity firms underestimate the comovement between private equity and market returns.

Now we can replace RTN_{it} in equation (1) with SR_{it}, and run the regression in equation (6). The parameter of interest is β_1'. If $\hat{\beta}'_1$ is positive

[16]The long-run mean, long-run variance and long-run covariance are all for the period 1995-2013 except for the asset Energy and Natural Resource, which is calculated fro 2003-2013 because of the data availability.

and significantly different from zero, it means that after adjusting for the risk, bigger endowments still outperform smaller ones. Then, besides the risk channel, the information channel must have contributed to the better performance. Otherwise, the risk channel dominates. In other words, there is no secret recipe for the out-performers. They get a higher return simply by loading on more risk.

$$SR_{it} = \alpha_i' + \beta_1' \ln ENDOW_{it} + \Sigma_{t=2003}^{2012} \delta_t' year_t + \varepsilon_{it} \tag{6}$$

Table 10 shows the regression results of equation (6). The upper panel presents the results with the full sample from 2003 to 2013 with different values for decay parameter λ.[17] Although the coefficient β_1' is not statistically significant at a level of 90 percent, the estimates are negative. This tells us after controlling for the risk that the bigger endowments perform no better than the smaller ones, and perhaps even underperform the smaller ones. If we concentrate the estimation on the endowments that are under $1 billion, this negative correlation between the Sharpe ratio and size becomes even larger for any given λ.

[17] Note that $\lambda = 1$ is the usual case of a constant mean and standard deviation.

There are other pieces of evidence that risk plays a very important role in determining the capital return for university endowments. Figure 2 represents a stable pattern that the bigger an endowment gets, the less weight is allocated to the fixed income. Indeed, Figure 3 reveals that the bigger endowments put more weight on international equity compared to smaller ones. Although after the 2008 financial crisis, the biggest endowments have lowered the allocation in risky international equities, they still put more weight in them than the smaller endowments. Table 8 tells us that the international equity is one of the most volatile assets, while the fixed income is of very low risk.

Figure 4 shows the year-to-year regression result of RTN on $\ln ENDOW$. The coefficient $\hat{\beta}_1$ varies a lot. But the general pattern is that when the market is in a boom, the correlation between return and size is positive, such as 2000 and 2004 - 2008.[18] When the market is in a recession, the positive correlation disappears. In year 2009, this correlation is even reversed. This suggests that the bigger endowments may just surf on the wave of the market and expose themselves to more market risk.

[18]The NACUBO data is collected every year in June. Therefore, year 2008 is still considered to be in an economic boom.

C. Controlling for the Information Channel

In this subsection, I present a method to explicitly control for the information channel. The takeaway message is that the information channel is negligible relative to the risk channel in determining capital return inequality. In the previous subsection, I demonstrate that risk channel dominates the contribution to capital return inequality.

The main assumption is that benchmark indexes contain all the public information and university endowments deviate from the benchmarks because they own some private information. If each endowment simply relies on the public information and traces only benchmarks, the synthetic return and the actual return should be exactly the same. And the coefficient $\hat{\beta}_1$ should be the same as well, using either the synthetic return or the actual return in regression (1). The discrepancy between synthetic return and actual return demonstrates that some endowments deviate from the benchmark indexes. And we do see in Table 9 that after excluding the endowments above \$1 billion, the coefficient $\hat{\beta}_1$ obtained with the synthetic return is much closer to that of the actual return. This piece of evidence suggests that bigger endowments deviate more from the benchmark indexes than smaller ones.

Therefore, I construct a proxy for the private information in equation (7):

$$|Diff|_{it} = |RTN_{it} - RTN_{it}^{syn}| \tag{7}$$

The absolute value in equation (7) comes from the assumption that no endowment can have less information than the publicly available market information. This proxy for the private information is not perfect though. It would be ideal to know the disaggregate return of individual assets for each endowment. Then we can use the difference between actual return of asset a and the benchmark return of asset a as a proxy for an endowments' private information in a particular type of asset. From there, we could aggregate to construct the total private information. However, the data at my disposal is only total return.

Including the proxy of the private information in panel regression, we now have regression equations (8) and (9):

$$RTN_{it} = \alpha_i + \beta_1 \ln ENDOW_{it} + \beta_2 |Diff|_{it-1} + \Sigma_{t=2004}^{2012} \delta_t year_t + \varepsilon_{it} \tag{8}$$

(9) $$SR_{it} = \alpha'_i + \beta'_1 \ln ENDOW_{it} + \beta'_2 |Diff|_{it-1} + \Sigma_{t=2004}^{2012} \delta'_t year_t + \varepsilon_{it}$$

The reason to use $|Diff|_{it-1}$ instead of $|Diff|_{it}$ is to avoid the potential endogeneity problem in the regressions.

The results of regression (8) are reported in the upper panel of Table 11, and the results of regression (9) in the lower panel. The loading on the information channel $\hat{\beta}_2$ and $\hat{\beta}'_2$ is negative and close to zero.

It is difficult to compare $\hat{\beta}_1$ and $\hat{\beta}_2$ directly since the variables $\ln ENDOW$ and $Diff$ have different units. However, we can compare their separate contributions to the capital income inequality. Since the information channel is controlled, the residual loading on size can be considered to be the loading on the risk channel in equation (8).

In the whole data set, the largest 10 percent of the endowments have an average $\ln ENDOW = 21.91$, while the smallest 10 percent yield $\ln ENDOW = 16.05$. Therefore, the size difference between the two groups is 5.86, and the contribution of the risk channel to the return difference of the two groups is $5.86 \times \hat{\beta}_1 = 13.4\%$. The information channel difference between the same two groups is 1.65, which indicates that the information channel contribution to the return differences is merely $1.65 \times \hat{\beta}_2 = -0.066\%$.

There is even more evidence supporting the conclusion that the information channel plays little role in determining capital return inequality. First, I run the year- to-year regression as in equation (10),

$$RTN_t = \alpha + \beta_1 \ln ENDOW_t + \beta_2 |Diff|_{t-1} + \varepsilon_t \tag{10}$$

This is not a panel regression anymore, so there is no fixed effect. The regression result can be used to compute the time-varying contribution of different channels to the capital return inequality. Figure 5 represents the contribution of two channels to the return difference between the top decile endowments and bottom decile ones in terms of the endowment size. The curve representing the information channel is close to zero compared to the other representing the risk channel. In some years, such as 2012 and 2013, the information channel is indeed comparable to the risk channel, but the contribution of the former is nonetheless negative.

Second, I run the regression as shown in equation (11)

$$Diff_{it} = \gamma_i + \theta_1 \ln ENDOW_{it} + \Sigma_{t=2003}^{2012} \delta_t year_t + \varepsilon_{it} \tag{11}$$

The dependent variable is $Diff_{it}$, not the absolute value. The idea is that if the private information has little impact on the capital return, public information should capture most of the variation of the returns. So the discrepancy between the actual return and synthetic return (or the excess return) should not depend on endowment size. Table 12 shows this link does exist: The coefficient $\hat{theta}_1$ is not statistically different from zero. After excluding forty of the largest university endowments with size above $1 billion, the coefficient is virtually zero.

IV. Robustness Check

In this section, I show alternative evidence that also supports the view that the risk channel rather than the information channel determines capital return inequality.

A. Total (static) Sharpe Ratio

In this subsection, I deal with the concern that the risk measured as the weighted volatility of the excess return of benchmark indexes only captures the variation of between-asset allocation, while ignoring the within-asset allocation. For example, let us say there are two endowments have the same allocation of portfolio in terms of eleven explicit asset types: Both put 50 percent in domestic equities and 50 percent in bond, and zero in all other assets. Based on this measure of risk, we would conclude that they have the same risk. However, it could be that one endowment allocates all the weight of domestic equities in riskier stocks and the other in safer stocks. So the true risk they face could potentially be very different.

I present an alternative risk measure and an alternative Sharpe ratio to alleviate the concern. This alternative Sharpe ratio is defined in equation (12):

$$SR_i^T = \frac{\overline{RTN}_i - \overline{Rf}}{\sigma_i^{ET}} \tag{12}$$

The superscript of Sharpe ratio T means that this measure takes the total risk into consideration. And since it is not a time-varying variable, there is no time subscription t. $\overline{RTN}_i$ stands for the time average of total net return of endowment i from year 2000 to 2013. $\overline{Rf}$ is the time average return of the US government's three-month treasury bills from the same period. σ_i^{ET}

is the total volatility, measured as the standard deviation of excess return of endowment i. I call SR_i^T the total Sharpe ratio and σ_i^{ET} the total volatility or the total risk.

In this setting, there is no panel data. The data set is degenerated into a purely cross-section one. The X axes of Figures 6 and 7 are the same, the time average of endowment size;[19] while the Y axes are respectively $\overline{RTN}_i$ and SR_i^T. In order to ensure that the standard deviation makes sense, I only keep the endowment that has at least 3 observations in the dataset.

The slope of the two graphs and the corresponding t-statistics are also specified in the southwest corner. The correlation between the average return and average size is both positive and statistically significant. Moreover the numeric value 0.45 is close to the result in column 2 of Table 5. However, after we control for the risk, Figure 7 shows no correlation between the size and the Sharpe ratio.

B. Explicit Risk Channel vs. Explicit Information Channel

In this subsection, I explicitly show the regression of return on both the risk channel and the information channel, rather than treating the risk channel as a residual channel as in equation (8).

[19]The endowment is measured in log term.

More specifically, I run the regressions in equation (13):

$$RTN_{it} = \alpha_i'' + \beta_1''\sigma_{it} + \beta_2''Diff_{t-1} + \Sigma_{t=2004}^{2012}\delta_t''year_t + \varepsilon_{it}$$

(13)

$$RTN_{it} = \alpha_i''' + \beta_1'''\sigma_{it}^E + \beta_2'''Diff_{t-1} + \Sigma_{t=2004}^{2012}\delta_t'''year_t + \varepsilon_{it}$$

The difference between the two equations above is the standard deviation used. The second equation uses σ_{it}^E, which is the same as is defined in equation (5), The superscript E stands for the excess return of the endowment return in comparison to the risk-free asset. The first equation uses an alternative time-varying risk measure σ_{it}, where $\sigma_{it}^2 = \Sigma_a\Sigma_b\sigma_{abt}W_{it}^aW_{it}^b$. The superscript E is dropped to indicate that it is no longer the excess return but the actual return of the benchmark indexes that is involved in the calculation of the risk. The computation of σ_{it} is shown in equation (14):

$$m_{a\tau+1} = \lambda m_{a\tau} + (1-\lambda) R_{a\tau}$$

$$v_{a\tau} = R_{a\tau} - m_{a\tau}$$

(14)

$$\sigma^2_{a\tau+1} = \lambda \sigma^2_{a\tau} + (1-\lambda) v^2_{a\tau}$$

$$\sigma_{ab\tau+1} = \lambda \sigma_{ab\tau} + (1-\lambda) v_{a\tau} v_{b\tau}$$

where λ is the decay parameter, $m_{a\tau}$ is the moving average of the return of the benchmark index a, and v_{at} is the deviation of the return of asset a from the mean. The initial values of iteration, m_{a0}, σ_{a0}, and σ_{ab0}, are the long run values. Actually, since the return of risk free asset is very stable, σ_{it} is very similar to σ^E_{it}.

The results are shown in Table 12. No matter which risk measurement is used, the load on the risk channel does not vary much and is around 0.60. And the load on the information channel is around -0.065. The average contribution of the risk channel to the return is therefore 3.27 percent, while that of the information channel is merely 0.6 percent.

V. Conclusion

I would like to conclude my paper with a story written by Mark Twain in 1906 called *$30,000 Bequest*. Living through the Gilded Age in the US, which was the last three decades of nineteenth century, Twain witnessed the increasing inequality of that era. His story is about a middle-class couple with an annual income of $800 in a small town. Their typical investment was to buy land and then resell it to newcomers to the town. One day, they heard from their distant uncle that they would get a $30,000 bequest after he died. Merely the news itself was already enough for them to make bolder investment strategies. With the vain hope that they would someday have such a huge amount of money, they started to envision investing in very risky assets, such as coal mines and stocks. They did not have more information on those assets and were simply attracted by the higher return. Alas, of course, this was only a dream for them. They did not receive any bequest from their uncle since he had died years before. The point of the story is to show that people are willing to bear more risk in investments once they become richer and this is consistent with the empirical finding in this paper that higher capital return comes from more risk.

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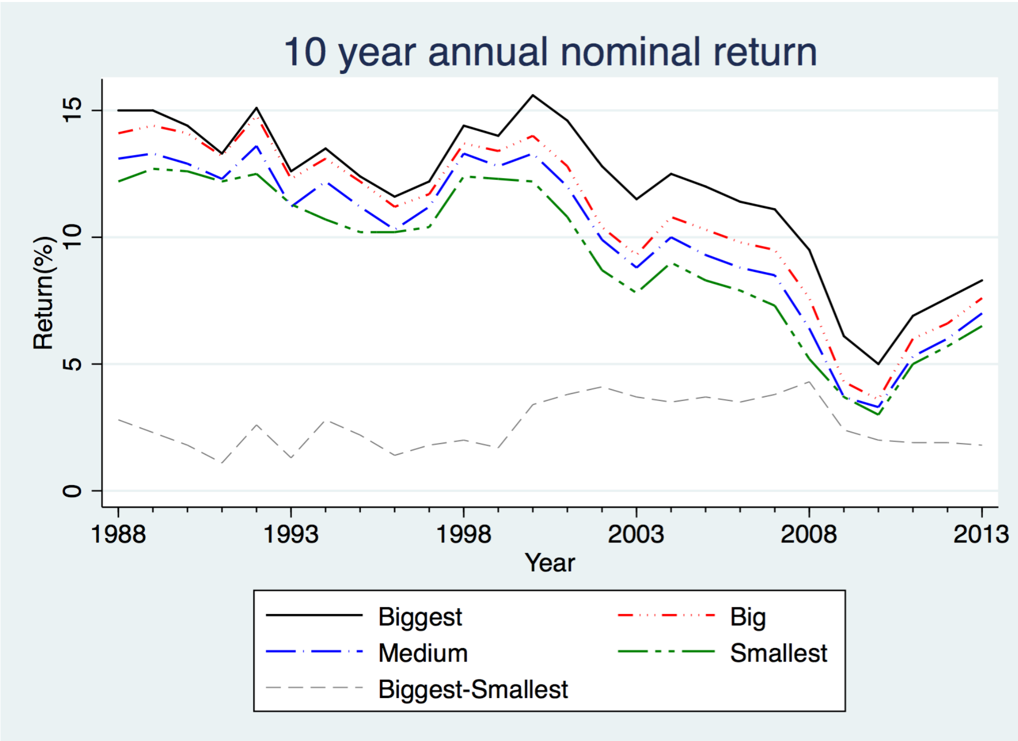
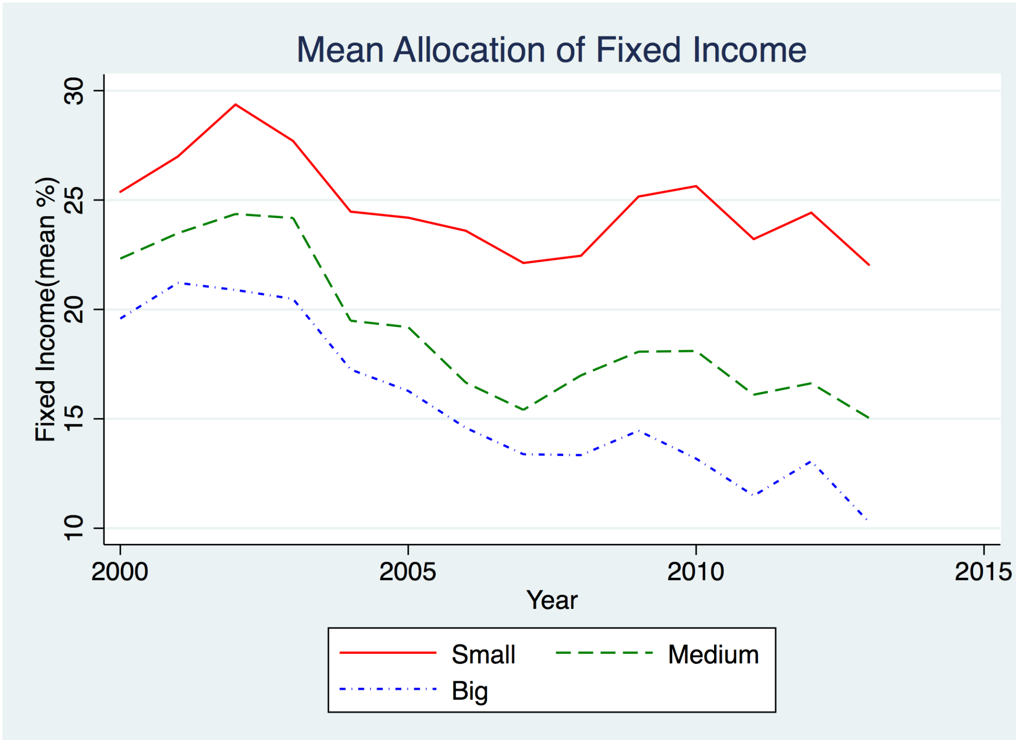
VI. Tables and Graphs

Figure 1. Total Net Return of University Endowments of Different Sizes



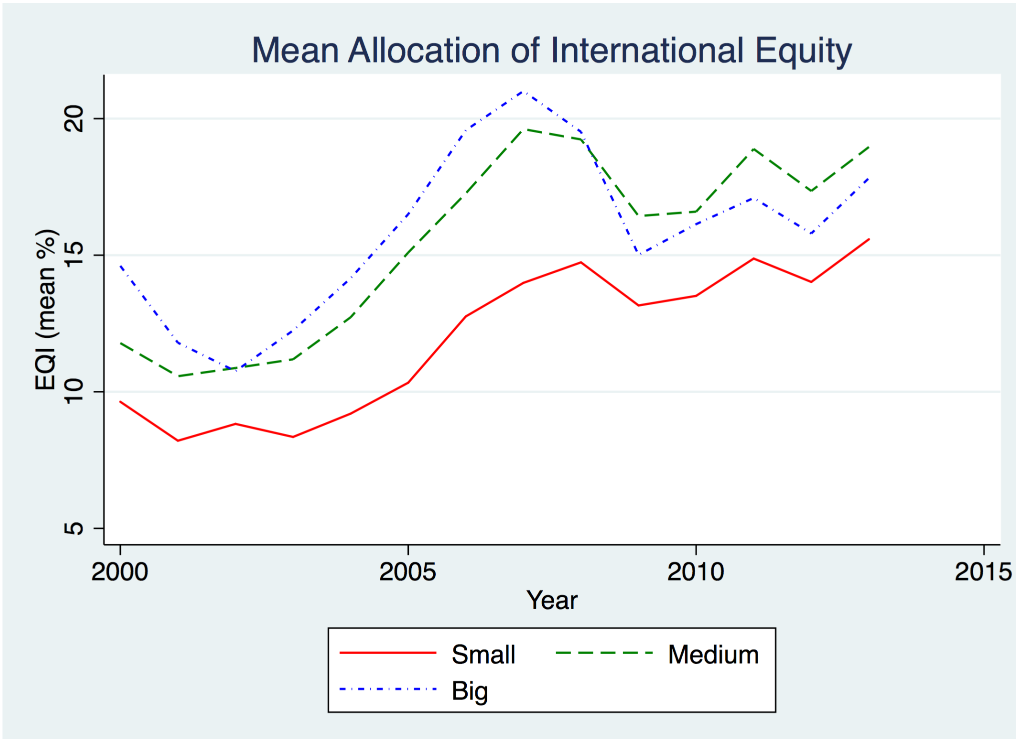
Note: Ten-year annual nominal return is calculated as the geometric mean of yearly nominal return over a moving window of ten years.
1988-1997: Smallest $25 million and under, medium $25 million - $100 million, big $100 million - $400 million, biggest over $ 400 million
1998-1999: Smallest $75 million and under, medium $75 million-$300 million, big $300 million - $1 billion, biggest over $ 1 billion
2000-2013: Smallest $100 million and under, medium $100 million - $500 million, big $500 million - $1 billion, biggest over $ 1 billion
From 2002 onwards, there are in total six categories, but I calculate the equally weighted mean of the lowest three categories to make the results comparable to 2000 and 2001
Source: NACUBO Annual Reports. It is only available on an aggregate level, not on the university-level.

FIGURE 2. MEAN ALLOCATION OF FIXED INCOME OF DIFFERENT SIZE OF ENDOWMENTS



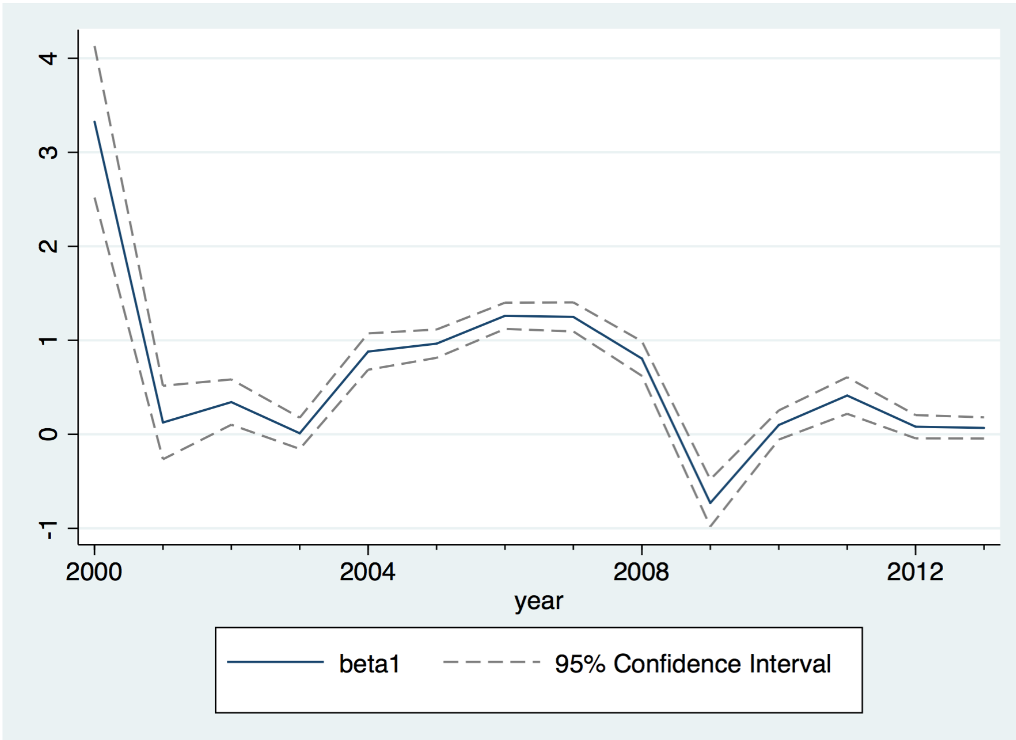
Note: Small $100 million and under, medium $100 million - $500 million, big over $500 million
Source: NACUBO Endowment-level Data

Figure 3. Mean Allocation of International Equity of Different Size of Endowments



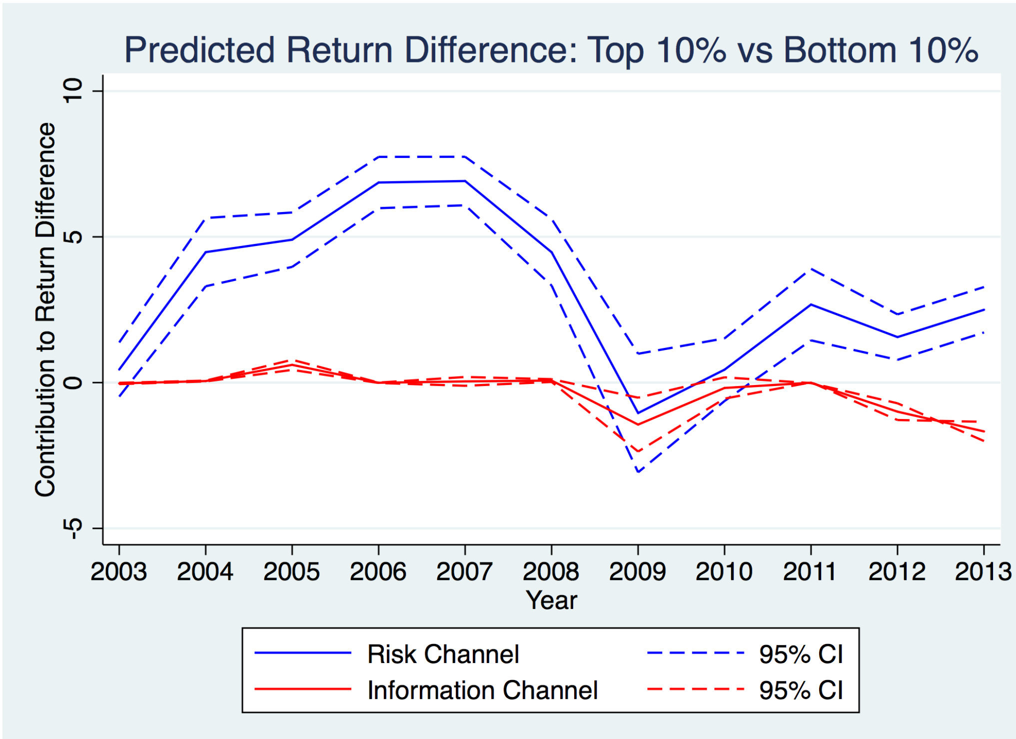
Note: Small \$100 million and under, medium \$100 million - \$500 million, big over \$500 million
Source: NACUBO Endowment-level Data

Figure 4. Year-to-Year Regression Coefficient of RTN on LENDOW



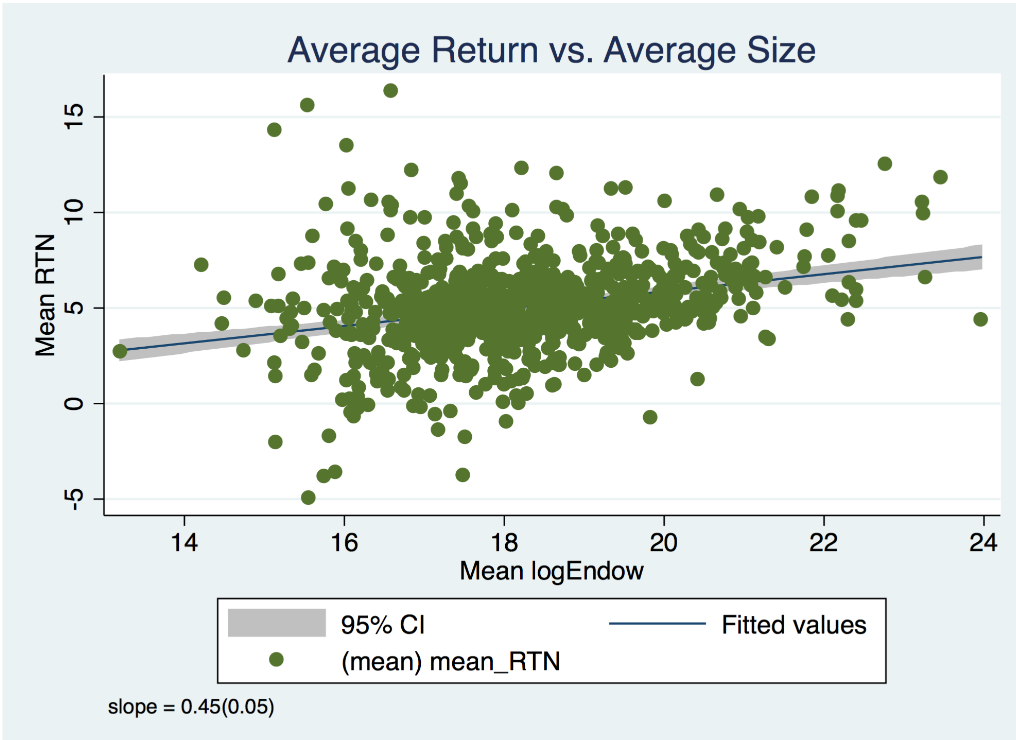
Source: NACUBO Endowment-level Data

Figure 5. Year-to-Year Contribution to Return Difference between Two Channels



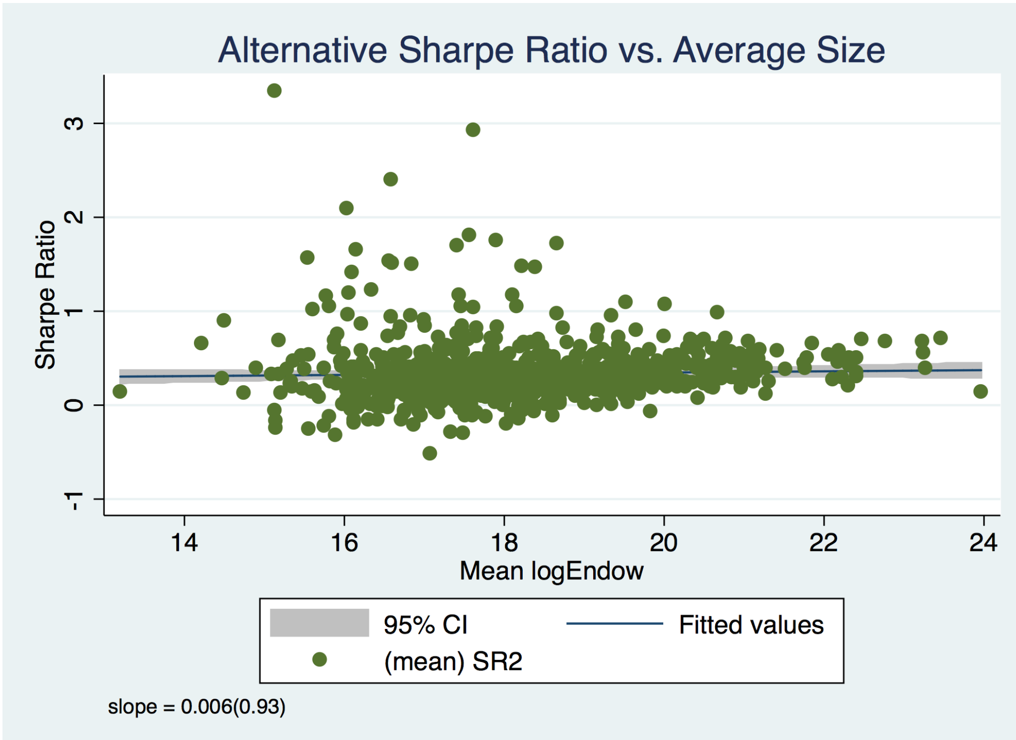
Source: NACUBO Endowment-level Data

Figure 6. Average Return vs. Average Size



Note: Each point in the graph stands for an endowment
Only endowments with at least three observations are included.
Three outliers are excluded from the graph. If They were included, the slope is slightly bigger: slope = 0.46(0.051)
Source: NACUBO Endowment-level Data

FIGURE 7. ALTERNATIVE SHARPE RATIO VS. AVERAGE SIZE



Note: Each point in the graph stands for an endowment
Only endowments with at least three observations are included.
Three outliers are excluded from the graph. If They were included, the slope would become slightly negative: slope = -0.019(0.020)
Source: NACUBO Endowment-level Data

Table 1—Statistics of Total Net Return and Endowment Size

	Total Net Return					Endowment Size ($)				
year	**N**	**mean**	**sd**	**min**	**max**	**N**	**mean**	**sd**	**min**	**max**
2000	450.0	13.5	13.3	-12.2	183.0	545.0	4.4e+08	1.3e+09	968000.0	1.9e+10
2001	554.0	-3.5	6.3	-32.9	24.8	588.0	4.0e+08	1.2e+09	1145000.0	1.8e+10
2002	591.0	-6.2	4.5	-27.0	10.1	666.0	3.3e+08	1.1e+09	159000.0	1.7e+10
2003	626.0	3.2	3.1	-10.2	31.0	684.0	3.4e+08	1.1e+09	321000.0	1.9e+10
2004	646.0	15.3	4.0	-1.0	25.4	707.0	3.8e+08	1.3e+09	370000.0	2.2e+10
2005	662.0	9.4	3.3	-11.0	22.3	710.0	4.2e+08	1.5e+09	4738.0	2.5e+10
2006	684.0	10.8	3.5	-2.7	23.0	731.0	4.6e+08	1.7e+09	488000.0	2.9e+10
2007	697.0	17.3	3.8	2.1	62.2	749.0	5.4e+08	2.0e+09	571000.0	3.5e+10
2008	700.0	-2.9	4.1	-22.6	12.1	761.0	5.4e+08	2.1e+09	596000.0	3.7e+10
2009	748.0	-18.6	5.6	-40.0	23.3	823.0	3.8e+08	1.5e+09	597677.0	2.6e+10
2010	759.0	11.9	3.4	-18.3	36.2	795.0	4.1e+08	1.6e+09	747048.0	2.8e+10
2011	753.0	19.2	4.3	-4.2	31.8	789.0	5.0e+08	1.9e+09	574049.0	3.2e+10
2012	741.0	-0.3	2.7	-9.5	15.8	766.0	5.1e+08	1.9e+09	609747.0	3.0e+10
2013	788.0	11.8	2.5	1.2	27.6	809.0	5.4e+08	2.0e+09	713687.0	3.2e+10
Total	9399.0	5.8	11.7	-40.0	183.0	10123.0	4.4e+08	1.7e+09	4738.0	3.7e+10

Note: Total Net Return means that the return rate of the endowment investment includes capital appreciation and excludes management fees. Endowment size is measured in terms of the market value of endowment assets.
Source: NACUBO Endowment-level Data

TABLE 2—PORTFOLIO ALLOCATION MEAN (PERCENT)

year	N	DE	FI	EQI	PE	ALT	VC	RE	EN	COM	DD	CASH	OTHER
2000	528.0	50.7	23.1	11.4	0.9	2.7	2.4	2.1	0.3	0.1	0.3	4.2	1.8
2001	585.0	49.9	24.8	9.6	0.9	3.4	1.5	2.4	0.3	0.0	0.3	4.1	2.3
2002	629.0	46.3	26.2	9.8	1.1	5.0	0.9	2.6	0.4	0.0	0.0	3.9	1.5
2003	669.0	47.6	25.6	9.7	1.4	6.2	0.8	2.8	0.4	0.0	0.0	4.0	1.5
2004	695.0	49.1	21.9	11.0	1.4	7.4	0.8	2.7	0.6	0.0	0.0	3.7	1.4
2005	699.0	45.7	21.4	12.8	1.6	8.8	0.9	3.1	1.0	0.0	0.0	3.5	1.3
2006	717.0	42.5	19.9	15.3	2.0	9.6	0.9	3.5	1.5	0.0	0.0	3.4	1.3
2007	722.0	40.5	18.3	17.1	2.3	10.8	1.0	3.5	1.6	0.0	0.0	3.5	1.3
2008	717.0	35.0	19.1	17.0	3.4	12.9	1.1	4.2	2.3	0.0	0.0	3.6	1.4
2009	836.0	33.6	21.7	14.3	3.3	13.1	1.2	2.3	1.6	0.7	0.9	5.6	1.7
2010	775.0	32.5	21.7	14.7	3.8	13.9	1.1	1.9	1.9	1.0	1.1	4.1	2.0
2011	793.0	32.4	18.9	16.5	4.2	14.2	1.3	2.2	2.2	1.3	1.0	3.9	1.9
2012	764.0	31.2	19.7	15.4	4.5	14.7	1.5	2.6	2.3	1.5	1.1	3.6	1.9
2013	810.0	32.4	17.7	17.0	4.2	12.5	1.3	2.5	2.4	1.3	0.8	6.1	1.9
Total	9939.0	39.9	21.2	13.9	2.6	10.1	1.2	2.7	1.4	0.5	0.4	4.1	1.6

Note: Domestic Equities(DE), Fixed Income(FI), International Equities(EQI), Private Equity(PE), Marketable Alternatives(ALT), Venture Capital(VC), Real Estate(RE), Energy and Natural Resources(EN), Commodities(COM), Distressed Debt(DD), Short-Term Securities/Cash(CASH)
Source: NACUBO Endowment-level Data

Table 3—Endowment by Size

year	N	< $25 mn.	$25 mn.-$50 mn.	$50 mn.-$100 mn.	$100 mn.-$500 mn.	$500 mn.-$1 bn.	> $1 bn.
2000	545	65	92	97	203	47	41
2001	588	74	106	108	211	48	41
2002	666	128	130	124	198	46	40
2003	684	138	134	120	203	50	39
2004	707	125	146	120	219	50	47
2005	710	120	124	137	217	54	58
2006	731	129	120	138	221	61	62
2007	749	114	119	146	232	63	75
2008	761	117	126	149	231	62	76
2009	823	200	127	168	215	59	54
2010	795	175	128	162	215	62	53
2011	789	129	127	157	241	66	69
2012	766	125	113	159	236	68	65
2013	809	128	120	162	251	70	78

Note: Number of endowments in each group by endowment size.

Source: NACUBO Endowment-level Data

Table 4—Attrition Problem of Endowment Data

	Endowment Size			Portfolio Allocation		
year	**N**	**# Attr.**	**% Attr.**	**N**	**# Attr.**	**% Attr.**
2000	545	11	2.0	528	16	3.0
2001	588	38	6.5	585	21	3.6
2002	666	3	0.5	629	25	4.0
2003	684	27	3.9	669	28	4.2
2004	707	29	4.1	695	34	4.9
2005	710	15	2.1	699	24	3.4
2006	731	27	3.7	717	37	5.2
2007	749	19	2.5	722	26	3.6
2008	761	44	5.8	717	49	6.8
2009	823	71	8.6	836	73	8.7
2010	795	28	3.5	775	22	2.8
2011	789	26	3.3	793	51	6.4
2012	766	39	5.0	764	10	1.3

Note: Definition of attrition in year t: Observed in year t, but not observed in year $t+1$ and $t+2$.
Source: NACUBO Endowment-level Data

TABLE 5—REGRESSION OF RETURN ON ENDOWMENT SIZE

	W/ FE (1)	**W/O FE** (2)	**W/O FE** (3)	**2003 - 2013** (4)	**2003-2013 EX. >1b** (5)
LENDOW	.822**	.513***		.955**	1.01**
L2.LENDOW			.428***		
S.E.	.361	.043	.039	.448	.492
R^2	.8351	.8367	.9046	.8935	.8913
Obs.	(970,8811)	8811	6670	(948,7162)	(908,6573)

Note: In the row "Obs.", (970, 8811) means that the regression is run with fixed effect, 8811 is the total number of observations, and 970 is the number of groups.
Standard error is heteroscedasticity-consistent, and clustered by university endowment.
L2.LENDOW means the two periods lagged $\ln ENDOW$.
Column (1) panel regression with fixed effect.
Column (2) panel regression without fixed effect.
Column (3) panel regression without fixed effect and the endowment size is lagged for two periods.
Column (4) panel regression with fixed effect using the subperiod from 2003 to 2013.
Column (5) panel regression with fixed effect using the subperiod from 2003 to 2013 and excluding endowments larger than $1 billion.
Source: NACUBO Endowment-level Data

Table 6—Assets and Benchmark Indexes Match

Asset Class	**Abbreviation**	**Benchmark Index**
Domestic Equities	DE	S&P 500
Fixed Income	FI	Barclays US Aggregate
International Equities	EQI	MSCI World ex-USA USD
Private Equity	PE	Commonfund Capital Private Equity
Marketable Alternatives	ALT	HFRI Fund of Funds
Venture Capital	VC	Commonfund Capital Venture Capital
Real Estate	RE	NCREIF Open-End Diversified Core
Energy & Natural Resources	EN	S&P Global Natural Resources
Commodities	COM	DJ-UBS Commodity
Distressed Debt	DD	HFRI Distressed Debt
Short-Term Securities/Cash	Cash	S&P/BGC 0-3m US T-bill TR

Note: Standard & Poor's (S&P), Morgan Stanley Capital International (MSCI), Hedge Fund Research Indices(HFRI), National Council of Real Estate Investment Fiduciaries (NCREIF), Dow Jones (DJ), and BGCantor (BGC).
Source: Following NACUBO 2013 Report

TABLE 7—BENCHMARK INDEXES ANNUAL RETURN

year	DE	FI	EQI	PE	ALT	VC	RE	EN	COM	DD	CASH
2000	13.3	11.6	5.5	.	19.6	.	14.3	.	31.8	10.5	6.1
2001	-26.8	8.4	-29.4	.	-0.8	.	5.6	.	-19.5	7.0	4.1
2002	-17.1	10.3	-14.2	.	2.1	.	5.5	.	25.9	2.5	1.7
2003	22.3	4.1	29.7	.	9.0	.	9.3	41.6	23.9	27.6	1.1
2004	13.1	4.3	22.1	.	5.7	.	13.1	24.4	9.1	17.3	1.3
2005	10.4	2.4	25.1	.	10.3	.	21.4	26.8	21.4	15.3	3.0
2006	10.6	4.3	20.5	.	7.0	.	16.3	29.8	2.1	11.3	4.8
2007	18.4	7.0	26.3	.	14.0	.	16.0	41.7	16.2	11.6	4.7
2008	-23.3	5.2	-29.0	.	-10.9	.	-10.0	-38.3	-35.6	-11.4	1.7
2009	-8.9	5.9	0.6	.	-1.2	.	-29.8	36.1	18.9	1.7	0.1
2010	13.6	6.5	7.1	.	3.5	.	16.4	11.0	16.8	13.1	0.1
2011	-2.2	7.8	-11.2	.	-1.8	.	16.0	-14.9	-13.3	0.4	0.0
2012	34.4	4.2	18.2	.	2.9	.	10.9	7.2	-1.1	8.5	0.1
2013	20.0	-2.0	21.4	.	6.5	.	13.9	1.5	-9.5	13.6	0.0
Mean	5.5	5.7	6.6	.	4.7	.	8.5	15.2	6.2	9.2	2.0

Note: Domestic Equities(DE), Fixed Income(FI), International Equities(EQI), Private Equity(PE), Marketable Alternatives(ALT), Venture Capital(VC), Real Estate(RE), Energy and Natural Resources(EN), Commodities(COM), Distressed Debt(DD), Short-Term Securities/Cash(CASH)
Source: Publicly Available Benchmark Indexes

Table 8—Standard Deviation of Benchmark Indexes Quarterly Return

year	DE	FI	EQI	PE	ALT	VC	RE	EN	COM	DD	CASH
2000	10.4	1.7	9.7	.	5.9	.	0.84	.	7.6	5.1	0.17
2001	9.9	1.8	9.7	.	5.2	.	0.90	.	7.2	4.4	0.22
2002	11.4	2.0	10.0	.	4.0	.	1.4	.	7.6	3.5	0.43
2003	10.9	1.8	11.2	.	3.1	.	1.0	10.5	6.0	3.7	0.46
2004	9.8	2.0	11.7	.	2.6	.	0.85	10.5	6.5	3.8	0.40
2005	7.4	2.0	9.4	.	2.5	.	1.2	8.4	7.8	3.3	0.31
2006	5.4	1.9	7.8	.	2.4	.	1.3	9.0	8.5	2.8	0.35
2007	4.5	1.8	6.1	.	2.5	.	0.98	8.1	7.0	2.3	0.38
2008	5.1	1.8	6.1	.	2.8	.	1.7	11.7	9.3	3.1	0.36
2009	9.4	2.1	12.8	.	5.9	.	7.0	16.4	17.0	7.1	0.48
2010	11.6	1.8	15.2	.	5.2	.	6.4	14.5	13.6	8.0	0.45
2011	10.8	1.9	13.5	.	4.1	.	5.9	14.4	12.3	5.9	0.35
2012	12.3	1.6	13.6	.	3.8	.	4.4	13.8	10.1	5.7	0.26
2013	9.9	1.6	10.7	.	3.2	.	3.1	10.9	8.6	4.9	0.19
Mean	9.2	1.8	10.5	.	3.8	.	2.3	11.7	9.2	4.5	0.34

Note: Domestic Equities(DE), Fixed Income(FI), International Equities(EQI), Private Equity(PE), Marketable Alternatives(ALT), Venture Capital(VC), Real Estate(RE), Energy and Natural Resources(EN), Commodities(COM), Distressed Debt(DD), Short-Term Securities/Cash(CASH)
Source: Publicly Available Benchmark Indexes

Table 9—Similarity between Actual Return and Synthetic Return

Var.	**Obs.(Reg.)**	**Mean**	**SD**	**Min**	**Max**	**Coef.** β_1**(se)**
Full Sample	**2003-2013**					
RTN	7804(7162)	6.93	11.32	-40	62.2	.955(.448)**
$RTN_{syn}(PE = VC = 0)$	8197(7162)	7.08	9.33	-30.66	30.45	.695(.260)***
$RTN_{syn}(PE = VC = COM)$	8197(7162)	7.13	9.81	-30.66	30.45	.722(.267)***
Exclude Endow $>$ **1b**	**2003-2013**					
RTN	6772(6573)	6.65	11.44	-40	62.2	1.01(.492)**
$RTN_{syn}(PE = VC = 0)$	7400(6573)	7.13	9.33	-30.66	30.45	.839(.290)***
$RTN_{syn}(PE = VC = COM)$	7400(6573)	7.18	9.71	-30.66	30.45	.928(.297)***

Note: The column "Obs. (Reg.)" means that the total observation of RTN is 7804, and 7162 observation enter into the regression using equation (1).
Standard error is heteroscedasticity-consistent, and clustered by university endowment.
Source: NACUBO Endowment-level Data, Publicly Available Benchmark Indexes

Table 10—Regression of Sharpe Ratio on Size

	$\lambda = 0.99$	$\lambda = 0.84$	$\lambda = 0.7$
Full Sample	**2003-2013**		
LENDOW	-0.97	-1.03	-1.41
S.E.	.99	.98	1.09
Obs.	(948, 7162)	(948, 7162)	(948, 7162)
Exclude Endow > 1b	**2003-2013**		
LENDOW	-1.13	-1.18	-1.61
S.E.	1.12	1.11	1.23
Obs.	(908, 6573)	(908, 6573)	(908, 6573)

Note: λ is the decay parameter.
Standard error is heteroscedasticity-consistent, and clustered by university endowment.
Source: NACUBO Endowment-level Data

Table 11—Regression of Return and Sharpe Ratio on Size and Information

Dep.	Indep.	Full Sample	Exclude Endow > 1b
RTN	**LENDOW**	2.29(.608)***	2.53(.645)***
	L.Diff	-.040(.0169)**	- .045(.0176)**
SR	**LENDOW**	-1.63(1.590)	-1.75(1.706)
	L.Diff	-.054(.046)	-.063(0.056)
	Obs.	(867, 5888)	(819, 5342)

Note: The decay parameter is $\lambda = 0.84$ in this table.
Standard Error is heteroscedasticity-consistent, and clustered by university endowment.
Source: NACUBO Endowment-level Data

Table 12—Regression of Excess Return on Size

Dep.	**Indep.**	**Full Sample**	**Exclude Endow > 1b**
Diff	**LENDOW**	0.23(.38)	0.08(.38)
	Obs.	(948, 7162)	(908,6573)

Note: The decay parameter is $\lambda = 0.84$ in this table.
Standard error is heteroscedasticity-consistent, and clustered by university endowment.
Source: NACUBO Endowment-level Data

Table 13—Regression of Return on the Risk Channel and Information Channel

Dep.	**Indep.**	**Full Sample**	**Exclude Endow > 1b**
RTN	σ	.60(.101)***	.59(.106)***
	L.Diff	-.065(.0165)***	-.066(.0182)***
RTN	σ^E	.62(.100)***	.61(.106)***
	L.Diff	-.066(.0165)***	-.067(.0182)***
	Obs.	(867, 5888)	(819, 5342)

Note: The decay parameter is $\lambda = 0.84$ in this table.
Standard Error is heteroscedasticity-consistent, and clustered by university endowment.
Source: NACUBO Endowment-level Data