

FRictional Costs of Fossil Fuel Divestment

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Abstract. Advocacy for fossil fuel divestment has been growing on college campuses nationwide in recent years. In contrast with prior literature, which focuses on the impact of divestment on returns, I investigate the “frictional” costs that college and university endowments incur in implementing fossil fuel divestment, including transaction costs and ongoing monitoring and active management costs. I find that these costs are likely to be substantial, for the following reasons. First, endowments are long-term investors that tend to hold illiquid assets that are costly to sell. Second, endowments frequently invest in mutual funds or commingled funds, which requires them to sell more than just fossil-fuel-related assets in order to divest. Third, since there is no well-defined and agreed-upon list of assets that are fossil-fuel-related, investment managers must undertake a degree of active management in order to maintain compliance with divestment goals. Overall, I estimate a total cost to endowments over 20 years due to the frictional costs of divestment that range between approximately 2 and 12 percent of the endowment’s value, which, for a typical large university endowment, would translate to a decline in value of between \$1.4 billion and \$7.4 billion.

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I. INTRODUCTION

A. Background

Fossil fuel divestment refers to the sale of assets, such as stocks and bonds, associated with companies whose activities related to fossil-fuel extraction and/or distribution are claimed to contribute to climate change. Advocacy in support of fossil fuel divestment came to public prominence with environmental activist Bill McKibben's 2012 article in *Rolling Stone*,¹ and has grown modestly since then. McKibben's campaign recently announced that more than 500 institutions, representing \$3.4 trillion in total assets under management, have committed to some form of divestment.² The amount of assets actually divested to date appears to be relatively small, though, in part because many institutions that have announced adherence to divestment goals apparently owned few fossil fuel-related assets to begin with.³ Advocates argue that, by divesting, investors can "take the fossil fuel industry to task for its culpability in the climate crisis" and "help break the hold that the fossil fuel industry has on our economy and our governments."⁴

Colleges and universities, religious institutions, and public pension funds are frequently the focus of divestment activists' efforts, and appear to constitute a sizeable share of the institutions that have divested to date. However, a number of prominent institutions have considered, but rejected, divestment as well. In particular a number of prominent universities, including the University of Michigan,⁵ Columbia University,⁶ Cornell University,⁷ Vassar

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1. Bill McKibben (2012) "Global Warming's Terrifying New Math," *Rolling Stone*, July 19.
 2. Melanie Mattauch (2015) "In the space of just 10 weeks ...", gofossilfree.org blog post, December 2, <http://gofossilfree.org/in-the-space-of-just-10-weeks/> [accessed March 8, 2016].
 3. Michael McDonald (2015) "College Divestment Pledges Are Mostly Empty Gestures," *BloombergBusiness*, June 23, <http://www.bloomberg.com/news/articles/2015-06-23/for-all-their-talk-colleges-divest-little-after-climate-protest> [accessed March 21, 2016] ("Oxford University, calling itself 'a world leader in the battle against climate change,' said in May it would avoid direct investments in coal and oil-sands companies in its \$2.6 billion endowment. The British university, in fact, held none, it said. Syracuse University similarly announced it would divest from fossil fuels only to say it had no direct holdings."). See also Michael McDonald (2015) "Georgetown Joins Stanford in Divesting Its Endowment from Coal," *BloombergBusiness*, June 4, <http://www.bloomberg.com/news/articles/2015-06-04/georgetown-joins-stanford-in-divesting-its-endowment-from-coal> [accessed March 21, 2016] ("Georgetown University will no longer make direct investments in coal companies, joining Stanford and other schools that have targeted the industry because of its contribution to climate change...Georgetown is still evaluating its portfolio, according to spokeswoman Rachel Pugh. She said 'an insubstantial amount' of the endowment is invested in companies whose principal business is coal mining.").
 4. <http://gofossilfree.org/what-is-fossil-fuel-divestment/> [accessed March 8, 2016].
 5. University of Michigan Office of the President (2015), "Addressing Climate Change as a Powerful Community," <http://president.umich.edu/news-communications/on-the-agenda/addressing-climate-change-as-a-powerful-community/> [accessed March 8, 2016].
 6. Columbia University, "Response of the ACSRI to the CDCJ Proposal of October 2015," November 17, 2015, <http://finance.columbia.edu/files/gateway/content/ACSRI%20Response%20to%20CDCJ%20Petition%20-%20Final%2011.19.15.pdf> [accessed March 8, 2016].
 7. Susan Kelley (2016) "Trustees approve new standard and process for divestment consideration," *Cornell Chronicle*, February 2, <http://news.cornell.edu/stories/2016/02/trustees-approve-new-standard-consider-divestment> [accessed March 8, 2016].

College,⁸ and the University of British Columbia,⁹ have recently rejected broad-based fossil fuel divestment for their endowment funds. Other major universities, including Harvard University,¹⁰ Brown University,¹¹ and Yale University¹² had previously rejected calls for divestment, while Stanford University¹³ and Georgetown University¹⁴ have indicated a desire to divest from coal-related assets, but explicitly not those in the oil and gas sector. In some cases universities that chose to divest assets on the basis of other concerns, such as human rights in Sudan, have nevertheless elected to not divest in the case of fossil fuels.¹⁵

A small but growing body of literature on fossil fuel divestment, which I summarize in Appendix A, has focused primarily on the question of whether a divested portfolio could potentially produce lower risk-adjusted returns to investors over time. By contrast, in this paper, I focus entirely on the “frictional” costs associated with fossil fuel divestment, including transaction costs associated with trading securities and ongoing portfolio monitoring costs. While some divestment advocates have argued that divested portfolios may suffer only minimal or no losses in future returns, the existence and impact of frictional costs of the type I describe in this paper cannot be meaningfully disputed. That is, costs of this type will be incurred in virtually every case where an investor divests a material amount of fossil fuel assets, irrespective of the market performance of the underlying assets in question.

My goal in this paper is not to provide commentary or analysis related to the potential environmental benefits of a broad societal shift from fossil fuels, as this important issue has been extensively discussed elsewhere. Rather, my goal is to shed light on the existence of lesser-known frictional costs of divestment – many of which are often excluded from broader

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8. President Catherine Hill (2016) “Shareholder role crucial in climate reform,” *The Miscellany News* [Poughkeepsie, NY], February 17, <http://miscellanynews.org/2016/02/17/opinions/shareholder-role-crucial-in-climate-reform/> [accessed March 8, 2016].
 9. “UBC board of governors votes against divestment from fossil fuel industry,” *The Vancouver Sun*, February 15, 2016, http://www.vancouversun.com/technology/board+governors+votes+against+divestment+from+fossil+fuel+industry/11720467/story.html?_lsa=75e2-7b45 [accessed March 8, 2016].
 10. Harvard University Office of the President (2013) “Fossil Fuel Divestment Statement,” October 3, <http://www.harvard.edu/president/news/2013/fossil-fuel-divestment-statement> [accessed March 8, 2016].
 11. Brown University Office of the President (2013) “10-27-2013: Coal Divestment Update,” <https://www.brown.edu/about/administration/president/2013-10-27-coal-divestment-update> [accessed March 8, 2016].
 12. Yale University (2014) “Statement of the Yale Corporation Committee on Investor Responsibility,” [http://acir.yale.edu/pdf%20and%20hyperlinks/CCIR%20Statement%20\(2014\).pdf](http://acir.yale.edu/pdf%20and%20hyperlinks/CCIR%20Statement%20(2014).pdf) [accessed March 8, 2016].
 13. Michael Wines (2014) “Stanford to Purge \$18 Billion Endowment of Coal Stock,” *New York Times*, May 6, <http://www.nytimes.com/2014/05/07/education/stanford-to-purge-18-billion-endowment-of-coal-stock.html> [accessed March 21, 2016].
 14. Michael McDonald (2015) “Georgetown Joins Stanford in Divesting Its Endowment from Coal,” *BloombergBusiness*, June 4, <http://www.bloomberg.com/news/articles/2015-06-04/georgetown-joins-stanford-in-divesting-its-endowment-from-coal> [accessed March 21, 2016].
 15. Susan Kelley (2016) “Trustees approve new standard and process for divestment consideration,” *Cornell Chronicle*, February 2, <http://news.cornell.edu/stories/2016/02/trustees-approve-new-standard-consider-divestment> [accessed March 8, 2016]; Columbia University, “Response of the ACSRI to the CDCJ Proposal of October 2015,” November 17, 2015, <http://finance.columbia.edu/files/gateway/content/ACSRI%20Response%20to%20CDCJ%20Petition%20-%20Final%2011.19.15.pdf> [accessed March 8, 2016].

discussions about the merits of divestment policy – and to provide reasonable estimates of their magnitude, so that divestment decisions can be evaluated by trustees, administrators, students and interested stakeholders with the most complete information possible.

B. Summary of Conclusions

A brief summary of the key points made in the remainder of this report is as follows:

- Many investors, including university endowments, hold assets in structures such as mutual funds, commingled funds, and private equity funds that themselves house a variety of investments. Divestment by a fund investor of the fossil fuel assets owned by a fund generally requires sale of the entirety of the fund. For this reason, the magnitude of assets that would need to be sold and replaced to achieve fossil fuel divestment is generally larger than the fossil fuel assets themselves.
- Because university endowments are perpetual institutions that make long-term investments, they tend to have disproportionately large holdings in relatively illiquid assets.
- As a consequence of these facts, transaction costs associated with divesting and replacing existing fossil fuel assets in university endowments are likely to be substantial. Focusing on a sample of 30 universities, including large, medium-sized, and small endowments, conservative estimates of these transaction costs range between 60 basis points and 269 basis points for large endowments, between 25 basis points and 180 basis points for medium endowments, and between nine basis points and 124 basis points for small endowments.
- Fossil fuel divestment advocates are not unanimous with respect to identifying which assets should be divested, and there is no objective scorecard of which I am aware to determine this question. Further, as company policies and technologies evolve, the individual investments that comprise an appropriately divested portfolio will likely change. As a consequence, investment managers would need to undertake ongoing research and management costs to maintain compliance with divestment goals. This introduces a costly element of active management into endowment portfolios.
- While some universities may take on this element of active management internally, others will elect to outsource this function to specialized environmental fund managers with appropriate expertise in these issues. A conservative estimate, derived from the difference between expenses charged by mutual funds with an explicit environmental focus and those without such a focus, indicates ongoing annual frictional costs of between approximately eight basis points and 52 basis points for large endowments, and similar or larger annual costs for medium and smaller endowments.
- Combining estimates of transaction costs and ongoing compliance costs, I estimate that endowments would lose between approximately two and 12 percent of value due

to these frictional costs of divestment over a 20-year period. For a typical large endowment growing at a historically reasonable rate, this would translate into a loss in value of between \$1.4 billion and \$7.4 billion by the end of the 20-year period. The equivalent range for medium endowments is between \$52 million and \$298 million, and the equivalent range for small endowments is between \$17 million and \$89 million. These frictional costs **are in addition to** any reduction in investment returns that divestment may impose due to foregone diversification benefits, as discussed in prior literature.

- While the actual frictional costs of divestment will vary depending on the precise holdings of the investor and the particular divestment strategy undertaken, it cannot be meaningfully disputed that frictional costs of the nature discussed in this paper will occur. These frictional costs of divestment are large enough to impose substantial costs on institutions that decide to divest.

C. The finance literature recognizes the importance of frictional costs, and some universities have rejected divestment at least in part on this basis.

The finance literature recognizes the importance of frictional costs when evaluating total returns as well as the choice of investment strategies. Some strategies that appear attractive may be suboptimal once frictional costs are taken into account. For instance, Damadoran (2012) states, “Some investment schemes are more expensive than others because of transaction costs – execution fees, bid-ask spreads, and price impact. A complete test will take these into account before it passes judgment on the strategy.”¹⁶ Pederson (2015) states, “Whereas a high-turnover trading rule (i.e., a rule that implies frequent and/or large trades) may be the best on paper, without taking transaction costs into account, it may be a poor trading strategy in practice. Said differently, even if returns are large *gross* of transaction costs, *net* returns may be poor.”¹⁷ Harris (2003) states, “On average, active managers cannot outperform the market. Transaction costs and high management fees ensure that they underperform the market on average.”¹⁸ Indeed, even if (as some argue) the reduction in average rates of return from divestment is small, the frictional costs of divestment may nevertheless make a divestment strategy undesirable.

A number of universities have already elected not to divest at least in part because they have concluded that these frictional costs would be high. For instance:

- *Williams College*: “The initial cost of divestment would be in liquidating the portfolio which, even done in an orderly fashion over the course of a year, would cost \$75 million or more ... [T]he expected cost to Williams of divestment has nothing to do with projecting whether the particular class of targeted companies are themselves

16. Aswath Damodaran (2012) *Investment Philosophies: Successful Strategies and the Investors Who Made Them Work*, Second Edition, John Wiley & Sons, Inc., at p. 122.

17. Lasse Heje Pedersen (2015) *Efficiently Inefficient: How Smart Money Invests & Market Prices are Determined*, Princeton University Press, at p. 64.

18. Larry Harris (2003) *Trading and Exchanges: Market Microstructure for Practitioners*, Oxford University Press, at p. 492.

good or bad investments, and is entirely a result of the expected cost of fundamentally changing the college's strategy for managing the endowment."¹⁹

- *American University*: “[D]ivesting from these companies would require that AU investments be withdrawn from index funds and commingled funds in favor of more actively managed funds,” and cited the results of an internal study indicating that “this withdrawal would cause manager fees to double.”²⁰
- *Middlebury College*: “At this time, too many of these questions either raise serious concerns or remain unanswered for the board to support divestment. Given its fiduciary responsibilities, the board cannot look past the lack of proven alternative investment models, the difficulty and material cost of withdrawing from a complex portfolio of investments, and the uncertainties and risks that divestment would create.”²¹
- *Bates College*: “To guarantee divestment from these 200 public companies, our investment advisers estimate that between a third and a half of the entire endowment would need to be liquidated and replaced with separately managed accounts. Were we to guarantee a fossil fuel free endowment more broadly than the 200 companies, greater than half of the endowment would need to be liquidated. In either scenario, the transition would result in significant transaction costs, a long-term decrease in the endowment's performance, an increase in the endowment's risk profile, and thus a loss in annual operating income for the college. Such a reduction in resources would affect critical college priorities, including financial aid, faculty and staff salaries, and support for academic programs. In short, divestment would potentially threaten core aspects of the college's mission.”²²
- *Swarthmore College*: “If Swarthmore decided to divest, we would have to find replacements for all the commingled funds because an institution has no power to impose a constraint on a commingled fund. Swarthmore's commingled funds totaled \$660 million at the end of the last fiscal year. Divestment would incur a very large cost. With divestment, an option would be to hire a firm (such as Aperio Group) to design customized index funds for the endowment. This group could put together portfolios of stocks designed to match desired indexes but without using the divested companies. The firm customizes this approach for an endowment's specific

19. Williams College Office of the President (n.d.) “Statement by the Board of Trustees and President Adam F. Falk on the College's Role in Addressing Climate Change,” <http://president.williams.edu/trustees/statement-by-the-board-of-trustees-and-president-adam-f-falk-on-the-colleges-role-in-addressing-climate-change/> [accessed March 21, 2016].

20. Jeffrey A. Sine (2014) “Memorandum: Fall 2014 Board of Trustees Meeting – Sustainability & Fossil Free Discussion and Decision,” November 21, <http://www.american.edu/trustees/Announcement-November-21-2014.cfm> [accessed March 16, 2016].

21. Middlebury College (2013) “Middlebury College Statement on Divestment,” <http://www.middlebury.edu/newsroom/archive/524638/node/459563> [accessed March 21, 2016].

22. Bates College Office of the President (2014) “President Clayton Spencer's Statement on Climate Change and Divestment,” January 21, <http://www.bates.edu/president/2014/01/21/statement-on-climate-change-and-divestment/> [accessed March 21, 2016].

constraints. If Swarthmore were to follow this approach, it would forego the 1.7% to 1.8% added return per year. This would amount to lost earnings each and every year ... [T]he loss the first year would be \$11.2 million, but by five years it would be a cumulative \$73.1 million, and by ten years it would be \$203.8 million. It would be even greater if all the affected portfolios of the endowment were invested in this way.²³

D. The Asserted Benefits of Fossil Fuel Divestment Are Speculative.

In this paper, I focus on certain *costs* associated with fossil fuel divestment. Before introducing my analysis, it is worth briefly considering the potential *benefits* claimed for divestment. It is beyond the scope of this paper to address the potential costs and benefits to society as a whole of a broad shift from the usage of fossil fuels to reliance on alternative sources of energy, as this crucial issue has been discussed extensively elsewhere. Divestment activists appear to rely on the reasoning that divestment will spur such a shift away from reliance on fossil fuels. However, there is little economic support for the claim that divestment of fossil fuel assets will have a material impact on the targeted companies in a way that would produce such a shift. Therefore, the claimed benefits of divestment appear to be, at best, speculative.

Claims of benefits to investors from divestment fall into roughly three categories. First, some activists claim that companies that allegedly contribute to climate change can be “punished” by reducing their stock price, thereby reducing their access to sources of capital or increasing their costs of raising capital. However, as some divestment activists appear to appreciate, economic theory indicates that divestment is unlikely to accomplish this goal.²⁴ Further, to the extent that the goal is achieved, the cost may be borne primarily by those who divest, for the following reason. Any securities sold by divesting endowments will be purchased by other investors. In general, sales of large asset blocks occur at a discount to prevailing market prices.²⁵ Some or all of the price discount is typically temporary, being reversed after the sale. Such *temporary* price impacts from divestment sales would provide transfers of wealth from divesting endowments to market liquidity providers who take the opposite side of the divestment sales. These liquidity providers are often large banks, hedge funds, or specialized firms that engage in frequent trading. There is little objective basis to conclude that divestment sales would have any *permanent* effect on the prices of the divested assets, since divestment *per se* contains

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23. Andrew Karas (2013) “Swarthmore Pegs Cost of Divestment at \$200 Million Over 10 Years,” *Swarthmore College Daily Gazette*, May 9, <http://daily.swarthmore.edu/2013/05/09/college-pegs-cost-of-divestment-at-200-million-over-10-years/> [accessed March 21, 2016].
 24. See, e.g., Aram Ghoogasian (2015) “For College Students, Divestment Is a Means of Dissent,” *New York Times*, August 11 (“Though divestment may not always exert significant financial pressure, it can, at the very least, exert a good deal of social pressure on corporations and contribute to large-scale change.”). See also the website of the Fossil Free organization (“While sale of stock might not have an immediate impact on a fossil fuel company, especially one as gigantic as Exxon, what it does do is start to sow uncertainty about the viability of the fossil fuel industry’s business model.”) <http://gofossilfree.org/frequently-asked-questions/> [accessed March 21, 2016].
 25. The existence of price discounts for large block sales has been extensively documented. For the original evidence, see Alan Krauss and Hans Stoll (1972) “Price Impacts of Block Trading on the New York Stock Exchange,” *Journal of Finance*, Vol. 27, p. 569-588.

no new information about the underlying fundamentals (*e.g.*, firm profitability) that affect asset values. Further, even if divestment sales did have a permanent effect on asset prices, divestment would have accumulative effects that would impose costs on divesting institutions. The first institution to divest would suffer little loss from such permanent price impacts, but subsequent divesting parties would sell at lower and lower prices.

A second argument some activists provide for divestment alleges that fossil fuel stocks are currently overpriced and are likely to underperform as investments in the future due to increased regulation or the likelihood that consumers will switch to alternative fuels. Such claims are particularly prevalent at times when these stocks have recently performed poorly – even though price declines over the past several months actually appear to be associated with increased production of fossil fuels.²⁶ In contrast, at times when these stocks have recently performed well, some activists have asserted that fossil fuel stocks are in a “bubble” that is bound to pop.²⁷ Stock prices for the companies at issue may rise or fall in the future, and individual forecasts may or may not turn out to be correct. However, at any point in time, stock prices reflect the interaction of buy orders and sell orders submitted by the full set of market participants, including both those optimistic and those pessimistic about the companies’ future prospects. There is no objective basis to conclude that market participants as a whole have systematically over- or under-estimated the value of fossil fuel companies. Neither is there a basis to assume that divestment campaigners have access to information related to the future performance of these companies that is otherwise unavailable to the market at large.

Finally, some advocates also claim that divestment can “stigmatize” companies and raise awareness of their allegedly harmful activities, perhaps leading to the imposition of a more restrictive regulatory regime governing individual company activities, or on climate change issues writ large. Exactly how this will occur is unclear, and divestment could generate political opposition rather than lead to desired regulatory action. Moreover, studies of past divestment efforts, such as those directed at companies invested in Apartheid-era South Africa, consistently find that these divestment efforts had little or no effect.²⁸ Because the alleged benefits of divestment in terms of the ability to spur shifts away from the reliance on fossil fuels are speculative, while the costs associated with divestment are tangible and significant in magnitude, many endowment managers may conclude that the costs of divestment exceed any likely gain.

It may be the case that divestment is primarily a “bumper sticker” political statement, as opposed to a realistic attempt to affect meaningful change in patterns of energy production. In

26. Recent declines in the prices of oil and gas would be expected to lead to declines in securities prices for companies that own or exploit oil and gas resources. However, these recent declines do not appear to reflect the popping of a “bubble” or investors’ sudden appreciation of the future regulatory risks these companies face. Extant analyses tend to focus primarily on supply explanations, including the recent dramatic increase in U.S. production and the potential for increased production from Iran after the loosening of sanctions. *See, e.g.*, Clifford Kraus (2016) “Oil Prices: What’s Behind the Drop? Simple Economics,” *New York Times*, March 8, <http://www.nytimes.com/interactive/2016/business/energy-environment/oil-prices.html> [accessed March 21, 2016].

27. Joshua Humphreys (2013) “Institutional Pathways to Fossil-Free Investing,” Tellus Institute, at p. 13.

28. Fischel (2015), *op. cit.*, at ¶¶ 44-49, summarizes the literature. *See also* Ivo Welch (2014) “Why Divestment Fails,” *New York Times*, May 9, <http://www.nytimes.com/2014/05/10/opinion/why-divestment-fails.html> [accessed March 21, 2016].

support of this possibility, note that divestment advocates typically propose the sale of institutions' *current* holdings of fossil fuel stocks. They generally do not, as far as I have seen, advocate going further and short-selling these stocks.²⁹ That is, they do not advocate borrowing the holdings of other institutions that have not yet adopted divestment goals, and selling those holdings for them. To the extent that one believes that fossil fuel stocks are substantially overpriced, or that selling can generate capital market pressure or effective social stigma, it is unclear that it is optimal to stop once one has sold all one's holdings. That is, one could keep selling and gain additional perceived benefits. By doing so, there would be no need to wait for other institutions to adopt divestment goals, as those currently committed to those goals could essentially sell their holdings for them. The absence of proposals that institutions short sell the securities issued by fossil fuel companies is consistent with the reasoning that the main purpose of divestment is to make a political statement, albeit at a potentially high cost (as discussed here), rather than to effect meaningful changes.

II. Transaction Costs of Divestment

In this section, I focus on estimating the transaction costs of divestment that will be paid if fossil fuel assets are sold and other assets are purchased to replace them. I first discuss the endowment holdings of a sample of 30 colleges and universities. I then estimate how much of each class of assets held by these 30 institutions would need to be divested, and I review estimates from industry and academic literature as to the transaction costs typically associated with trading these classes of assets. Combining this information, I estimate the total transaction costs that would be associated with fossil fuel divestment.

Selling and buying assets, as fossil fuel divestment requires, involves transaction costs, which depend on the type of asset, the size of requisite trades, and the market institutions that facilitate trading. Buying and selling stocks, for instance, typically requires payment of commissions and fees to brokers and exchanges.³⁰ In addition, there are implicit transaction costs associated with buying and selling stocks and other assets, including the bid-ask spread and the price impact of trades. The bid-ask spread refers to the difference between the lowest ask (or offer) price and the highest bid price in the market for a given security. The bid-ask spread is an implicit payment to the market-maker or other liquidity supplier for providing liquidity and measures the implicit cost to an investor of executing a small trade.³¹ "Conventionally, half of the spread is taken to be the execution cost of either a purchase or a sale (a one-way trip)."³²

The term "price impact" refers to "the additional cost (over and above the spread) that a trader may incur to have a larger order executed quickly. It is the higher price that must be paid

29. In practice, some institutions might face restrictions on their abilities to enter short positions.

30. In this paper, I focus primarily on college and universities, which are, in most cases, nonprofit entities. For-profit investors may also incur tax liability on the sale of assets that have appreciated, constituting another category of transaction costs.

31. The bid and ask quotes are each good for a specified quantity. Larger quantities will typically be executed at prices inferior to the bid and ask quotes.

32. Robert A. Schwartz and Reto Francioni (2004) *Equity Markets in Action*, John Wiley & Sons, Inc., at p. 66.

for a large purchase or the reduction in price that must be accepted for a large sale.”³³ Transaction costs for other types of investments, which are traded in markets that are typically less liquid than stocks markets, will generally be larger, as I discuss below.

A. Endowment Holdings of a Sample of 30 Colleges and Universities

For the purpose of illustrating the potential transaction costs of divestment, I selected a sample of 30 colleges and universities with varying endowment sizes, as reported in Exhibits A-1, A-2, and A-3. In particular, using the *Chronicle of Higher Education*'s most recent (fiscal year 2015) list of U.S. college and university endowments, I selected 10 “large” endowments, 10 “medium” endowments, and 10 (relatively) “small” endowments.³⁴ These are reported in Exhibits A-1, A-2, and A-3, and repeated below.

Thirty U.S. Endowments Fiscal Year 2015 Endowment Size in \$MM

Large Endowments		Medium Endowments		Small Endowments	
Harvard	\$36,449	Univ. of Miami	\$887	UC-Santa Barbara	\$266
Yale	\$25,572	Hamilton Coll.	\$856	Bates Coll.	\$262
Univ. of Texas	\$24,083	Virginia Tech	\$818	The Citadel	\$254
Princeton	\$22,723	Univ. of Houston	\$795	Univ. of Idaho	\$240
Stanford	\$22,223	Lafayette Coll.	\$778	Univ. of N. Dakota	\$231
MIT	\$13,475	Rochester Inst. Tech.	\$759	Kalamazoo Coll.	\$220
Texas A&M	\$10,477	Colorado Coll.	\$720	San Diego State	\$209
Northwestern	\$10,193	Drexel	\$668	Florida Atlantic	\$205
Univ. of Pennsylvania	\$10,134	Fordham	\$666	Univ. of Akron	\$198
Univ. of Michigan	\$9,952	Auburn	\$642	Cal. Poly - SLO	\$195

Source: *The Chronicle of Higher Education*.

The large endowment sample contains the 10 largest in the country, ranging between \$36.4 billion (Harvard University) and \$10.0 billion (University of Michigan, Ann Arbor). The medium endowments are all ranked between 100th and 150th largest in the country, ranging between \$887 million (University of Miami) and \$642 million (Auburn University).³⁵ The small endowments are all ranked between 250th and 302nd in the country, ranging between \$266

33. *Ibid.*

34. “Sortable Table: College and University Endowments, 2014-15,” *Chronicle of Higher Education*, January 27, 2016, <http://chronicle.com/article/Sortable-Table-College-and/235074> [accessed March 24, 2016].

35. I generally attempted to collect holdings data on every fifth university in this range, *i.e.*, the 100th, 105th, 110th, ..., 145th from the *Chronicle*'s ranking. In cases where public information on holdings was not available for a specified university, I selected the next largest university endowment. For instance, if the university ranked 120th by the *Chronicle* did not provide public data on its holdings, I replaced it with the university ranked 121st.

million (University of California, Santa Barbara) and \$195 million (California Polytechnic State University, San Luis Obispo).³⁶

Endowments generally do not provide detailed holdings information publicly, but they often provide a breakdown of their investments by sector, *i.e.*, the share of the endowment held in equities, fixed income, and so on. Exhibits A-1, A-2, and A-3 summarize the endowment allocations by sector for the 30 universities in the sample.³⁷ The exhibits also report the weighted average allocation by asset sector (weighted by the size of the endowments) for each size group of 10 universities.

As demonstrated in Exhibits A-1, A-2, and A-3, across all three size categories, a relatively large share of sample university endowments is invested in non-traditional assets, which tend to be illiquid. The “Alternative Equities” category includes limited partnerships in private equity, venture capital, or hedge funds. The “Natural Resources” and “Other Real Assets” categories include ownership of natural resources, commodities, and real estate assets. For large endowments, these non-traditional categories constitute 61 percent of the total weighted average portfolio. For small endowments, these categories constitute a smaller, but still substantial, 25 percent of the total weighted average portfolio.³⁸

The fact that university endowments invest in non-traditional and illiquid assets is unsurprising when one recognizes that university endowments operate essentially in perpetuity. Even compared with other institutional investors, universities tend to be very long-lived. Indeed, some U.S. universities were founded more than two (or even three) centuries ago. It is sensible for such long-run investors to take positions in assets that involve relatively long holding periods and relatively illiquid markets, since they recognize it is unlikely they will want to engage in short-run trading.

As one academic study stated, “The central idea behind the endowment model is that liquidity should not be a primary concern for endowments. Unlike individuals, institutional investors like universities have very long time horizons, and so liquidity, which comes at a high

36. Again, I attempted to collect holdings data on every fifth university in this range, *i.e.*, the 250th, 255th, ..., 295th from the *Chronicle’s* ranking, but used different universities when public holdings data were not available.

37. In a few cases, imputations were made in order to report allocations on a consistent basis across universities. For instance, a few universities report only a total allocation to “Fixed Income and Cash.” For these universities, I used the proportional allocation between the Fixed Income and Cash categories reported by other universities in the same size group to impute an allocation of “Fixed Income and Cash” into the two individual components. Details on how investments were categorized and in which cases imputations were made can be found in Appendix B.

38. These findings are consistent with those of the most recent NACUBO Commonfund Study of Endowments, which finds that endowments greater than \$1 billion held, on average, 57 percent of their portfolios in “Alternative Strategies,” which combines what I refer to as “Alternative Equities” with “Natural Resources” and “Other Real Assets.” (NACUBO does not provide a break-out among these categories.) The NACUBO study also finds that investment in these Alternative Strategies declines, but remains significant, for smaller endowment funds. NACUBO (2015) “Asset Allocations for U.S. College and University Endowments and Affiliated Foundations, Fiscal Year 2015,” http://www.nacubo.org/Documents/EndowmentFiles/2015_NCSE_Public_Tables_Asset_Allocations.pdf [accessed March 24, 2016].

price in the form of lower returns, is not essential.”³⁹ Yale University, which is widely considered one of the leaders in endowment management, has stated, “The Endowment’s long time horizon is well suited to exploit illiquid, less efficient markets such as venture capital, leveraged buyouts, oil and gas, timber, and real estate . . . Since market participants routinely overpay for liquidity and since less liquid markets exhibit more inefficiencies than their liquid counterparts, illiquid markets create opportunities for astute investors to identify mispricings and generate outsized returns. Furthermore, operational, strategic, and company-building skills of control-oriented, illiquid asset managers can add tremendous value to portfolio holdings. Investors willing to accept less liquid alternatives enhance the opportunity to outperform the market. Intelligent pursuit of illiquidity is well suited to endowments, which operate with extremely long time horizons.”⁴⁰ While it was sensible for University endowments to undertake these investments, their illiquidity increases the costs of divestment.

B. Fossil Fuel Divestment Will Typically Require Sale of Non-Fossil Fuel Assets

The fraction of a portfolio that an investor would need to sell in order to fulfill a divestment mandate depends upon both the amount of fossil fuel assets held and the nature of other investments in the portfolio. As I will discuss in section III below, the act of simply identifying the relevant fossil fuel investments is itself a complicated task in many cases, and divestment advocates do not agree on which companies are acceptable and which are unacceptable in a “fossil free” portfolio. However, regardless of how one chooses to identify assets that are unacceptably linked to fossil fuels, the actual share of the portfolio that must be sold will often encompass much more than these assets alone.

The need to sell additional assets under a conventional divestment scenario arises because many investors hold substantial portions of their portfolio in funds of various types, including mutual funds, commingled funds, limited partnerships in private equity funds, and so on. If a fund includes fossil fuel assets that must be divested, it is generally not possible for an investor to sell only selected parts of the fund. The entire fund investment must be sold, creating “collateral damage” as those portions of the portfolio allocated to assets that have nothing to do with fossil fuels must also be sold. For this reason, it may be the case that a large share of an investor’s assets must be sold in order to implement divestment of a small number of fossil fuel assets.

For instance, as noted previously, Bates College, which has an endowment of \$262 million (among the small universities in my sample), has stated that it would need to liquidate “between a third and a half of the entire endowment” in order to divest.⁴¹ Swarthmore College,

39. Harvey S. Rosen and Alexander J.W. Sappington (2015) “What Do University Endowment Managers Worry About? An Analysis of Alternative Asset Investments and Background Income,” Griswold Center for Economic Policy Studies Working Paper No. 244, at p. 6.

40. “The Yale Endowment: 2013,” at pp. 6-7.

41. Bates College Office of the President (2014) “President Clayton Spencer’s Statement on Climate Change and Divestment,” January 21, <http://www.bates.edu/president/2014/01/21/statement-on-climate-change-and-divestment/> [accessed March 21, 2016].

which has an endowment worth \$1.8 billion (between the large and medium endowments in my sample) has stated that divestment would require it to sell \$660 million in commingled funds, or 36 percent of its total portfolio value.⁴² Even Harvard University, which has the largest endowment of any U.S. university, appears to hold substantial amounts of funds. In its most recent 13-F filing with the Securities and Exchange Commission, Harvard disclosed more than \$183 million in exchange-traded fund (“ETF”) holdings.⁴³

C. Estimating Shares of University Portfolios for Divestment

Exhibits A-1, A-2, and A-3, described above, report the weighted average holdings of large, medium, and small university endowments across six major asset categories (plus “Other” assets). For two of the categories, “Other Real Assets” and “Cash” (which includes cash equivalents), I assumed no assets would need to be divested.⁴⁴ For each of the other four categories, I describe below three scenarios regarding the share of holdings that would need to be sold and replaced to comply with fossil fuel divestment goals. These scenarios reflect estimates for a typical endowment; an individual endowment’s actual share of assets related to fossil fuels will depend on its specific holdings.

1. Traditional Equities

The energy industry’s share of the total market value of the S&P 500 was 6.4 percent as of March 2016.⁴⁵ Therefore, if an investor had only individual stocks in his Traditional Equities holdings and held securities similar to those of the equity market as a whole, I expect that approximately 6.4 percent of these holdings would need to be sold and replaced in order to implement fossil fuel divestment. I used this assumption as “Scenario 1” for divestment.

As discussed above, endowments frequently hold Traditional Equities in mutual funds, commingled funds, and other funds, which creates “collateral damage” on other stocks that must be sold in order to rid the portfolio of fossil fuel stocks. The actual holdings of such funds of course vary across universities. I have already noted above the statements by Bates College and Swarthmore College indicating that between 36 percent and 50 percent of their total portfolios are held in funds. Syracuse University, which is larger than all of the medium-size endowments

42. Andrew Karas (2013) “Swarthmore Pegs Cost of Divestment at \$200 Million Over 10 Years,” *Swarthmore College Daily Gazette*, May 9, <http://daily.swarthmore.edu/2013/05/09/college-pegs-cost-of-divestment-at-200-million-over-10-years/> [accessed March 21, 2016].

43. Institutions are not required to report mutual fund holdings on form 13-F, so Harvard’s holdings of equity funds may be much larger than reported there. Harvard’s ETF holdings included \$69.4 million in Powershares ETF Trust II, \$60.1 million in SPDR S&P 500 ETF, \$25.3 million in iShares Core S&P500 ETF, \$15.7 million in Market Vectors Indonesia ETF, \$6.5 million in iShares iBoxx High Yield ETF, and \$5.6 million in SPDR Russell 2000 ETF, among a number of other smaller ETF investments. Harvard Management Company Inc., “Form 13-F,” February 12, 2016.

44. I also assume no divestment of assets in the “Other” category.

45. The S&P 500 component energy companies focus on oil and gas, but of course, many of them also invest in alternative energy. I have not attempted to distinguish S&P 500 energy companies by their relative investment in alternative energy.

in my sample, also appears to hold a large share of its equity holdings in funds.⁴⁶ Among smaller endowments, the share may be even larger. For instance, Kalamazoo College (endowment size \$220 million) reports that mutual funds and pooled funds constitute 81 percent of its equity holdings and 98 percent of its fixed income holdings.⁴⁷

Unless they were specifically selected otherwise, most equity mutual funds include oil and gas company stocks, since these funds generally attempt to include a broad range of industries for diversification purposes. (Of course, the weights applied to various industries by a given fund will vary depending on the objective of the fund.)⁴⁸ Given this fact, along with the evidence above regarding Bates, Swarthmore, and Kalamazoo, I considered in my analysis two additional scenarios for divestment, in which the endowment would need to sell and replace 25 percent (“Scenario 2”) or 50 percent (“Scenario 3”) of its Traditional Equities holdings in order to fully eliminate its fossil fuel holdings. It may be that these scenarios are particularly relevant for smaller endowments, which would be expected to hold a larger share of their Traditional Equities assets in funds, but as the example of Swarthmore shows, even relatively large endowments can invest a substantial share of their portfolios in funds.

2. *Alternative Equities*

Private equity, venture capital, and hedge funds have traditionally been heavily invested in oil and gas concerns. As a recent *Wall Street Journal* report indicated, “Private equity bet big on the oil patch over the past decade . . . Including the borrowed money they typically use to fund deals, private-equity firms’ energy-buying power stands at more than \$300 billion.”⁴⁹ Private equity industry analyst firm Preqin reports that 31 percent of funds reported current investment-seeking activity in the energy industry, and, of the largest 50 private equity funds, 28 (*i.e.*, 56 percent) have oil and gas investments.⁵⁰

The Alternative Equities sector is almost entirely dominated by funds rather than direct, individual, investments. Therefore, there will almost certainly be “collateral damage” from any divestment effort, as entire funds must be sold and replaced, not just individual fossil fuel assets.

46. When Syracuse University announced it was divesting from fossil fuel securities, divestment activists indicated, “Syracuse University did not have direct investments in fossil fuels. On Tuesday, SU administration made this a formal prohibition. However, they do have substantial investments in fossil fuels through external fund managers.” “Divest SU responds to university limiting fossil fuel investments,” *The Daily Orange*, April 1, 2015, <http://dailyorange.com/2015/04/divest-su-responds-to-university-limiting-fossil-fuel-investments/> [accessed April 28, 2016]. Consistent with this conclusion, Syracuse University did not file a 13F form with the SEC, which would normally be required for an institution with at least \$100 million in holdings of exchange-traded securities.

47. “Kalamazoo College Financial Report with Additional Information,” June 30, 2015, at p. 16.

48. I examined the ten largest equity mutual funds as of March 2016 from Bloomberg and found that all ten had material energy industry weights, ranging between 1.49 percent and 9.73 percent. The number of distinct energy stock holdings ranged between 11 and 279 for these ten funds.

49. Ryan Dezember (2015) “Private-Equity Firms Plunge Back Into the Oil Patch,” *Wall Street Journal*, September 3.

50. Preqin Blog (2015) “Industrial Sector the Most Targeted by Private Equity Buyout Funds,” November, <https://www.preqin.com/blog/0/12984/buyout-industry-preferences> [accessed March 21, 2016]. Note that the 31 percent figure for the energy sector in these data excludes “Cleantech” / green energy.

Of course, an investor may choose not to divest a position in Alternative Equities for this reason, in which case there would be no transaction costs from divestment (for this sector). In so doing, however, the investor would blunt the claimed benefits of divestment. Particularly for colleges and universities, which as noted above have large holdings in Alternative Equities, a decision to exclude these assets from divestment efforts would seem to seriously undermine the purpose and meaning of divestment. Nevertheless, as a highly conservative estimate, I assumed in “Scenario 1” that no Alternative Equities holdings are divested. In Scenarios 2 and 3, I assumed that either 30 percent or 50 percent of Alternative Equities holdings would be divested, in line with the range of energy industry investments reported by Prequin mentioned above.

3. *Real Assets*

As reported in Exhibit A-1, large university endowments on average hold approximately nine percent of their assets in “Natural Resources” and another 11 percent in “Other Real Assets.” That is, nearly half of all Real Assets holdings are in Natural Resources, a category that is likely to include a substantial share of assets associated with fossil fuels. Medium and small universities generally did not provide sufficiently detailed information for me to derive the same categorization of Natural Resources and Other Real Assets. While these smaller endowments typically hold less overall in either the Natural Resources or Other Real Assets categories, there is no particular reason to believe that they hold a smaller or larger share of their real asset investments in Natural Resources as compared to Other Real Assets. I assume for purposes of the calculations here that these medium and small universities held the same proportion (*i.e.*, nearly half) of their real asset investments in Natural Resources versus other Real Assets.

To identify the likely quantity of Natural Resources assets divested, I examined the five largest mutual funds as measured by “assets under management” and listed in Bloomberg’s Natural Resources asset class.⁵¹ Using detailed holdings data for each fund, I identified securities associated with coal, oil, and natural gas.⁵² The funds’ share of holdings in these industries range between 49.7 percent and 95.5 percent, with an average of 68.0 percent. Accordingly, I assumed that a typical university endowment would need to divest and replace approximately 68.0 percent of its Natural Resources holdings to implement true fossil fuel divestment. I applied this same assumption to all three scenarios.

4. *Fixed Income*

Fixed Income includes a wide range of different assets, including corporate bonds, government bonds, and mortgage-backed securities. In general, fossil fuel securities would likely be concentrated among corporate bonds. I examined the five largest mutual funds

51. These are Van Eck Global Hard Assets Fund (GHAAX), Prudential Jennison Natural Resources Fund (PRGNX), RS Global Natural Resources Fund (RSNRX), Fidelity Advisor Energy Fund (FAGNX), and Ivy Global Natural Resources Fund (IGNAX).

52. Each security is associated with a unique CUSIP code, which identifies the security issuer. Using standard industry databases, I identified each issuer with a Global Industry Classification (GIC) code. The relevant GIC code in this case is 1010, which includes “Energy Equipment & Services” and “Oil, Gas & Consumable Fuels.”

according to assets under management in Bloomberg’s Corporate Bond asset class, and identified for each fund the share of holdings in the oil, gas, and coal industries.⁵³ These shares range between 2.6 percent and 7.1 percent of assets, with an average across the five funds of 4.6 percent.

However, because university endowment reports generally do not distinguish with specificity between different types of fixed income securities, it is difficult to determine exactly what share of fixed income holdings are corporate bonds. Therefore, reflecting an overly conservative approach, I assumed for Scenario 1 that a university endowment would not need to divest *any* of its Fixed Income holdings. This would only be true if a university’s fixed income holdings included no corporate bonds from fossil fuel companies.

Especially to the extent that universities hold fixed income securities in funds, there will be “collateral damage.” As noted above in the case of Kalamazoo College, this collateral damage may be very large – 98 percent of their Fixed Income holdings were in mutual funds or pooled funds. Conservatively, for Scenarios 2 and 3 in my analysis, I assumed 15 percent or 30 percent divestment of Fixed Income holdings.

D. Estimated Transaction Costs of Divestment for University Endowments

For each of the four categories discussed above for which assets may be divested, I obtained from the academic and industry literature estimates of the total transaction costs that would be associated with the sale of assets in that category. The actual transaction costs an individual investor would incur would depend on the particular securities sold, and the magnitude and timing of the sales, but the following calculations reflect reasonable estimates for generic divestment efforts in the near future.

Most Traditional Equities securities trade in what are typically liquid and competitive markets, where transaction costs are relatively low. The 10 largest components of the S&P 500 (by market capitalization) had a mean bid-ask spread of 2.1 basis points as of March 2016. For large cap U.S. stocks, market research firm ITG measured a typical price impact for institutional-sized trades of 31.4 basis points in their most recent data (Q3 2015).⁵⁴ Therefore, a reasonable estimate of total transaction costs from institutional selling of Traditional Equities would be 32.4 basis points (the price impact plus half of the spread). For Fixed Income assets, I estimated in previous research an average transaction cost figure of 7.9 basis points.⁵⁵ I used this as an estimate of the expected transaction cost a university endowment would incur in selling Fixed Income assets.

53. These are Vanguard Intermediate-Term Investment-Grade Fund (VFICX), Blackrock High Yield Bond Portfolio Institutional (BHYIX), Vanguard High-Yield Corporate Fund Investor (VWEHX), American Funds American High-Income Trust (AHITX), and JPMorgan Strategic Income Opportunities Fund (JSOAX).

54. Investment Technology Group (2015) “Global Cost Review Q3/2015, Final Results as of 1/26/2016,” <http://analyticsincubator.itginc.com/tasks/render/file/?fileID=1BC7A1F1-5026-466B-B1BABCA90D2719C3> [accessed April 28, 2016].

55. Hendrik Bessembinder, William Maxwell, and Kumar Venkataraman (2006) “Market transparency, liquidity externalities, and institutional trading costs in corporate bonds,” *Journal of Financial Economics* 82:251-288, at 270. This figure is conservative, as it considers only the effective bid-ask spread for corporate bond trades.

Alternative Equities are most typically held either until expiry or until a liquidity event, but that may take many years. There is a growing secondary market for private equity and hedge fund investments. Studies of these secondary markets provide some indications of the transaction costs that are associated with selling these illiquid assets. Prices in secondary markets fluctuate over time, and the cost of selling varies. Available secondary market data indicates typical secondary prices of around 90 percent of Net Asset Value (“NAV”) in recent years, with prices substantially lower than 90 percent of NAV during many time periods.⁵⁶ Based on these data, for purposes of the calculations here, I estimated transaction costs of 10 percent for a university endowment selling Alternative Equities assets.

For Natural Resources, the available evidence indicates that, due to illiquidity, sales prices also fall well below NAV. For instance, a recent study of timberland sales found that “it is not uncommon for TIMOs and REITs to apply a 10 to 20 percent discount to the component value of a forest property.”⁵⁷ I also used 10 percent as an estimate of the expected transaction cost a university endowment would incur in selling Natural Resources assets.

I applied these estimates from the literature to the three scenarios for fossil fuel divestment described above to derive expected transaction costs from divestment. Exhibits B-1, B-2, and B-3 summarize the results of these calculations. Scenario 1 reflects the most conservative assumptions about divestment, including that divestment in Traditional Equities could be implemented on an individual security basis, and that no divestment of Alternative Equities or Fixed Income holdings would be required. In other words, this scenario assumes no “collateral damage.” This scenario is too conservative if a university endowment holds a substantial portion of its holdings in funds of any type, which would need to be sold in order to eliminate fossil fuel holdings. Under Scenario 1, large university endowments would incur transactions costs ranging between 12 and 94 basis points due to divestment, with a weighted average across large endowments of 60 basis points. These percentage costs translate to dollar costs at the time of divestment of between \$15.7 million and \$269.5 million for the large endowments, with a weighted average cost of \$110.5 million. For medium and small endowments, the transaction costs associated with scenario 1 are smaller but still significant, equaling 25 basis points on a weighted average basis for medium endowments and nine basis points on a weighted average basis for small endowments. This smaller cost estimate for smaller endowments mainly reflects their more modest positions in the Natural Resources asset category and their relatively larger positions in Traditional Equities and Fixed Income, which have lower transaction costs.

56. See Abbot Capital Management, LLC (2014) “Private Equity Market Overview: 2014 Review and 2015 Outlook,” at p. 10 (indicating mean secondary price between 2007 and 2014 of less than 85 percent, and 2H-2014 secondary price of 91 percent, of NAV). See also Preqin, Ltd. (2015) “Preqin Special Report: Private Equity Secondary Market: Challenging the Illiquidity Myth,” March, at p. 4 (“Survey respondents indicated that the average price paid for buyout funds purchased on the secondary market was 90% of NAV, although this can be as low as 70% of NAV for mature assets.”).

57. Chong-Hong Fu (2014) “Timberland Investments: A Primer,” Timberland Investment Resources, April, at p. 22. See also Secondaries Investor (2015), “Finding Inefficiencies in the World of Timber Funds,” June 9 (“With only few active buyers, the secondary market for timberland fund stakes remains quite illiquid compared to other asset classes, creating inefficiencies and offering attractive discounts to net asset value, says Thomas Goodrich, a partner with Stafford Capital Partners.”).

Scenarios 2 and 3 provide a more realistic view of expected transaction costs in most cases, particularly for smaller endowments, which may be more likely to hold assets in funds. Under these scenarios, a large endowment would incur costs of 185 basis points (Scenario 2) or 269 basis points (Scenario 3) on a weighted average basis due to divestment. The estimated transaction cost for the weighted average large endowment is \$342.4 million for Scenario 2 and \$499.1 million for Scenario 3. Smaller endowments would also experience substantial transaction costs under these scenarios. For the medium endowments, Scenarios 2 and 3 involve costs of 117 basis points and 180 basis points, respectively, on a weighted average basis. For small endowments, Scenarios 2 and 3 involve costs of 77 basis points and 124 basis points, respectively, on a weighted average basis.

An important point of perspective is that these calculations reflect only the costs of *selling* the assets selected for divestment. Presumably, endowments will wish to replace these assets by buying other, different, assets. Purchases also incur various transaction costs including commissions, fees, spreads, and price impacts. Without knowing the assets an endowment would choose to purchase to replace divested fossil fuel assets, one cannot quantify the additional transaction costs associated with replacement. In some cases, such as for Alternative Equities, transaction costs for buying could be lower than for selling. Therefore, the total transaction costs could well be less than double what is reported in Exhibit B. However, in other cases, such as Traditional Equities, transaction costs could be higher to the extent that an endowment chooses to purchase “clean energy” company stocks and “green” mutual funds, which tend to be smaller in market capitalization and less frequently traded than major oil and gas company stocks and broad market funds. In any case, because they do not include the transaction costs associated with buying, the results reported in Exhibits B-1, B-2, and B-3 reflect conservative estimates of total transaction costs, and may substantially understate total transaction costs.

III. Ongoing Monitoring and Management Costs of Divestment

In addition to the largely immediate transaction costs of divestment discussed above, there are additional ongoing costs involved in managing a portfolio in order to maintain compliance with divestment goals over time. These costs involve initial and continuing research regarding which securities are acceptable and which are unacceptable in a divested portfolio. In this section, I discuss and estimate these ongoing costs that university endowments would incur.

A. Identifying Fossil Fuel Securities for Divestment Raises Complicated Questions that Investment Managers May Not Be Equipped to Answer

In a fossil fuel divestment, the choice of which securities to sell (and which to buy as replacements) requires careful thought and substantial research. To date, divestment advocates are not unanimous on the question of which companies are the most appropriate targets for divestment. If the purpose of divestment is to stigmatize or reduce the value of targeted companies, a diffuse divestment movement, in which different investors divest from different companies, is less likely to be impactful. In any case, different advocates are likely to propose

different targeted companies to investment managers, and managers will need to expend time and resources in order to evaluate these conflicting proposals, consider how other institutions are implementing divestment, and deal with criticisms that will likely arise regardless of the decisions they make.

For example, Bill McKibben – the author of the *Rolling Stone* article that brought fossil fuel divestment activism to public light – proposes that investors divest from the “Carbon Underground 200,” which is a listing of “the top 100 public coal companies globally and the top 100 public oil and gas companies globally, ranked by the potential carbon emissions content of their reported reserves.”⁵⁸ However, it is unclear that a focus on companies that hold reserves, as opposed to companies that actually burn fossil fuels, would have the greatest impact.

An alternative approach to divestment would focus on companies that are currently extracting and/or burning the largest amounts of fossil fuels, and companies deemed to not effectively mitigate their environmental impact. This approach is embodied in certain fossil fuel divestment proposals that are commonly cited by advocates, such as the so-called “Filthy Fifteen” coal companies⁵⁹ or the “Greenhouse 100 Polluters Index.”⁶⁰ Notably, however, there is rather little overlap between these lists of extractors and burners of fossil fuels and the list of companies holding fossil fuel reserves.⁶¹

Yet another alternative would be to target firms that are large consumers of fossil fuels, such as utilities or airlines, as opposed to producers of fossil fuels. Targeting such firms has the potential to stigmatize *demand* for fossil fuels rather than stigmatizing those who supply fossil fuels. But a similar effort by activists aimed at addressing and reducing the demand for fossil fuels has not materialized as far as I have seen.

There are other complications involved in identifying divestment target firms. For instance, as Columbia University stated recently in rejecting divestment of a particular list of companies, “Divestment on the basis of identification on this list would not distinguish among firms on the basis of their current conduct (e.g., the rate to which they are adding to reserves or the extent of research and development investment in renewables or in carbon-reducing technologies). The list includes natural gas companies as well as coal-mining companies, yet the substitution of natural gas for coal is one immediate way of reducing the carbon footprint of

58. <http://gofossilfree.org/top-200/> [accessed March 21, 2016].

59. Wearepowershift.org (2012) “Coal Divestment Toolkit: Moving Endowments Beyond Coal,” at p. 14. http://www.wearepowershift.org/sites/wearepowershift.org/files/Coal_Divestment_Toolkit_2012.pdf [accessed March 21, 2016].

60. Political Economy Research Institute (2016) “The Greenhouse 100,” <http://www.peri.umass.edu/greenhouse/> [accessed March 21, 2016].

61. Fischel (2015), *op. cit.*, at ¶¶ 30-31. McKibben’s group appears to recognize the limitations of the Carbon Underground 200, noting that “[t]here are many more companies that contribute indirectly to climate change – the multinationals that build drilling equipment, lay oil pipelines, transport coal, and utilities that buy and trade electricity. But right now, we’re focused on these 200 companies.” <http://gofossilfree.org/frequently-asked-questions/> [accessed March 25, 2016].

energy production. The list also omits electric utilities that generate a disproportionately high share of electricity from coal despite the opportunity to shift to natural gas.”⁶²

As a striking example, divestment advocates are not unanimous as to whether ExxonMobil, the largest U.S. oil and gas company, should be a target for divestment. ExxonMobil is the largest domestic company targeted for divestment in the Carbon Underground 200.⁶³ By contrast, ExxonMobil is the third-largest *holding* in the “MSCI ACWI Low Carbon Leaders Index,” a market index intended to “address[] two dimensions of carbon exposure – carbon emissions and fossil fuel reserves – providing clients with an effective tool for limiting the exposure of their portfolios to carbon risk. By excluding companies with the highest carbon emissions intensity and the largest owners of carbon reserves per dollar of market capitalization, the index aims to achieve at least 50% reduction in its carbon footprint.”⁶⁴ If divestment advocates do not agree on whether ExxonMobil is worthy of divestment, it is unclear whether they can objectively make such a determination for any company, thereby leaving the question up to individual investment managers.

Divestment advocates commonly propose that, after selling fossil fuel assets, institutions should replace those assets with investments in renewable energy companies or other “green” assets.⁶⁵ Determining which assets to buy raises additional complicated questions for investment managers, since available market options in this class of assets vary widely in their focus and quality. For instance, in a guide for investors, well-known investment ratings firm Morningstar notes that “[i]nvestors need to look under the hood and decide for themselves which green strategy they’d prefer. Socially conscious investors may be surprised that not all green funds fit the bill (because they may invest in nuclear power companies, for example).”⁶⁶

Indeed, some self-identified socially conscious funds – even those with an explicit environmental focus – are rated poorly by independent evaluators of sustainability goals. For instance, a number of green funds, including the Etho Climate Leadership US ETF, First Trust NASDAQ Clean Edge Green Energy ETF, DFA US Sustainability Core 1 fund, Market Vectors Environmental Services ETF, Market Vectors Solar Energy ETF, and Pax World Global Environmental Markets A fund, all received “Low” or “Below Average” environmental scores from Morningstar, based on independent ratings firm Sustainalytics.

62. Columbia University, “Response of the ACSRI to the CDCJ Proposal of October 2015,” November 17, 2015, <http://finance.columbia.edu/files/gateway/content/ACSRI%20Response%20to%20CDCJ%20Petition%20-%20Final%2011.19.15.pdf> [accessed March 8, 2016].

63. <http://fossilfreeindexes.com/research/the-carbon-underground/> [accessed March 21, 2016]. ExxonMobil is ranked fourth overall, behind the Russian companies Gazprom and Rosneft, and the Chinese firm PetroChina.

64. <https://www.msci.com/documents/10199/e82d0059-d504-4f82-84e0-20a25194f3bf> [accessed March 21, 2016]. Divestment advocates have pointed to fossil-free indexes produced by MSCI in their studies of the costs of divestment. See Appendix A.

65. See, e.g., <http://gofossilfree.org/usa/your-roadmap-to-personal-divestment/> [accessed March 25, 2016] (“How can I reinvest in climate solutions? There are several funds that focus a reinvestment strategy on renewable energy, energy efficiency, and climate mitigation and adaptation infrastructure.”).

66. Michael Herbst (2007) “Going Beyond the Hype of Green Investing,” p. 5 in *The Morningstar Guide to “Green” and Socially Responsible Investing*.

As a consequence of having to sort through these complex issues, investment managers will likely incur substantial and ongoing costs of research and management in order to attain and maintain compliance with divestment goals.

B. Divestment Introduces an Element of Active Management, Which Increases Ongoing Portfolio Management Costs

Whatever standards an institution selects to identify unacceptable fossil fuel assets and acceptable replacement assets, the institution must manage the portfolio on an ongoing basis in order to maintain compliance with those standards. Over time, both the list of unacceptable companies and the list of desirable replacements are likely to change with companies' activities and the continual availability of new securities in the market. Compliance with divestment goals effectively introduces an additional element of active management into a university endowment. Instead of merely tracking broad sets of securities, divestment requires an investment manager to also monitor the environmental impact of the companies involved, and to buy and sell as necessary to maintain the goals of the divestment movement.

One way to achieve ongoing compliance would be to outsource the research and management efforts to a fund that specializes in fossil-free or other environmental investing goals. There are a number of such fund managers; for instance, Bill McKibben's divestment advocacy group recommends the list of fund managers at GreenAmerica.org.⁶⁷

Alternatively, an institution could attempt to replicate the work of these fund managers internally, although there is no reason to believe that a university endowment would realize any particular cost advantage in such research and management efforts as compared to specialized external fund managers who focus exclusively on environmental issues. Replicating the work internally would also expose the investment manager to ongoing debates regarding the suitability of specific assets, particularly given the disagreement among environmental advocates on which assets should be divested, as discussed above. Relying on an external fund manager would presumably redirect at least some of the debate toward the fund manager and away from the university investment office.

Regardless of the approach an institution takes, the economics literature has concluded that active management of the sort that divestment introduces into a portfolio leads to increased

67. <http://gofossilfree.org/usa/your-roadmap-to-personal-divestment/> [accessed March 21, 2016]. The GreenAmerica list is available at <http://app.greenamerica.org/fossil-free/2015/09/29/Firms.html> [accessed March 21, 2016], and includes Arjuna Capital, Boston Common Asset Management, Calvert Asset Management, Clean Yield Asset Management, First Affirmative Financial Network, Green Alpha Advisors, Horizon Investment Services, LLC, Jantz Management LLC, JPS Global Investments, Krull & Company, Legg Mason Investment Counsel, Newground Social Investment, North Sky Capital, Northstar Asset Management, Inc., Pax World Funds, The Sustainability Group, Trillium Asset Management, Veris Wealth Partners, Vision Capital Investment Management, Walden Asset Management, Washington Square Capital Management, and Zevin Asset Management.

fees, which in turn limit the investment success of the portfolio.⁶⁸ In the case of divestment, the goal of active management is not (necessarily) to attain higher returns relative to risks, but also to achieve political ends. Active management associated with divestment will lead to increased costs or management fees, which must be borne by the investment portfolio.

The additional fees incurred by an institution that attempts to undertake this active management work internally depend on the nature of the divestment and the number and type of staff available to the institution. The cost of such an approach may be higher or lower than simply outsourcing the work to an external fund manager. If an institution does rely on an external fund manager, the evidence indicates that the ongoing costs are likely to be high. For instance, the Morningstar guide to socially conscious investment noted above indicates that “green funds are generally not cheap. Most of the green ETF expense ratios fall in the 0.50% to 0.75% range, which does not include the brokerage costs that come with buying and selling them. Similarly, the mutual fund options’ levies range from 1.25% to a hefty 1.98%.”⁶⁹

C. Estimated Ongoing Frictional Costs of Divestment for University Endowments

I estimate the ongoing costs of divestment for institutions that choose to outsource these active management tasks based on the difference in fees charged by major environmentally-focused mutual funds and exchange-traded funds (“ETFs”) compared to large mutual funds and ETFs without such a focus. As noted above, the costs for institutions that attempt to perform these tasks internally may be higher or lower.

Active management, as the term is typically used in finance, refers to fund management that performs security research or analysis of some kind in an attempt to identify investments that are likely to rise in value or otherwise meet the objectives of the fund. As discussed above, an investor who undertakes fossil fuel divestment requires a distinct type of active management – research and analysis that attempts to identify investments in companies that have minimal impact on the environment. An institution choosing to divest may remain an active or passive investor with respect to other fund objectives, even though they now require active management with respect to investments’ environmental impact.

Hence, I performed three specific comparisons for Traditional Equities, based on a hypothetical institution’s preferences for active or passive investments with respect to non-environmental objectives.⁷⁰ First, in Exhibit C-1, I examined the 10 largest actively-managed institutional equity funds in the U.S. market today and compared them with the ten largest actively-managed socially conscious institutional equity funds that have an explicit

68. See, e.g., Larry Harris (2003) *Trading and Exchanges: Market Microstructure for Practitioners*, Oxford University Press, at p. 492 (“On average, active managers cannot outperform the market. Transaction costs and high management fees ensure that they underperform the market on average.”).

69. Michael Herbst (2007) “Going Beyond the Hype of Green Investing,” p. 6 in *The Morningstar Guide to “Green” and Socially Responsible Investing*.

70. The data were retrieved from Morningstar as of April 15, 2016. If Morningstar identified the fund as an index fund (including ETFs), I classified the fund as passive. Otherwise, I classified it as active.

environmental focus.⁷¹ Because we focused on institutional funds that require a relatively large minimum investment, the expense ratios in Exhibit C-1 are lower than the 1.25 percent to 1.98 percent figures indicated by Morningstar in its general guide for all investors. Even so, these funds have relatively high net expense ratios, with an average of nearly 80 basis points. The ten largest funds, which are reported in Exhibit C-1, are replicated below:

Ten Largest Active Socially-Conscious Environmental Funds

	Net Expense Ratio	Fund Size (\$MM)
Parnassus Core Equity Institutional	0.67	\$12,580.3
Neuberger Berman Socially Rspns Inst	0.68	\$2,265.1
Calvert Equity I	0.66	\$2,133.7
Ariel Fund Institutional	0.72	\$2,009.2
Ariel Appreciation Institutional	0.79	\$1,754.6
Eventide Gilead I	1.18	\$1,583.6
Parnassus Endeavor Institutional	0.83	\$1,437.7
Domini Social Equity Instl	0.80	\$931.2
Parnassus Institutional	0.77	\$738.3
Parnassus Mid Cap Institutional	0.85	\$648.4

Source: Morningstar.

See Exhibit C-1 for detailed notes.

By comparison, Exhibit C-1 shows that the non-environmental actively-managed funds have an average net expense ratio of just above 69 basis points, *i.e.*, more than 10 basis points lower. This is consistent with the fact that the environmental funds require an additional element of active management, even among funds that are already engaging in active management with respect to other fund objectives. These higher expense ratios presumably cover the additional ongoing compliance costs described above, including researching securities to determine their suitability with a given position on climate change issues. They may also be higher if competition among environmental funds is weaker or if investors who seek to pursue environmental objectives are less likely to select among funds based on lower expenses.

By focusing on the largest funds, I have excluded funds from some of the companies that have been most vocal in advocating for divestment, and which divestment advocates often point to as providing replacements for divested funds. I examined the funds provided by two such vocal advocates, Green Century Funds and Trillium Mutual Funds. Each company offers two funds to investors seeking to avoid exposure to fossil fuel-related assets.

71. The “environmental” funds may also have other objectives in addition to environmental concerns. Indeed, there are very few active socially conscious institutional funds that exclusively focus on environmental concerns, which raises an additional concern about divestment, namely, that investors will be forced to incorporate into their investment strategies other socially conscious objectives besides climate change sensitivity, when they may not wish to do so.

Other Prominent Active Socially-Conscious Environmental Funds

	Net Expense Ratio	Fund Size (\$MM)
Trillium Portfolio 21 Global Equity Institutional	1.08	\$434.6
Green Century Balanced	1.48	\$181.2
Green Century Equity	1.25	\$162.9
Trillium Small / Mid Cap Institutional	0.98	\$3.0

Source: Morningstar.

As indicated above, these funds have expense ratios between 0.98 percent and 1.48 percent. These expense ratios are not only much higher than those of the non-environmental funds, but they are also generally higher than the expense ratios charged by the ten largest active environmental funds discussed above. Therefore, my focus on the largest funds may lead me to understate the increased annual expenses that divesting investors would actually incur, if they selected environmentally-focused funds based on the recommendations of the most prominent and vocal advocates of divestment.

In Exhibit C-2, I performed a similar calculation as in Exhibit C-1, but focusing on the largest *passive* funds. The ten largest passive socially conscious institutional equity funds with an environmental focus are reported in Exhibit C-2, and are also replicated below:⁷²

Ten Largest Passive Socially-Conscious Environmental Funds

	Net Expense Ratio	Fund Size (\$MM)
Vanguard FTSE Social Index I	0.15	\$2,057.3
Calvert US Large Cap Core Rspnb Idx I	0.19	\$689.5
PowerShares Water Resources ETF	0.61	\$662.2
iShares MSCI KLD 400 Social	0.50	\$504.3
Pax MSCI International ESG Idx Instl	0.56	\$441.2
Guggenheim S&P Global Water ETF	0.64	\$367.8
iShares MSCI USA ESG Select	0.50	\$362.1
Northern Global Sustainability Index	0.31	\$247.3
Guggenheim Solar ETF	0.70	\$238.1
iShares MSCI ACWI Low Carbon Target	0.02	\$224.3

Source: Morningstar.

See Exhibit C-2 for detailed notes.

72. Because there are many non-environmental passive funds, I excluded any funds that did not have an institutional share class.

As in Exhibit C-1, I compared these funds with the ten largest passive equity funds without an environmental focus. Exhibit C-2 shows that the average net expense ratio for the passive environmental funds is nearly 44 basis points, while the average net expense ratio for the passive non-environmental funds is only 6 basis points, for a difference in average net expense ratios of nearly 38 basis points. This is an estimate of the cost a passive investor in Traditional Equities would pay if he attempted to remain a passive investor, only undertaking the active management required to divest.

Finally, in Exhibit C-3, I compared the active environmental funds from Exhibit C-1 with the passive non-environmental funds from Exhibit C-2. This comparison is relevant because there may not be an adequate supply of passive environmental equity funds. The 10 largest passive environmental funds have average assets of \$579 million (Exhibit C-2), whereas the 10 largest actively-managed environmental funds have average assets of \$2.6 billion (Exhibit C-1), more than four times larger. Exhibit C-3 documents an average difference in the net expense ratio for active environmental versus passive non-environmental funds of 73 basis points.

For Alternative Equities, the same issues of ongoing research and management as in Traditional Equities arise. Endowments that wish to remain divested must carefully monitor the investments made by private equity or hedge funds in which they invest, and sell off any fund that begins in the future to invest in fossil fuel companies. Because most or all major private equity and hedge funds have not made a divestment pledge, and because (as noted above) selling a position in these funds on the secondary market is costly, an ongoing divestment policy may require endowments to dramatically reduce or eliminate their portfolio allocation to Alternative Equities. I consider the same set of three scenarios described in Exhibits C-1, C-2, and C-3 as estimates of the ongoing costs of divestment for Alternative Equities. These estimates are likely to substantially understate the actual ongoing costs of divestment in the Alternative Equities category, and for that reason, the calculations below of the ongoing frictional costs of divestment are likely conservative.

Holdings in the Natural Resources category likely would also require additional ongoing research and management efforts, but the costs of such efforts may be different from those necessary for equity securities, and may be lower in some cases. For the purposes of my analysis, I assumed no ongoing costs of divestment for Natural Resources. This assumption also implies that my cost estimates are likely to be conservative.

For Fixed Income, I attempted to perform a similar set of analyses as in the case of Traditional Equities, comparing net expense ratios for Fixed Income mutual funds without an environmental focus to expense ratios for Fixed Income socially-conscious funds with an environmental focus. However, I found that there are very few socially conscious fixed income funds with an environmental focus.⁷³ Therefore, the ongoing cost of compliance for an investor may be very high, as they are forced to either fully eliminate their Fixed Income assets or else

73. I searched all “Socially Conscious” fixed income mutual funds and ETFs listed by Morningstar, focusing on those that were either listed as “Environmental, Social, and Corporate Governance” funds or “Environmental Focus” funds. I also focused on funds where at least 50 percent of holdings are corporate bonds. I was able to identify only three such funds among this set with an explicit environmental focus.

perform the active management function internally. The active management involved in identifying the environmental impact of fixed income securities is conceptually similar to that involved in identifying the environmental impact of equity securities. However, because I cannot measure the cost directly for Fixed Income investments, I conservatively assumed 20 basis points. This is close to the lower estimates of the difference in equity mutual fund expenses reported in Exhibits C-1, C-2, and C-3.

Exhibits D-1, D-2, and D-3 summarize the resulting estimates of ongoing compliance costs of divestment for large, medium, and small university endowments based on this methodology. In each exhibit, I report three scenarios for the estimated ongoing cost of divestment, reflecting the three calculations of this cost for equities in Exhibits C-1, C-2, and C-3.⁷⁴ For the weighted average large endowment, I estimate annual compliance costs of divestment averaging between approximately eight basis points (Scenario 1) and 52 basis points (Scenario 3) per year, with slightly higher or lower figures for certain specific endowments. This translates to between \$16 million and \$97 million per year for the weighted average large endowment. The annual compliance costs of divestment are similar in terms of basis points for medium and small endowments, but obviously, the dollar amounts are lower because the endowment sizes are smaller: between \$0.7 million and \$4.2 million per year for the weighted average medium endowment, and between \$0.3 million and \$1.3 million per year for the weighted average small endowment.

IV. Total Frictional Costs of Divestment Over a 20-Year Horizon

Combining estimates of the transaction costs associated with an initial choice to divest with estimates of the ongoing annual costs of divestment, I obtain total cost estimates that indicate that divestment would substantially reduce the value of an endowment over time. These costs would accrue even assuming that a divested portfolio could attain the same level of risk-adjusted returns (prior to costs) as a pre-divestment portfolio.

For these calculations, I assume that, absent divestment, endowments will grow from their current values at a rate of 6.3 percent per year, which reflects their historical annual growth rate over the last 10 years.⁷⁵ With divestment, the endowment's current value is reduced by transaction costs, as summarized in Exhibits B-1, B-2, and B-3, and the rate of growth thereafter is also reduced (below 6.3 percent) by the increase in ongoing compliance costs, as summarized in Exhibits D-1, D-2, and D-3.

Exhibits E-1, E-2, and E-3 summarize the outcomes of these calculations, indicating that, over a 20-year period, the total reduction in the value would in most cases be between approximately two percent and 12 percent of the endowment value, with slightly higher or lower

74. As noted above, the ongoing cost of divestment for Fixed Income is assumed to be 20 basis points in all three scenarios.

75. NACUBO (2015) "Average Annual One-, Three-, Five- and Ten-Year Returns for U.S. Higher Education Endowments and Affiliated Foundations for Periods Ending June 30, 2015," http://www.nacubo.org/Documents/EndowmentFiles/2015_NCSE_Public_Tables_Avg_One_Three_Five_and_Ten_Year_Returns.pdf [accessed April 19, 2016].

numbers for some endowments. This translates to a reduction in the value of the weighted average large endowment after 20 years of between \$1.4 billion and \$7.4 billion. The equivalent reduction in value for the weighted average medium endowment is between \$52 million and \$298 million, and the equivalent reduction in value for the weighted average small endowment is between \$17 million and \$89 million.

Endowments serve a vital purpose in achieving the goals of colleges and universities to promote research and educate students. Reductions in the value of these endowments of the size indicated in Exhibits E-1, E-2, and E-3 therefore risk real harm to these laudable and socially beneficial activities. This paper does not address the question (focused on by other research) of whether fossil fuel divestment leads to lower pre-cost returns, but rather focuses on the more concrete frictional costs of divestment. There can be no question that divestment would by definition require selling and buying assets, and that doing so creates transaction costs. Divestment would also require additional ongoing costs of compliance for endowment managers who could otherwise focus solely on achieving high returns relative to risk. The magnitude of these costs will vary across different investors, depending on their holdings, but the existence of these costs in some form is not subject to debate.

These frictional costs directly reduce the value of an endowment's portfolio in return for, at best, speculative benefits from divestment. For this and other reasons, a number of universities have made the decision to not undertake divestment at the cost of substantial reductions in endowment value and the consequent harm to universities' educational and research goals. I am hopeful that this paper will be useful to investment managers in their assessment of divestment proposals.

Appendix A: Prior Literature on Returns from Fossil Fuel Divestment

Several studies, including those by my Compass Lexecon colleagues Daniel R. Fischel (2015) and Bradford Cornell (2015), conclude that the diversification losses associated with divesting fossil fuel stocks are large.¹ Fischel (2015) showed that the energy sector has the lowest historical correlation with the rest of the market, indicating the greatest potential benefit from diversification.² He then constructed an optimized portfolio of stocks, including energy and non-energy stocks, and compared the 50-year history of returns for this optimized portfolio with the returns on a similarly optimized portfolio containing only non-energy stocks. On a risk-adjusted basis, the portfolio including energy stocks outperformed the divested portfolio by approximately 50 basis points per year.³

Complementing Fischel (2015), who considered a hypothetical optimized equity portfolio, Cornell (2015) considered the actual holdings (including non-equities) of five large university endowments. Using mutual fund proxies for each of the major asset classes held by these universities, he estimated more than 2,000 scenarios for each of the five university endowments, and found that 91 percent of these scenarios involved a reduction in value due to divestment.⁴ The average expected risk-adjusted loss ranged between 12 and 30 basis points per year, which amounts to many millions of dollars annually for these large university endowments.⁵

In contrast, other studies have argued that divestment involves little or no loss in returns for investors. Most studies of this nature involve comparing returns for a specified stock market index with returns to a similar index, stripped of fossil fuel stocks. For instance, a study described in Kevin Bagos and Joann Loviglio (2013) involves a comparison of returns over the past ten years for the S&P 500 and a version of the S&P 500, absent fossil fuel stocks.⁶ Similarly, Zahra Hirji (2015) describes a study comparing returns for the MCSI ACWI index with a fossil-free version of the same index.⁷ These studies do not appear to adjust for differences in risk between the index at issue and the divested version of the index.

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1. Daniel R. Fischel (2015) “Fossil Fuel Divestment: A Costly and Ineffective Investment Strategy”; Bradford Cornell (2015) “The Divestment Penalty: Estimating the Costs of Fossil Fuel Divestment to Select University Endowments”.
 2. Fischel (2015), *op. cit.*, at ¶17.
 3. *Id.*, at ¶24. On a gross (non-risk-adjusted) basis, the portfolio including fossil fuel stocks outperformed the divested portfolio by 70 basis points. *Id.*, at ¶22.
 4. Cornell (2015), *op. cit.*, at ¶7.
 5. *Id.*, at ¶8. On a gross (non-risk-adjusted) basis, the losses range between 17 and 37 basis points. *Id.*, at ¶10. A separate study by Robert J. Shapiro and Nam D. Phan, argues that oil and gas securities have earned superior returns relative to other assets held by university endowments. Robert J. Shapiro and Nam D. Phan (2012) “The Financial Returns from Oil and Natural Gas Company Stocks Held by American College and University Endowments,” Sonecon Working Paper.
 6. Kevin Bagos and Joann Loviglio (2013) “College fossil-fuel divestment movement builds,” *Associated Press*, May 22. I have not been able to identify any public version of the study itself, but only this news report describing the study.
 7. Zahra Hirji (2015) “Fossil Fuel Divestment Has Grown to \$2.6 Trillion in Assets,” *InsideClimate News*, September 23.

Slightly more sophisticated analyses are provided by Impax Asset Management (2013), Geddes (2013), and Geddes, *et al.* (2015), who demonstrate that it is possible for an investor who holds a particular index (such as the Russell 3000 or the MCSI World Index) to divest from certain fossil fuel stocks, and then reallocate the divested funds in such a way that they can track the index reasonably closely.⁸ This demonstrates that divestment costs may be low for investors who are attempting to track one of the indexes these papers consider. However, these studies do not explicitly consider divestment costs for an investor who optimizes his portfolio to maximize expected returns for a given level of risk.

8. Impax Asset Management (2013) “Beyond Fossil Fuels: The Investment Case for Fossil Fuel Divestment”, Patrick Geddes (2013) “Do the Investment Math: Building a Carbon-Free Portfolio”, and Patrick Geddes, Lisa Goldberg, Robert Tymoczko, and Michael Branch (2016) “Building a Carbon-Free Equity Portfolio”.

Appendix B: Asset Allocations for Sample of 30 College and University Endowments

Name	Source Date	Traditional Equities	Alternative Equities	Natural Resources	Other Real Assets	Fixed Income	Cash	Other	Imputations, Other Adjustments, and Comments
Harvard University	September 2015	U.S. Equity	Private Equity	Natural Resources and Commodities	Real Estate	Domestic Bonds	Domestic Bonds		Harvard reports a range of allocation for each asset class. The mean of the high and low bounds of the range is used, normalized to keep the total equal to 100%. "Domestic Bonds," "Foreign Bonds," and "Inflation-Linked Bonds" categories imputed 65% to Fixed Income, and 35% to Cash, based on average across large endowments that reported both categories.
		Foreign Equity	Absolute Return			Foreign Bonds	Foreign Bonds		
		Emerging Market Equity	High Yield			Inflation-Linked Bonds	Inflation-Linked Bonds		
Yale University	June 2014	Domestic Equity	Absolute Return	Natural Resources	Real Estate	Fixed Income	Cash		
		Foreign Equity	Private Equity						
University of Texas	August 31, 2015	Equity - Developed Country (Long Only)	Equity - Developed Country (Hedge Funds)	Natural Resources	Real Estate	Fixed Income - Investment Grade	Fixed Income - Investment Grade		"Fixed Income- Investment Grade" and "Fixed Income-Credit Related" categories imputed 65% to Fixed Income, and 35% to Cash, based on average across large endowments that reported both categories.
		Equity - Emerging Markets (Long Only)	Equity - Emerging Markets (Hedge Funds)			Fixed Income - Credit Related	Fixed Income - Credit Related		
			Equity - Developed Country (Private Investments)						
Princeton University	June 30, 2015	Domestic Equity	Independent Return	Real Assets	Real Assets	Fixed Income and Cash	Fixed Income and Cash		"Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories. "Fixed Income and Cash" category imputed 65% to Fixed Income, and 35% to Cash, based on average across large endowments that reported both categories.
		International Equity - Developed	Private Equity						
		International Equity - Emerging							
Stanford University	October 1, 2015	Domestic Equity	Absolute Return	Natural Resources	Real Estate	Fixed Income	Fixed Income		"Fixed Income" category imputed 65% to Fixed Income, and 35% to Cash, based on average across large endowments that reported both categories.
		International Equity	Private Equity						
Massachusetts Institute of Technology	June 30, 2015	Common Equity- Long Domestic	Equity- Absolute Return	Real Assets	Real Estate	U.S. Treasury	Cash and Cash Equivalents	Split Interest Agreements	Allocations taken from listing of university investments. "Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.
		Common Equity- Long Foreign	Equity- Private		Real Assets	U.S. Government Agency		Other	
		Common Equity- Short Foreign				Domestic Bonds		Derivatives	
		Equity- Domestic				Foreign Bonds			
Texas A&M University	June 30, 2015	International Equities	Private Equities	Private Real Estate and Hard Assets	Private Real Estate and Hard Assets	Domestic Fixed Income	Cash and Cash Equivalents		Figures taken from Long Term Investment Pool Asset Allocations. "Private Real Estate and Hard Assets" and "Public Real Estate and Commodities" categories imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.
		Domestic Equities	Alternative Marketable Equities	Public Real Estate and Commodities	Public Real Estate and Commodities	International Fixed Income			
Northwestern University	August 31, 2015	U.S. Equity	Absolute Return	Real Assets	Real Assets	Fixed Income	Cash		"Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.
		International Equity	Private Investments			High Yield Credit			
University of Pennsylvania	June 30, 2015	U.S. Equities	Absolute Return	Natural Resources	Real Estate	Fixed Income/Cash	Fixed Income/Cash		"Fixed Income/Cash" category imputed 65% to Fixed Income, and 35% to Cash, based on average across large endowments that reported both categories.
University of Michigan	June 30, 2015	International Equities	Private Equity						
		Emerging Markets							
		Stocks	Absolute Return	Natural Resources	Real Estate	Bonds	Cash		
			Venture Capital						
			Private Equity						

Appendix B: Asset Allocations for Sample of 30 College and University Endowments

Name	Source Date	Traditional Equities	Alternative Equities	Natural Resources	Other Real Assets	Fixed Income	Cash	Other	Imputations, Other Adjustments, and Comments	
University of Miami	December 2014	U.S. Large/Mid Cap Equity	Hedge Funds	Hard Assets	Hard Assets	Aggregate Fixed Income	Aggregate Fixed Income		"Hard Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.	
		U.S. Small Cap Equity	Private Equity			Global Fixed Income	Global Fixed Income			
		International Equity							"Aggregate Fixed Income" and "Global Fixed Income" categories imputed 62% to Fixed Income, and 38% to Cash, based on average across medium endowments that reported both categories.	
		Emerging Markets Equity								
Hamilton College	June 30, 2015	Investments- U.S. Equity Securities	Investments- Hedge Funds- Multistrategy	Investments- Energy	Investments- Real Estate	Investments- Fixed Income Securities	Investments-Cash and Cash Equivalents	Investments- Insurance	Allocations taken from listing of university long-term investments.	
		Investments- International Equity Securities	Investments- Hedge Funds- Other		Medium-term Investments- Real Estate	Medium-term Investments- Fixed Income Securities	Medium-term Investments Cash and Cash Equivalents	Medium-term Investments- Insurance		
			Investments- Private Equity- Buy-Out			Short-term Investments- Fixed Income Securities		Investments- Other		
			Investments- Private Equity- Venture Capital					Medium-term Investments- Other		
Virginia Tech	June 30, 2015	Global Equities	Global Equities	Real Assets	Real Assets	Credit	Cash and Cash Equivalents		"Global Equities" category imputed 58% to Traditional Equities, and 42% to Alternative Equities, based on average across medium endowments that reported both categories. "Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.	
						Government Bonds				
University of Houston	December 31, 2015	Developed Markets Developing Markets	Hedge Fund Program Private Investments	Marketable Inflation Hedge	Marketable Inflation Hedge	Bonds	Cash and Equivalents		"Marketable Inflation Hedge" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.	
Lafayette College	June 30, 2015	Equity- Stocks	Alternative Investments- Event Driven/Distressed		Real Estate	Fixed Income- Investments	Fixed Income- Investments		Allocations taken from listing of university investments.	
		Equity- Mutual Funds	Alternative Investments- Long/Short Equity			Fixed Income- Mutual Funds	Fixed Income- Mutual Funds			
		Equity- Institutional Mutual Funds	Alternative Investments- Multi Strategy / Absolute Return			Fixed Income- Institutional Mutual Funds	Fixed Income- Institutional Mutual Funds			"Fixed Income- Investments," "Fixed Income- Mutual Funds," "Fixed Income- Institutional Mutual Funds," and "Alternative Investments- Opportunistic Fixed Income" categories imputed 62% to Fixed Income, and 38% to Cash, based on average across medium endowments that reported both categories.
			Private Equity			Alternative Investments- Opportunistic Fixed Income	Alternative Investments- Opportunistic Fixed Income			
Rochester Institute of Technology	June 30, 2015	U.S. Equities	Private Equity	Real Assets	Real Assets	Fixed Income	Cash		"Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.	
		International Equities	Hedge/ Absolute Return Strategies							
Colorado College	June 30, 2015	Domestic Equity	Absolute Returns	Real Assets	Real Assets	Cash and Fixed Income	Cash and Fixed Income		"Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories. "Cash and Fixed Income" category imputed 62% to Fixed Income, and 38% to Cash, based on average across medium endowments that reported both categories.	
		International Equity	Hedged Equity							
			Private Equity							
Drexel University	June 30, 2014	Equity Securities	Alternative Investments	Real Estate and Real Assets	Real Estate and Real Assets	Fixed Income Securities and Bond Funds	Money Market Funds		Information taken from Drexel University and Subsidiaries Financial Statements and Schedule of Expenditures of Federal Awards and Reports in Accordance with OMB Circular A-133 Thereon for the year ended June 30, 2014. "Real Estate and Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.	
Fordham University	June 30, 2012	Domestic Equities	Non-Public Equity Funds			U.S. Government Obligations	Cash and Cash Equivalents	Other	Allocations taken from listing of university investments.	
		Equity Mutual Funds	Hedge Funds- Long/Short			Domestic Corporate Bonds				
			Hedge Funds- Absolute Return			Bond Mutual Funds				
			Private Equity Funds							
Auburn University	April 17, 2015	Equity- Global Equity	Equity- Global Private Capital	Inflation Hedging/ Real Assets-Natural Resources, Real Estate, Commodities	Inflation Hedging/ Real Assets- Natural Resources, Real Estate, Commodities	Inflation Hedging/ Real Assets- U.S. TIPS	Liquidity- Cash	Uncorrelated (Dollar Hedge)- Non U.S. Government	"Inflation Hedging/ Real Assets- Natural Resources, Real Estate, Commodities" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories. The "Credit-Core Bonds," "U.S. TIPS," and "Liquidity-Cash" categories all have allocations of 0%.	

Appendix B: Asset Allocations for Sample of 30 College and University Endowments

Name	Source Date	Traditional Equities	Alternative Equities	Natural Resources	Other Real Assets	Fixed Income	Cash	Other	Imputations, Other Adjustments, and Comments	
University of California, Santa Barbara	June 30, 2015	U.S. Equity	Private Equity	Commodities/Natural Res./Energy	Real Estate	Core Fixed Income	Liquidity Accounts		The "Global Equity," "TIPS," "Non-US/Global Fixed - Dev. Mkt.," and "Commodities/Natural Res./Energy" categories all have allocations of 0%.	
		Non U.S. Developed Equity	Abs. Ret./Mktable Alts./Hedge Fds.			TIPS				
		Global Equity	Cross Asset Class			High Yield Debt				
		Emerging Market Equity				Non-US/Global Fixed - Dev. Mkt. Emerging Market Debt				
Bates College	June 30, 2015	Equity Securities and Funds	Venture Capital Partnerships Private Equity Partnerships Hedge Funds	Commodity and Other Funds	Real Estate and Real Estate Funds	Fixed Income Securities and Funds	Cash and Cash Equivalents		Allocations taken from listing of university investments.	
The Citadel	December 31, 2012	Equity- Domestic Equity- International Equity- Global	Opportunistic (PE, Venture) Multi-Strategy	Real Assets	Real Assets Real Estate	Credit	Cash		"Real Assets" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.	
University of Idaho	June 30, 2015	Common Stock	Private Equities			U.S. Government Agency Obligations	U.S. Government Agency Obligations		The allocations are taken from a listing of university investments located in the University's Audited Financial Statements. The financial statement lists a "Real Assets" allocation with a value of zero for the year 2015. "U.S. Government Agency Obligations," "Corporate Debt," "Preferred Stock," "Municipal Securities," and "U.S. Treasuries" categories imputed 85% to Fixed Income, and 15% to Cash, based on average across small endowments that reported both categories.	
		International Equity Funds				Corporate Debt	Corporate Debt			
		Mutual Funds				Preferred Stock	Preferred Stock			
						Municipal Securities U.S. Treasuries	Municipal Securities U.S. Treasuries			
University of North Dakota	June 30, 2015	International Equities	Alternative Investments			Fixed Income	Fixed Income	Others	"Balanced" category imputed 77% to Traditional Equities, and 23% to Fixed Income, based on average across small endowments that reported both categories. "Fixed Income" category imputed 85% to Fixed Income, and 15% to Cash, based on average across small endowments that reported both categories.	
		Domestic Equities				Balanced				
		Balanced								
Kalamazoo College	June 30, 2015	Equity Securities- U.S.	Private Equity Funds	Pooled Funds- Commodities	Pooled Funds- Commodities	Corporate Debt Securities	Cash and cash equivalent- Money Market Mutual Funds		Allocations taken from listing of Kalamazoo College's investments located in "Financial Statements June 30, 2015."	
		Equity Securities- Foreign				Hedge Funds				Real Property
		Mutual Funds- U.S.								Mutual Funds- Fixed Income
		Mutual Funds- Foreign								Pooled Funds- Fixed Income
		Pooled Funds- U.S. Equities								
Pooled Funds- Foreign				"Pooled Funds- Commodities" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories.						
San Diego State University	December 31, 2015	Domestic Equity	Alternative Investment	Commodities	Commodities	Domestic Fixed Income	Domestic Fixed Income		"Commodities" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories. "Domestic Fixed Income" category imputed 85% to Fixed Income, and 15% to Cash, based on average across small endowments that reported both categories.	
		International Equity				Real Estate				
Florida Atlantic University	June 30, 2015	U.S. Stocks	Hedge Funds	Real Asset Funds	Real Asset Funds	Fixed Income	Fixed Income		Allocations taken from listing of university investments listed in Florida Atlantic University's Financial Statements. "Real Asset Funds" category imputed 47% to Natural Resources, and 53% to Other Real Assets, based on average across large endowments that reported both categories. "Fixed Income" category imputed 85% to Fixed Income, and 15% to Cash, based on average across small endowments that reported both categories.	
		International Stocks	Private Equity Funds							
University of Akron	December 10, 2008	Equities- Large Cap Growth	Alternatives			Fixed Income & Cash	Fixed Income & Cash		"Fixed Income & Cash" category imputed 85% to Fixed Income, and 15% to Cash based on average across small endowments that reported both categories.	
		Equities- Large Cap Value								
		Equities- Small/Mid Cap Growth								
		Equities- Small/Mid Cap Value								
		Equities- International Growth								
Equities- International Value										
California Polytechnic State University, San Luis Obispo	December 31, 2014	Domestic Equity	Alternatives Equity			International Fixed Income	International Fixed Income		"International Fixed Income" and "Domestic Fixed Income" categories imputed 85% to Fixed Income, and 15% to Cash, based on average across small endowments that reported both categories.	
		International Equity	Tactical Strategies			Domestic Fixed Income	Domestic Fixed Income			
		Inflation Hedges Equity								

Source Documents:

Harvard University	http://www.hmc.harvard.edu/docs/Final_Annual_Report_2015.pdf
Yale University	http://investments.yale.edu/images/documents/Yale_Endowment_14.pdf
University of Texas	http://www.utimco.org/funds/allfunds/2015Annualpdfs/2015_UTIMCO_Annual_Report%20-%20Printable%20-%20High-Res.pdf
Princeton University	https://finance.princeton.edu/princeton-financial-overv/report-of-the-treasurer/2014-2015.pdf
Stanford University	http://bondholder-information.stanford.edu/pdf/Annual_Report_SMC.pdf
Massachusetts Institute of Technology	http://vpf.mit.edu/site/content/download/183604/410800/file/Trs_Rprt_2015_web_version_2.pdf
Texas A&M University	http://www.txamfoundation.com/s/1436/gid3eive/2014/index.aspx?sid=1436&gid=3&pgid=2294
Northwestern University	http://www.northwestern.edu/investment/asset-allocation-and-objective.html
University of Pennsylvania	http://www.evp.upenn.edu/investments/annual-report.html
University of Michigan	https://publicaffairs.vpcomm.umich.edu/wp-content/uploads/sites/19/2015/11/2015-06-30-Endowment-Profile-1.pdf
University of Miami	https://umshare.miami.edu/web/vda/bondholder/GrowthPoolStatementofInvestmentPolicy.pdf
Hamilton College	https://hamilton.edu/documents/2015_HamiltonCollege.PDF
Virginia Tech	http://www.vtf.vt.edu/media/annual_reports/VTF_2015_Annual_Report.pdf
University of Houston	http://www.uh.edu/treasury/reports/Endow%20Allocation_2015_12.pdf
Lafayette College	http://finadmin.lafayette.edu/files/2015/10/Financial-Audit-FY-2014-15.pdf
Rochester Institute of Technology	https://www.rit.edu/fa/controller/sites/rit.edu/fa.controller/files/files/docs/Pool%201%20Asset%20Allocation%2028as%20of%206.30.2015%29.pdf
Colorado College	https://www.coloradocollege.edu/offices/finance/endowment.html
Drexel University	https://www.google.com/url?sa=t&rc=t&ct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahUKEwih8eGQ4u3LAhXlqR4KHcTtBiYOFggqMAI&url=https%3A%2F%2Fwww.drexel.edu%2F-%2Fmedia%2FFiles%2Fresearch%2Fadmin%2Ffinancial%2520compliance%2F2014%2520A-133%2520Audit.ashx&usq=AFQjCNGKcA4YsvHaKm1DEveG4vEpr_MmOg&sig2=01j_ShM2BLE31w5-0fx9hA&bvm=bv.118443451_dmo
Fordham University	http://emma.msrb.org/ER631110-ER488560-.pdf
Auburn University	http://www.auburn.edu/administration/endow_invest/pdf/AU_Investment_Policy.pdf
University of California Santa Barbara	http://ucop.edu/investment-office/files/report/UC_Annual_Endowment_Report_FY2014-2015.pdf
Bates College	http://www.bates.edu/accounting/files/2011.06/Financial-Statements-Bates-College-FY15.pdf
The Citadel	http://foundation.citadel.edu/page.aspx?pid=343
University of Idaho	https://www.uidaho.edu/uidahofoundation/financial-highlights
University of North Dakota	http://www.undalumni.org/s/1652/images/gid2/editor_documents/financial_documents/2015/f_endowment_report.pdf
Kalamazoo College	https://reason.kzoo.edu/business/finstmts/
San Diego State University	http://tcf.sdsu.edu/tcf/files/05702-Investment_Summary_December_2015.pdf
Florida Atlantic University	http://www.fau.edu/controller/general-accounting/pdfs/AuditedFS-2015FloridaAtlanticUniversityFoundation.pdf
University of Akron	https://www.uakron.edu/dotAsset/02d6a181-19e4-4dd9-96de-f2b4e98c94cf.pdf
California Polytechnic State University, San Luis Obispo	http://www.giving.calpoly.edu/forms/Cal_Poly_Foundation_Endowment.pdf

Exhibit A-1 University Endowment Information

Large Endowment Universities

Rank	School Name	Endowment Size (MM)	Traditional Equities	Alternative Equities	Natural Resources	Other Real Assets	Fixed Income	Cash	Other
1	Harvard University	\$36,449	29%	35%	11%	13%	8%	4%	0%
2	Yale University	\$25,572	15%	50%	8%	18%	5%	4%	0%
3	University of Texas system	\$24,083	23%	40%	14%	7%	10%	6%	0%
4	Princeton University	\$22,723	23%	53%	8%	9%	4%	2%	0%
5	Stanford University	\$22,223	29%	48%	10%	8%	3%	2%	0%
6	Massachusetts Institute of Technology	\$13,475	35%	27%	2%	17%	6%	11%	1%
7	Texas A&M University System	\$10,477	49%	18%	7%	8%	14%	3%	0%
8	Northwestern University	\$10,193	28%	39%	7%	8%	14%	4%	0%
9	University of Pennsylvania	\$10,134	41%	43%	5%	5%	4%	2%	0%
10	University of Michigan, Ann Arbor	\$9,952	28%	42%	6%	9%	10%	4%	0%
Weighted Average			28%	41%	9%	11%	7%	4%	0%

Notes:

[1] In cases in which an endowment did not list a breakdown between categories, the average breakdown of all large endowments was used.

[2] The endowment sizes are as of the end of Fiscal Year 2015.

Sources: *The Chronicle of Higher Education*; University Endowment Filings

Exhibit A-2 University Endowment Information

Medium Endowment Universities

Rank	School Name	Endowment Size (MM)	Traditional Equities	Alternative Equities	Natural Resources ¹	Other Real Assets ¹	Fixed Income	Cash	Other
100	University of Miami	\$887	55%	25%	5%	5%	6%	4%	0%
105	Hamilton College	\$856	55%	13%	4%	4%	13%	7%	4%
110	Virginia Tech	\$818	30%	21%	7%	8%	18%	17%	0%
115	University of Houston System	\$795	45%	40%	2%	2%	7%	4%	0%
121	Lafayette College	\$778	48%	31%	0%	3%	11%	7%	0%
125	Rochester Institute of Technology	\$759	41%	37%	4%	5%	11%	2%	0%
131	Colorado College	\$720	40%	39%	3%	4%	9%	5%	0%
139	Drexel University	\$668	47%	14%	4%	24%	10%	1%	0%
141	Fordham University	\$666	23%	45%	0%	0%	15%	17%	1%
145	Auburn University	\$642	40%	38%	6%	6%	6%	0%	5%
	Weighted Average		43%	30%	3%	6%	11%	6%	1%

Notes:

[1] In cases where the Medium and Small size endowments listed “Real Assets,” they were divided between “Natural Resources” and “Other Real Assets” according to the same sectoral breakdown as the Large Endowments. Generally only the large endowments split the two categories, and thus the breakdown was used for the Medium and Small size endowments. In all other cases of a Medium or Small size endowment not listing a breakdown between categories, the average breakdown for the respective endowment size was used.

[2] Generally, in cases where public information on holdings was not available for a specified university, the next largest university endowment was selected. For instance, if the university ranked 120th did not provide public data on its holdings, it was replaced with the university ranked 121st.

[3] The endowment sizes are as of the end of Fiscal Year 2015.

Sources: *The Chronicle of Higher Education*; University Endowment Filings

Exhibit A-3 University Endowment Information

Small Endowment Universities

Rank	School Name	Endowment Size (MM)	Traditional Equities	Alternative Equities	Natural Resources ¹	Other Real Assets ¹	Fixed Income	Cash	Other
250	University of California, Santa Barbara	\$266	55%	24%	0%	2%	13%	6%	0%
255	Bates College	\$262	38%	44%	2%	1%	14%	2%	0%
261	The Citadel	\$254	48%	28%	3%	7%	12%	2%	0%
266	University of Idaho	\$240	68%	6%	0%	0%	22%	4%	0%
270	University of North Dakota	\$231	48%	18%	0%	0%	25%	4%	5%
275	Kalamazoo College	\$220	51%	28%	1%	2%	19%	0%	0%
285	San Diego State University	\$209	56%	10%	1%	9%	20%	4%	0%
289	Florida Atlantic University	\$205	49%	20%	6%	6%	16%	3%	0%
297	University of Akron	\$198	60%	15%	0%	0%	21%	4%	0%
302	California Polytechnic State University, San Luis Obispo	\$195	59%	16%	0%	0%	21%	4%	0%
Weighted Average			53%	21%	1%	3%	18%	3%	1%

Notes:

[1] In cases where the Medium and Small size endowments listed "Real Assets," they were divided between "Natural Resources" and "Other Real Assets" according to the same sectoral breakdown as the Large Endowments. Generally only the large endowments split the two categories, and thus the breakdown was used for the Medium and Small size endowments. In all other cases of a Medium or Small size endowment not listing a breakdown between categories, the average breakdown for the respective endowment size was used.

[2] Generally, in cases where public information on holdings was not available for a specified university, the next largest university endowment was selected. For instance, if the university ranked 120th did not provide public data on its holdings, it was replaced with the university ranked 121st.

[3] The endowment sizes are as of the end of Fiscal Year 2015.

Sources: *The Chronicle of Higher Education*; University Endowment Filings.

Exhibit B-1 Estimated Transaction Costs of Divestment

Large Endowment Universities

Rank	School Name	Endowment Size (MM)	Transaction Cost Amount (\$MM)			Transaction Cost (% of Total Endowment)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
1	Harvard University	\$36,449	\$269.51	\$656.87	\$919.60	0.74%	1.80%	2.52%
2	Yale University	\$25,572	\$143.41	\$532.58	\$793.68	0.56%	2.08%	3.10%
3	University of Texas system	\$24,083	\$227.15	\$520.51	\$718.46	0.94%	2.16%	2.98%
4	Princeton University	\$22,723	\$122.85	\$488.83	\$735.01	0.54%	2.15%	3.23%
5	Stanford University	\$22,223	\$152.45	\$476.43	\$695.08	0.69%	2.14%	3.13%
6	Massachusetts Institute of Technology	\$13,475	\$15.68	\$129.46	\$207.29	0.12%	0.96%	1.54%
7	Texas A&M University System	\$10,477	\$52.52	\$113.30	\$155.96	0.50%	1.08%	1.49%
8	Northwestern University	\$10,193	\$48.06	\$170.46	\$253.29	0.47%	1.67%	2.48%
9	University of Pennsylvania	\$10,134	\$32.57	\$165.56	\$255.95	0.32%	1.63%	2.53%
10	University of Michigan, Ann Arbor	\$9,952	\$41.19	\$169.59	\$256.39	0.41%	1.70%	2.58%
	Weighted Average	\$18,528	\$110.54	\$342.36	\$499.07	0.60%	1.85%	2.69%

Notes:

[1] Scenario 1 involves divesting from 6.4% of Traditional Equity, 0% of Alternative Equity, 68% of Natural Resources, and 0% of Fixed Income. Scenario 2 involves divesting from 25% of Traditional Equity, 30% of Alternative Equity, 68% of Natural Resources, and 15% of Fixed Income. Scenario 3 involves divesting from 50% of Traditional Equity, 50% of Alternative Equity, 68% of Natural Resources, and 30% of Fixed Income.

[2] Transaction costs are assumed to be 0.32% for Traditional Equity, 10% for Alternative Equity, 10% for Natural Resources, and 0.079% for Fixed Income.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports.

Exhibit B-2 Estimated Transaction Costs of Divestment

Medium Endowment Universities

Rank	School Name	Endowment Size (MM)	Transaction Cost Amount (\$MM)			Transaction Cost (% of Total Endowment)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
100	University of Miami	\$887	\$2.93	\$9.89	\$14.73	0.33%	1.11%	1.66%
105	Hamilton College	\$856	\$2.33	\$6.00	\$8.64	0.27%	0.70%	1.01%
110	Virginia Tech	\$818	\$3.78	\$9.21	\$12.94	0.46%	1.13%	1.58%
115	University of Houston System	\$795	\$1.09	\$10.82	\$17.46	0.14%	1.36%	2.20%
121	Lafayette College	\$778	\$0.08	\$7.58	\$12.73	0.01%	0.97%	1.64%
125	Rochester Institute of Technology	\$759	\$2.17	\$10.81	\$16.70	0.29%	1.43%	2.20%
131	Colorado College	\$720	\$1.67	\$10.27	\$16.13	0.23%	1.43%	2.24%
139	Drexel University	\$668	\$2.06	\$5.03	\$7.15	0.31%	0.75%	1.07%
141	Fordham University	\$666	\$0.03	\$9.22	\$15.40	0.00%	1.38%	2.31%
145	Auburn University	\$642	\$2.51	\$9.89	\$14.91	0.39%	1.54%	2.32%
	Weighted Average	\$759	\$1.86	\$8.87	\$13.68	0.25%	1.17%	1.80%

Notes:

[1] Scenario 1 involves divesting from 6.4% of Traditional Equity, 0% of Alternative Equity, 68% of Natural Resources, and 0% of Fixed Income. Scenario 2 involves divesting from 25% of Traditional Equity, 30% of Alternative Equity, 68% of Natural Resources, and 15% of Fixed Income. Scenario 3 involves divesting from 50% of Traditional Equity, 50% of Alternative Equity, 68% of Natural Resources, and 30% of Fixed Income.

[2] Transaction costs are assumed to be 0.32% for Traditional Equity, 10% for Alternative Equity, 10% for Natural Resources, and 0.079% for Fixed Income.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports.

Exhibit B-3 Estimated Transaction Costs of Divestment

Small Endowment Universities

Rank	School Name	Endowment Size (MM)	Transaction Cost Amount (\$MM)			Transaction Cost (% of Total Endowment)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
250	University of California, Santa Barbara	\$266	\$0.03	\$2.04	\$3.44	0.01%	0.77%	1.29%
255	Bates College	\$262	\$0.31	\$3.79	\$6.16	0.12%	1.45%	2.36%
261	The Citadel	\$254	\$0.55	\$2.79	\$4.33	0.22%	1.10%	1.70%
266	University of Idaho	\$240	\$0.03	\$0.54	\$0.95	0.01%	0.23%	0.40%
270	University of North Dakota	\$231	\$0.02	\$1.34	\$2.27	0.01%	0.58%	0.98%
275	Kalamazoo College	\$220	\$0.11	\$2.01	\$3.33	0.05%	0.92%	1.51%
285	San Diego State University	\$209	\$0.22	\$0.93	\$1.45	0.11%	0.44%	0.69%
289	Florida Atlantic University	\$205	\$0.80	\$2.08	\$2.98	0.39%	1.02%	1.45%
297	University of Akron	\$198	\$0.02	\$0.99	\$1.69	0.01%	0.50%	0.85%
302	California Polytechnic State University, San Luis Obispo	\$195	\$0.02	\$1.03	\$1.75	0.01%	0.53%	0.90%
	Weighted Average	\$228	\$0.21	\$1.76	\$2.83	0.09%	0.77%	1.24%

Notes:

[1] Scenario 1 involves divesting from 6.4% of Traditional Equity, 0% of Alternative Equity, 68% of Natural Resources, and 0% of Fixed Income. Scenario 2 involves divesting from 25% of Traditional Equity, 30% of Alternative Equity, 68% of Natural Resources, and 15% of Fixed Income. Scenario 3 involves divesting from 50% of Traditional Equity, 50% of Alternative Equity, 68% of Natural Resources, and 30% of Fixed Income.

[2] Transaction costs are assumed to be 0.32% for Traditional Equity, 10% for Alternative Equity, 10% for Natural Resources, and 0.079% for Fixed Income.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports.

Exhibit C-1: Expense Ratio Comparison
Active Funds: Socially Conscious vs. Non-Social

Socially Conscious Funds

Non-Social Funds

<i>Socially Conscious Funds</i>			<i>Non-Social Funds</i>		
Largest Socially Conscious Funds	Prospectus Net Expense Ratios	Fund Size	Largest Non-Social Funds	Prospectus Net Expense Ratios	Fund Size
1 Parnassus Core Equity Institutional	0.67	\$12,580,328,948	1 T. Rowe Price Growth Stock I	0.53	\$43,664,639,985
2 Neuberger Berman Socially Rspns Inst	0.68	\$2,265,114,026	2 Harbor International Institutional	0.76	\$39,840,900,709
3 Calvert Equity I	0.66	\$2,133,672,688	3 MFS® Value I	0.62	\$36,564,411,537
4 Ariel Fund Institutional	0.72	\$2,009,194,903	4 T. Rowe Price Blue Chip Growth I	0.58	\$30,710,896,780
5 Ariel Appreciation Institutional	0.79	\$1,754,647,501	5 Oppenheimer Developing Markets I	0.86	\$28,846,193,993
6 Eventide Gilead I	1.18	\$1,583,552,370	6 MFS® International Value I	0.78	\$25,928,678,858
7 Parnassus Endeavor Institutional	0.83	\$1,437,680,361	7 Harbor Capital Appreciation Instl	0.65	\$25,609,611,272
8 Domini Social Equity Instl	0.8	\$931,174,116	8 Fidelity Advisor® New Insights Z	0.53	\$25,536,713,431
9 Parnassus Institutional	0.77	\$738,299,648	9 T. Rowe Price Mid-Cap Growth I	0.63	\$24,240,170,655
10 Parnassus Mid Cap Institutional	0.85	\$648,407,968	10 Franklin Mutual Global Discovery Z	0.99	\$23,123,084,687
Average	0.795	\$2,608,207,253	Average	0.693	\$30,406,530,191

Comparison

Type of Fund	Average Prospectus Net Expense Ratio
Socially Conscious Funds	0.795
Non-Social Funds	0.693
Difference	0.102

- Notes:**
- [1] Open-Ended U.S. Equity Mutual Funds with Institutional Share Classes were used. Funds with minimum investment of \$100,000,000 and below were selected.
 - [2] Fund Size is as of April 15, 2016 (date Morningstar was accessed).
 - [3] For Open-Ended U.S. Equity Mutual Funds Prospectus Net Expense Ratio for Institutional Share Class is reported. For funds with multiple institutional share classes, the lowest expense ratio is reported.
 - [4] Funds were classified as active if not classified as index funds by Morningstar.
 - [5] The TIAA-CREF Social Choice Eq Instl Fund was eliminated from the analysis since it has a special expense fee arrangement.
 - [6] Funds were determined to be socially conscious if classified as such by Morningstar. Social funds which did not filter investments according to environmental considerations were deleted from the analysis.

Source: Morningstar.

Exhibit C-2: Expense Ratio Comparison Passive Funds: Socially Conscious vs. Non-Social

Socially Conscious Funds

Largest Socially Conscious Funds	Prospectus Net Expense Ratios	Fund Size
1 Vanguard FTSE Social Index I	0.15	\$2,057,300,030
2 Calvert US Large Cap Core Rspnb Idx I	0.19	\$689,478,796
3 PowerShares Water Resources ETF	0.61	\$662,194,532
4 iShares MSCI KLD 400 Social	0.50	\$504,328,680
5 Pax MSCI International ESG Idx Instl	0.56	\$441,152,714
6 Guggenheim S&P Global Water ETF	0.64	\$367,767,219
7 iShares MSCI USA ESG Select	0.50	\$362,149,793
8 Northern Global Sustainability Index	0.31	\$247,332,862
9 Guggenheim Solar ETF	0.70	\$238,099,611
10 iShares MSCI ACWI Low Carbon Target	0.20	\$224,261,776
<i>Average</i>	<i>0.436</i>	<i>\$579,406,601</i>

Non-Social Funds

Largest Non-Social Funds	Prospectus Net Expense Ratios	Fund Size
1 Vanguard Institutional Index I	0.04	\$199,079,278,324
2 SPDR® S&P 500 ETF	0.09	\$188,396,063,382
3 Fidelity Spartan® 500 Index Instl	0.04	\$93,556,793,952
4 iShares Core S&P 500	0.07	\$71,824,662,531
5 Vanguard Mid-Cap ETF	0.09	\$67,297,382,618
6 Vanguard Mid Cap Index InstlPlus	0.06	\$67,297,382,618
7 Vanguard Total Stock Market ETF	0.05	\$59,576,974,731
8 Vanguard Total Stock Mkt Idx Instl Pls	0.02	\$59,576,974,731
9 Vanguard FTSE Developed Markets ETF	0.09	\$56,244,260,579
10 Vanguard Developed Markets Idx InstlPls	0.06	\$56,244,260,579
<i>Average</i>	<i>0.061</i>	<i>\$91,909,403,405</i>

Comparison

Type of Fund	Average Prospectus Net Expense Ratio
Socially Conscious Funds	0.436
Non-Social Funds	0.061
<i>Difference</i>	<i>0.375</i>

Notes:

[1] Open-Ended U.S. Equity Mutual Funds with Institutional Share Classes and Exchange-Traded Funds were used. Funds with minimum investment of \$100,000,000 and below were selected.

[2] Fund Size is as of April 15, 2016 (date Morningstar was accessed).

[3] For Open-Ended U.S. Equity Mutual Funds Prospectus Net Expense Ratio for Institutional Share Class is reported. For funds with multiple institutional share classes, the lowest expense ratio is reported.

[4] For Socially Conscious Funds, Calvert Water I was excluded (expense ratio of 0.93% as outlier).

[5] For Non-Social Funds, REITs and iShares MSCI EAFE (expense ratio of 0.33% as outlier) were excluded.

[6] Funds were determined to be socially conscious if classified as such by Morningstar. Social funds which did not filter investments according to environmental considerations were deleted from the analysis.

Source: Morningstar.

Exhibit C-3: Expense Ratio Comparison Active Socially Conscious Funds vs. Passive Non-Social Funds

Socially Conscious Funds

Largest Socially Conscious Funds	Prospectus Net Expense Ratios	Fund Size
1 Parnassus Core Equity Institutional	0.67	\$12,580,328,948
2 Neuberger Berman Socially Rspns Inst	0.68	\$2,265,114,026
3 Calvert Equity I	0.66	\$2,133,672,688
4 Ariel Fund Institutional	0.72	\$2,009,194,903
5 Ariel Appreciation Institutional	0.79	\$1,754,647,501
6 Eventide Gilead I	1.18	\$1,583,552,370
7 Parnassus Endeavor Institutional	0.83	\$1,437,680,361
8 Domini Social Equity Instl	0.80	\$931,174,116
9 Parnassus Institutional	0.77	\$738,299,648
10 Parnassus Mid Cap Institutional	0.85	\$648,407,968
Average	0.795	\$2,608,207,253

Non-Social Funds

Largest Non-Social Funds	Prospectus Net Expense Ratios	Fund Size
1 Vanguard Institutional Index I	0.04	\$199,079,278,324
2 SPDR® S&P 500 ETF	0.09	\$188,396,063,382
3 Fidelity Spartan® 500 Index Instl	0.04	\$93,556,793,952
4 iShares Core S&P 500	0.07	\$71,824,662,531
5 Vanguard Mid-Cap ETF	0.09	\$67,297,382,618
6 Vanguard Mid Cap Index InstlPlus	0.06	\$67,297,382,618
7 Vanguard Total Stock Market ETF	0.05	\$59,576,974,731
8 Vanguard Total Stock Mkt Idx Instl Pls	0.02	\$59,576,974,731
9 Vanguard FTSE Developed Markets ETF	0.09	\$56,244,260,579
10 Vanguard Developed Markets Idx InstlPls	0.06	\$56,244,260,579
Average	0.061	\$91,909,403,405

Comparison

Type of Fund	Average Prospectus Net Expense Ratio
Socially Conscious Funds	0.795
Non-Social Funds	0.061
Difference	0.734

Notes:

[1] Open-Ended U.S. Equity Mutual Funds with Institutional Share Classes were used. Funds with minimum investment of \$100,000,000 and below were selected.

[2] Fund Size is as of April 15, 2016 (date Morningstar was accessed).

[3] For Open-Ended U.S. Equity Mutual Funds Prospectus Net Expense Ratio for Institutional Share Class is reported. For funds with multiple institutional share classes, the lowest expense ratio is reported.

[4] Funds were classified as active if not classified as index funds by Morningstar.

[5] The TIAA-CREF Social Choice Eq Instl Fund was eliminated from the analysis since it has a special expense fee arrangement.

[6] For Non-Social Funds, REITs and iShares MSCI EAFE (expense ratio of 0.33% as outlier) were excluded.

[7] Funds were determined to be socially conscious if classified as such by Morningstar. Social funds which did not filter investments according to environmental considerations were deleted from the analysis.

Source: Morningstar.

Exhibit D-1 Estimated Ongoing Compliance Costs of Divestment

Large Endowment Universities

Rank	School Name	Endowment Size (MM)	Annual Compliance Cost (\$MM)			Annual Compliance Cost (% of Endowment)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
1	Harvard University	\$36,449	\$29.42	\$93.32	\$177.34	0.08%	0.26%	0.49%
2	Yale University	\$25,572	\$19.67	\$65.61	\$126.01	0.08%	0.26%	0.49%
3	University of Texas system	\$24,083	\$20.45	\$62.00	\$116.64	0.08%	0.26%	0.48%
4	Princeton University	\$22,723	\$19.70	\$67.16	\$129.56	0.09%	0.30%	0.57%
5	Stanford University	\$22,223	\$18.89	\$65.61	\$127.04	0.09%	0.30%	0.57%
6	Massachusetts Institute of Technology	\$13,475	\$10.27	\$33.34	\$63.68	0.08%	0.25%	0.47%
7	Texas A&M University System	\$10,477	\$10.13	\$29.32	\$54.56	0.10%	0.28%	0.52%
8	Northwestern University	\$10,193	\$9.84	\$28.71	\$53.52	0.10%	0.28%	0.53%
9	University of Pennsylvania	\$10,134	\$9.46	\$32.78	\$63.45	0.09%	0.32%	0.63%
10	University of Michigan, Ann Arbor	\$9,952	\$9.15	\$28.36	\$53.62	0.09%	0.28%	0.54%
	Weighted Average	\$18,528	\$15.70	\$50.62	\$96.54	0.08%	0.27%	0.52%

Note:

[1] Compliance costs for both traditional equities and alternative equities are assumed to be 0.10%, 0.38%, and 0.73% in the three scenarios, respectively. Compliance costs for fixed income are assumed to be 0.20%. See Exhibits C-1, C-2, and C-3 for determination of these cost factors.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports; Morningstar.

Exhibit D-2

Estimated Ongoing Compliance Costs of Divestment

Medium Endowment Universities

Rank	School Name	Endowment Size (MM)	Annual Compliance Cost (\$MM)			Annual Compliance Cost (% of Endowment)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
100	University of Miami	\$887	\$0.83	\$2.77	\$5.32	0.09%	0.31%	0.60%
105	Hamilton College	\$856	\$0.82	\$2.41	\$4.50	0.10%	0.28%	0.53%
110	Virginia Tech	\$818	\$0.72	\$1.86	\$3.37	0.09%	0.23%	0.41%
115	University of Houston System	\$795	\$0.80	\$2.64	\$5.07	0.10%	0.33%	0.64%
121	Lafayette College	\$778	\$0.81	\$2.49	\$4.70	0.10%	0.32%	0.60%
125	Rochester Institute of Technology	\$759	\$0.77	\$2.39	\$4.52	0.10%	0.32%	0.60%
131	Colorado College	\$720	\$0.71	\$2.26	\$4.30	0.10%	0.31%	0.60%
139	Drexel University	\$668	\$0.55	\$1.66	\$3.12	0.08%	0.25%	0.47%
141	Fordham University	\$666	\$0.66	\$1.90	\$3.53	0.10%	0.29%	0.53%
146	Auburn University	\$642	\$0.58	\$1.93	\$3.71	0.09%	0.30%	0.58%
Weighted Average		\$759	\$0.72	\$2.23	\$4.21	0.10%	0.29%	0.56%

Note:
 [1] Compliance costs for both traditional equities and alternative equities are assumed to be 0.10%, 0.38%, and 0.73% in the three scenarios, respectively. Compliance costs for fixed income are assumed to be 0.20%. See Exhibits C-1, C-2, and C-3 for determination of these cost factors.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports; Morningstar.

Exhibit D-3 Estimated Ongoing Compliance Costs of Divestment

Small Endowment Universities

Rank	School Name	Endowment Size (MM)	Annual Compliance Cost (\$MM)			Annual Compliance Cost (% of Endowment)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
250	University of California, Santa Barbara	\$266	\$0.28	\$0.86	\$1.61	0.11%	0.32%	0.61%
255	Bates College	\$262	\$0.29	\$0.87	\$1.63	0.11%	0.33%	0.62%
261	The Citadel	\$254	\$0.26	\$0.78	\$1.48	0.10%	0.31%	0.58%
266	University of Idaho	\$240	\$0.29	\$0.77	\$1.40	0.12%	0.32%	0.59%
270	University of North Dakota	\$231	\$0.27	\$0.68	\$1.23	0.12%	0.30%	0.53%
275	Kalamazoo College	\$220	\$0.26	\$0.73	\$1.35	0.12%	0.33%	0.61%
285	San Diego State University	\$209	\$0.23	\$0.60	\$1.10	0.11%	0.29%	0.53%
289	Florida Atlantic University	\$205	\$0.21	\$0.60	\$1.10	0.10%	0.29%	0.54%
297	University of Akron	\$198	\$0.24	\$0.64	\$1.18	0.12%	0.32%	0.59%
302	California Polytechnic State University, San Luis Obispo	\$195	\$0.23	\$0.63	\$1.15	0.12%	0.32%	0.59%
Weighted Average		\$228	\$0.26	\$0.72	\$1.32	0.11%	0.31%	0.58%

Note:

[1] Compliance costs for both traditional equities and alternative equities are assumed to be 0.10%, 0.38%, and 0.73% in the three scenarios, respectively. Compliance costs for fixed income are assumed to be 0.20%. See Exhibits C-1, C-2, and C-3 for determination of these cost factors.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports; Morningstar.

Exhibit E-1

Total Endowment Loss in Value over 20 Years

Large Endowment Universities

Rank	School Name	Endowment Size (MM)	Estimated Total Loss in Investment Returns due to Divestment (\$MM)			Estimated Investment Losses due to Divestment (%)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
1	Harvard University	\$36,449	\$2,765.82	\$7,948.21	\$13,691.55	2.24%	6.43%	11.07%
2	Yale University	\$25,572	\$1,726.95	\$5,816.35	\$10,155.68	1.99%	6.70%	11.70%
3	University of Texas system	\$24,083	\$2,054.28	\$5,551.66	\$9,359.15	2.51%	6.79%	11.45%
4	Princeton University	\$22,723	\$1,658.33	\$5,745.66	\$10,104.36	2.15%	7.45%	13.10%
5	Stanford University	\$22,223	\$1,706.23	\$5,609.61	\$9,827.69	2.26%	7.44%	13.03%
6	Massachusetts Institute of Technology	\$13,475	\$703.83	\$2,501.79	\$4,542.23	1.54%	5.47%	9.93%
7	Texas A&M University System	\$10,477	\$815.97	\$2,190.59	\$3,805.71	2.29%	6.16%	10.70%
8	Northwestern University	\$10,193	\$783.19	\$2,336.21	\$4,040.01	2.26%	6.75%	11.68%
9	University of Pennsylvania	\$10,134	\$707.64	\$2,562.32	\$4,604.19	2.06%	7.45%	13.39%
10	University of Michigan, Ann Arbor	\$9,952	\$716.67	\$2,310.63	\$4,049.47	2.12%	6.84%	11.99%
	Weighted Average	\$18,528	\$1,363.92	\$4,257.88	\$7,420.56	2.17%	6.77%	11.80%

Notes:

[1] Transaction costs are given in Exhibit B, and compliance costs are given in Exhibit D.

[2] In the case without divestment the endowment is assumed to earn a return of 6.3% per year. In the divestment case the initial endowment is reduced by the transaction cost for that endowment, and the 6.3% return each year is reduced by that endowment's annual compliance cost.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports; Morningstar.

Exhibit E-2

Total Endowment Loss in Value over 20 Years

Medium Endowment Universities

Rank	School Name	Endowment Size (MM)	Estimated Total Loss in Investment Returns due to Divestment (\$MM)			Estimated Investment Losses due to Divestment (%)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
100	University of Miami	\$887	\$62.63	\$203.82	\$366.78	2.08%	6.77%	12.18%
105	Hamilton College	\$856	\$59.73	\$169.26	\$300.53	2.06%	5.83%	10.34%
110	Virginia Tech	\$818	\$58.02	\$146.57	\$248.23	2.09%	5.28%	8.94%
115	University of Houston System	\$795	\$54.25	\$198.38	\$358.35	2.01%	7.36%	13.29%
121	Lafayette College	\$778	\$51.22	\$178.64	\$323.07	1.94%	6.77%	12.24%
125	Rochester Institute of Technology	\$759	\$56.16	\$183.13	\$324.55	2.18%	7.11%	12.61%
131	Colorado College	\$720	\$50.25	\$173.14	\$309.37	2.06%	7.08%	12.66%
139	Drexel University	\$668	\$41.57	\$119.94	\$213.44	1.83%	5.29%	9.41%
141	Fordham University	\$666	\$41.68	\$147.74	\$262.23	1.85%	6.54%	11.61%
146	Auburn University	\$642	\$45.19	\$151.74	\$270.17	2.07%	6.96%	12.40%
	Weighted Average	\$759	\$52.07	\$167.29	\$297.92	2.02%	6.50%	11.57%

Notes:

[1] Transaction costs are given in Exhibit B, and compliance costs are given in Exhibit D.

[2] In the case without divestment the endowment is assumed to earn a return of 6.3% per year. In the divestment case the initial endowment is reduced by the transaction cost for that endowment, and the 6.3% return each year is reduced by that endowment's annual compliance cost.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports; Morningstar.

Exhibit E-3 Total Endowment Loss in Value over 20 Years

Small Endowment Universities

Rank	School Name	Endowment Size (MM)	Estimated Total Loss in Investment Returns due to Divestment (\$MM)			Estimated Investment Losses due to Divestment (%)		
			Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
250	University of California, Santa Barbara	\$266	\$18.03	\$59.68	\$107.89	2.00%	6.61%	11.96%
255	Bates College	\$262	\$19.34	\$65.99	\$117.17	2.18%	7.44%	13.20%
261	The Citadel	\$254	\$18.03	\$57.65	\$102.86	2.09%	6.68%	11.92%
266	University of Idaho	\$240	\$18.26	\$49.50	\$88.00	2.25%	6.09%	10.82%
270	University of North Dakota	\$231	\$17.14	\$46.87	\$81.84	2.19%	5.99%	10.46%
275	Kalamazoo College	\$220	\$16.85	\$51.78	\$91.75	2.26%	6.94%	12.30%
285	San Diego State University	\$209	\$15.07	\$40.55	\$71.47	2.12%	5.71%	10.06%
289	Florida Atlantic University	\$205	\$15.98	\$43.82	\$76.38	2.30%	6.30%	10.99%
297	University of Akron	\$198	\$15.00	\$43.01	\$76.38	2.23%	6.39%	11.35%
302	California Polytechnic State University, San Luis Obispo	\$195	\$14.72	\$42.41	\$75.27	2.23%	6.42%	11.39%
	Weighted Average	\$228	\$16.84	\$50.13	\$88.93	2.18%	6.48%	11.50%

Notes:

[1] Transaction costs are given in Exhibit B, and compliance costs are given in Exhibit D.

[2] In the case without divestment the endowment is assumed to earn a return of 6.3% per year. In the divestment case the initial endowment is reduced by the transaction cost for that endowment, and the 6.3% return each year is reduced by that endowment's annual compliance cost.

Sources: *The Chronicle of Higher Education*; University Endowment Filings and Reports; Morningstar.