

**Fossil Fuel Divestment and Its Potential Impacts On
Students, Faculty and Other University and Pension Stakeholders**

Hendrik Bessembinder*

Arizona State University, University of Washington, and Compass Lexecon

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Abstract

Fossil fuel divestment involves the sale by universities, pension funds, or other institutions, of financial securities issued by companies engaged in fossil-fuel related activities. Divestment can be seen as a symbolic expression of an institution's views on fossil energy-related environmental issues. Well-governed institutions will consider the costs of such an expressive statement, as well as who will bear those costs. Unlike the potential effects of a consumer boycott, which would presumably involve reduced consumption of energy derived from fossil fuels or reduced consumption of goods or services that require fossil fuel energy for their production, divestment has no direct effect on emissions of greenhouse gases, because divestment only leads to changes in the ownership of financial securities. However, divestment does involve real costs in terms of reduced diversification, ongoing compliance costs, and transaction costs. These costs are not just entries in accounting ledgers, but must be borne by the stakeholders of divesting institutions, potentially including students, faculty and staff, and pensioners. Further, these costs involve transfers of wealth from divesting institutions to financial-sector firms. I present a framework for assessing such costs. Based on illustrative assumptions calibrated to actual data, I calculate that the costs of divestment are equivalent to annual tuition increases (or equivalent reductions in tuition scholarships) of approximately \$123 to \$385 at a representative public university or \$1,043 to \$3,265 at a representative private university. Under similar assumptions, divestment equates to a reduction in monthly pension benefits of approximately five to seven percent for a typical pensioner.

* I am a Professor of Finance, and hold the Francis J. and Mary B. Labriola Endowed Chair, at the W.P. Carey School of Business of Arizona State University. I am also an Affiliate Professor in Business Economics and Finance at the Foster School of Business of the University of Washington, and a Senior Consultant to Compass Lexecon, an economic research and consulting company. The views expressed in this article are my own, and I do not speak for Arizona State University, the University of Washington, or Compass Lexecon. I previously held faculty positions at the University of Utah, the University of Rochester, and Emory University. My research focuses on financial markets, including stock, bond, energy, foreign exchange, and non-traditional markets, and has been published in the most prestigious peer-reviewed finance journals. I am Managing Editor of the *Journal of Financial and Quantitative Analysis*, and Associate Editor of the *Journal of Financial Economics* and the *Journal of Financial Markets*. From 2006 to 2015, I was a member of the Investment Advisory Committee for the University of Utah Endowment. I have been assisted in preparing this report by members of Compass Lexecon's professional staff. This study was commissioned and financed by the Independent Petroleum Association of America.

Fossil fuel divestment is a relatively new movement that has emerged on college and university campuses over the past few years. Advocates argue that university endowments (as well as other institutional investors, such as pension funds) should rid their portfolios of stocks and other securities that are, in the words of the leading divestment group, Fossil Free, “unethical or morally ambiguous.”¹ The companies targeted for divestment are those that proponents argue most contribute to global warming through the management or ownership of fossil fuels.

Why divest? As Fossil Free puts it, “[f]ossil fuel investments are a risk for both investors and the planet,” and divestment would “take[] the fossil fuel industry to task for its culpability in the climate crisis,” “highlight[] the moral dimensions of climate change,” “help break the hold that the fossil fuel industry has on our economy and our governments,” and eliminate the “vener of legitimacy” society gives these companies.²

The rationale for divestment expressed by Fossil Free is typical of that used by divestment advocates, in that it emphasizes broad but amorphous and hard-to-measure outcomes, such as taking the industry “to task.” Such statements fail to provide institutions considering divestment with a specific statement of the possible benefits of divestment or how they would be achieved. Missing is a clear articulation of exactly how targeted companies would be affected by divestment, what the expected magnitude of any such effects would be, or how advocates hope the targeted companies will respond. In fact, as discussed below, it is far from clear that even very broad adoption of fossil fuel divestment would affect the targeted companies in any measurable and relevant dimension.

Perhaps more important, while advocates proclaim benefits of divestment, they do not address the costs that would result, or who would bear those costs. Even if one is fully committed to the necessity of immediate action to combat climate change, the pursuit of a widespread divestment movement may have opportunity costs in the sense of limiting other approaches to the problem that may be more likely to succeed, such as corporate engagement, conservation advocacy, the investment of additional resources into energy technology research and development activities, and so on. Further, as discussed below, there are substantial real monetary costs from divestment, which are ultimately borne by the stakeholders of the universities or pension funds that divest, potentially including students, faculty, and pensioners. No serious investment manager or trustee can ignore these costs, even if sympathetic to the goals of the divestment movement.

The bottom line to university endowment and pension fund administrators, as well as investors in general, is that fossil fuel divestment involves substantial costs. The costs borne by any particular institution and its stakeholders will differ depending on a number of factors, but the existence and importance of these costs is objectively demonstrable. I provide below some illustrative calculations that demonstrate the types of costs and their general magnitude, which may form an outline for an institution’s own specific analysis. Against these costs, there is little or no basis in economics or history to believe that portfolio divestment will affect environmental outcomes in any measurable way, as divestment simply shifts the ownership of financial securities across investors, without any direct effect on operational decisions. Divestment can be seen as a symbolic expression of an institution’s views on

1. <https://gofossilfree.org/what-is-fossil-fuel-divestment/>

2. *Ibid.*

fossil-energy related environmental issues. Even so, well-governed institutions will consider the costs of such an expressive statement, who will bear those costs, and whether there are less costly alternative ways of expressing those views.

A Brief History

It is important to distinguish portfolio divestment from boycotts.³ Portfolio divestment involves the sale of securities – in particular, stocks and bonds issued by certain firms. Importantly, other investors purchase these same securities, and there is no direct effect on the operations of the affected firms. Boycotts, in contrast, involve decisions by consumers to not purchase the products or services offered by certain firms, along with efforts to persuade other consumers to do likewise. In the case of fossil fuels, boycotts would presumably involve consumers purchasing less energy produced from fossil fuels, or purchasing less of the products or services offered by firms who themselves rely on fossil fuel energy. Boycotts potentially disrupt operations at targeted firms because they can reduce revenue and profit. While many boycotts fail because they attract too few participants, there have been notable successes, and there is no reason to dismiss the possibility that a boycott can affect the operations and decisions of targeted firms.⁴ In contrast, as I discuss further below, there is little or no reason to think that transfers of securities between investors, as occurs with portfolio divestment, will directly affect the companies that issued the securities.

While there have been high-profile divestment movements in the past, even the most widely-adopted of these, that targeting South African companies during the late Apartheid era of the 1970s and 1980s, was (however meritorious on moral grounds) largely unsuccessful at affecting targeted companies. At its peak, over a hundred universities, plus key state public pension funds, pledged to divest from South African companies.⁵ However, academic studies consistently demonstrate that portfolio divestment did not materially impact South African companies.⁶

3. Portfolio divestment is also distinct from what might be termed operational divestment, where an organization ceases to conduct certain business operations, or sells off an operating division or operating assets. Lytle and Joy (1996) show that operational divestment is associated with reductions in share prices for the divesting firms. Laurian Casson Lytle and O. Maurice Joy (1996) “The stock market impact of social pressure: The South African divestment case,” *The Quarterly Review of Economics and Finance*, 36(4):507-27.

4. See, e.g., the findings of Robert Innes and Abdoul G. Sam (2008) “Voluntary pollution reductions and the enforcement of environmental law: An empirical study of the 33/50 program,” *Journal of Law and Economics*, 51(2):271-96.

5. William H. Kaempfer, James A. Lehman, and Anton D. Lowenberg (1987) “Divestment, Investment Sanctions, and Disinvestment: An Evaluation of Anti-Apartheid Policy Instruments,” *International Organization* 41(3):457-73.

6. See Siew Hong Teoh, Ivo Welch, and C. Paul Wazzan (1999) “The effect of socially activist investment policies on the financial markets: Evidence from the South African boycott,” *Journal of Business* 72(1):35-89, at pp. 79-83 (“We find no support for the common perception – and often vehement rhetoric in the financial media – that the anti-apartheid shareholder and legislative boycotts affected the financial sector adversely: the announcement of legislative or shareholder pressure had *no* discernable effect on the valuation of banks and corporations with South Africa operations or on the South African financial markets ... One explanation may be that the boycott primarily reallocated shares and operations from ‘socially responsible’ to more indifferent investors and countries.”). See also Laurian Casson Lytle and O. Maurice Joy (1996) “The stock market impact of social pressure: The South African divestment case,” *The Quarterly Review of Economics and Finance* 36(4):507-27 (“It appears

As compared to the South African divestment movement, where it was reasonably clear which firms operated in South Africa, it is more complicated to identify the appropriate firms to target for fossil fuel divestment, as almost all companies use fossil fuels in some way. Moreover, while many scientists with relevant expertise agree that climate change is a real phenomenon, there is a lack of unanimity as to the most effective and least-disruptive ways to address it. In contrast, Apartheid was the object of essentially uniform condemnation in the U.S. and elsewhere around the world during the 1980s.⁷ If South African divestment was unsuccessful in achieving its goals, it is questionable whether fossil fuel divestment, which to date has attracted less support from major institutional investors, can accomplish more.

Advocacy for fossil fuel divestment is in evidence across a number of U.S. university campuses today, supported principally by student groups, as well as certain national environmental organizations. While there had previously been sporadic attempts at organizing divestments around environmental issues, the start of the current fossil fuel divestment movement took place on the campus of Swarthmore College in 2011.⁸ By the end of that year, Hampshire College became the first institution of higher learning to announce it would divest.⁹ Over the ensuing years, a number of other, mostly smaller schools, announced their intention to join the divestment ranks, including University of Dayton,¹⁰ Chico State University,¹¹ The New School,¹² and the Rhode Island School of Design.¹³

However, on balance, successes in actually convincing university endowment funds to divest have been few and far between. Some larger and more recognizable institutions have also pledged to divest, but only in small part. Georgetown University,¹⁴ Stanford University,¹⁵ and the University of

that portfolio divestment announcements by major pension funds and endowment associations had no important impact on stock prices of firms doing business in South Africa.”)

7. See Alex Thomson (2008) *U.S. Foreign Policy Towards Apartheid South Africa, 1948-1994: Conflict of Interests*, Palgrave Macmillan, at p. 132 (“A CBS poll [in the U.S.] of September 1985, for instance, found that only 3 percent of its sample approved of apartheid ...”). By contrast, in the most recent Gallup poll on the issue, 36 percent of Americans indicated they are worried either “only a little” or “not at all” about global warming. Lydia Saad and Jeffrey M. Jones, “U.S. Concern About Global Warming at Eight-Year High,” *Gallup.com*, March 16, 2016.

8. Michelle Y. Raji, “Timeline: Fossil Fuels Divestment,” *Harvard Crimson*, October 2, 2014.

9. *Ibid.*

10. “Dayton Divests,” June 23, 2014, https://udayton.edu/news/articles/2014/06/dayton_divests_fossil_fuels.php.

11. “University Foundation Board Approves Divestment of Fossil Fuel Holdings,” December 12, 2014, <http://www.csuchico.edu/news/archived-news/2014-fall/12-12-14-divestment.shtml>.

12. John Schwartz, “The New School Divests Fossil Fuel Stock and Refocuses on Climate Change,” *New York Times*, February 7, 2015.

13. “RISD To Divest from Fossil Fuel,” *The Westerly Pawcatuck Press*, June 11, 2015.

14. “Georgetown Divests from Direct Investments in Coal Companies,” June 4, 2015, <https://www.georgetown.edu/news/sustainability-policy-regarding-investments.html>.

15. “Stanford to divest from coal companies,” May 6, 2014, <http://news.stanford.edu/news/2014/may/divest-coal-trustees-050714.html>.

Washington¹⁶ vowed to divest from coal companies – a much more limited action than a full divestment that included oil and gas-related securities. Syracuse University,¹⁷ the University of Massachusetts,¹⁸ and the University of Maryland¹⁹ agreed to divest “direct holdings” of fossil fuel companies, *i.e.*, individual stocks and bonds, but not mutual funds, exchange-traded funds, or alternative investments like private equity funds that hold fossil fuel company securities. In most cases, the bulk of university endowment assets are held in such “indirect” asset classes, implying that these institutions may have divested few if any assets.²⁰

Many other major universities have seriously considered, but ultimately rejected, fossil fuel divestment, including Harvard University,²¹ the Massachusetts Institute of Technology,²² Cornell University,²³ the University of Michigan,²⁴ Wellesley College,²⁵ Pomona College,²⁶ Duke University,²⁷ New York University,²⁸ Tufts University,²⁹ and, ironically, Swarthmore College,³⁰ where the fossil fuel divestment movement began.

16. Victor Balta, “UW Regents vote to divest from coal companies,” *UW Today*, May 14, 2015, <http://www.washington.edu/news/2015/05/14/uw-regents-vote-to-divest-from-coal-companies/>.

17. Dave Tobin, “Syracuse University to divest fossil fuel investments,” *Syracuse.com*, April 1, 2015, http://www.syracuse.com/schools/index.ssf/2015/04/syracuse_university_to_divest_fossil_fuel_investments.html.

18. “UMass Becomes First Major Public University to Divest from Direct Fossil Fuel Holdings,” May 25, 2016, <https://www.umass.edu/newsoffice/article/umass-becomes-first-major-public>.

19. Carrie Wells, “University System of Maryland to direct its endowment away from fossil fuels,” *Baltimore Sun*, June 28, 2016.

20. For instance, Syracuse University appears to have had no direct investments in fossil fuels, in which case their decision to divest direct holdings changed little or nothing about their portfolio. See “Divest SU responds to university limiting fossil fuel investments” (letter to the editor), *Daily Orange*, April 1, 2015 (“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.”).

21. “Fossil Fuel Divestment Statement,” October 3, 2013, <http://www.harvard.edu/president/news/2013/fossil-fuel-divestment-statement>.

22. Laura Krantz, “MIT won’t divest from fossil-fuel firms,” *Boston Globe*, October 21, 2015.

23. Madeline Cohen, “Cornell Trustees Vote Against Fossil Fuel Divestment,” *Cornell Daily Sun*, February 3, 2016, <http://www.sustainablecampus.cornell.edu/blogs/news/posts/cornell-trustees-vote-against-fossil-fuel-divestment>.

24. “Addressing Climate Change as a Powerful Community,” <http://president.umich.edu/news-communications/on-the-agenda/addressing-climate-change-as-a-powerful-community/>.

25. “Wellesley’s Board of Trustees has carefully considered proposals of fossil fuel divestment,” <http://www.wellesley.edu/about/president/mytake/divestment>.

26. Caroline Bowman, “Pomona Opts Not to Divest,” *The Student Life*, September 27, 2013, <http://tsl.news/articles/2013/9/27/news/4139-pomona-opts-not-to-divest>.

27. Rachel Chason, “Administration rejects Divest Duke proposal,” *Duke Chronicle*, January 29, 2015, <http://www.dukechronicle.com/article/2015/01/administration-rejects-divest-duke-proposal>.

28. “The Board of Trustees’ Response to the University Senate Resolution on Fossil Fuel Divestment,” <https://www.nyu.edu/about/leadership-university-administration/board-of-trustees/the-board-of-trustees-response-to-the-university-senate-resolution-on-fossil-fuel-divestment.html>.

29. “Statement on Divestment from Fossil Fuel Companies,” <http://president.tufts.edu/blog/2014/02/12/statement-on-divestment-from-fossil-fuel-companies/>.

30. Matt Gelb, “Swarthmore chooses not to divest fossil-fuel endowment,” *Philadelphia Inquirer*, May 3, 2015.

Having had limited success with university endowments, divestment advocates are increasingly turning towards public pension funds. However, the basic cost/benefit analysis of divestment, which is discussed below, is essentially the same for a public pension fund as for a university endowment. Hence, it is not clear that divestment will have more success with pension funds. In Vermont, for instance, the State Treasurer has opposed fossil fuel divestment, and the legislature has done little to take concrete steps toward divestment for the State's pension funds, despite pressure to do so from the Governor.³¹

What Are the Costs of Fossil Fuel Divestment?

Without looking closely at the economics of fossil fuel divestment, it may not be immediately clear why the response from so many universities, which are not known as havens for global warming skeptics or oil and gas industry apologists, has been so tepid. A recent literature, to which I have contributed, provides an answer to this puzzle. University administrators may sympathize deeply with the objectives of fossil fuel divestment, but ultimately, they have to be practical and recognize the costs that come with divestment and what those costs mean for stakeholders in the university.

The most readily apparent cost of divestment arises from the fact that any investor incurs transaction costs when selling securities, as well as when buying other securities to replace them. These costs include both commissions paid to brokers and implicit payments to those who effectively act as dealers. These implicit costs include bid-ask spreads and negative price impacts.³² All securities trading involves these types of costs, but for several reasons, they are particularly large in the case of fossil fuel divestment.

First, most major university endowments invest heavily in funds of various sorts – stock and bond mutual funds, exchange-traded funds, private equity funds, hedge funds, and so on, rather than in individual stocks and bonds.³³ The means that, even if only a small portion of a fund's assets are invested in fossil fuel companies, the entire fund must be sold (and some new set of assets purchased to replace it) in order to divest. This can dramatically increase the share of a university's portfolio that has to be turned over to fulfill a fossil fuel divestment pledge. Bates College, for instance, has stated that it would need to

31. Mike Polhamus, "Senate Panel Drops Fossil Fuel Divestment Legislation," *VT Digger*, March 15, 2016.

32. The bid-ask spread arises because the price that market participants will pay to a customer for a small sell order (the bid) is less than the price at which a small buy order would be executed (the ask). Price impact arises because larger orders are on average completed at prices inferior to the bid and ask quotes that were in effect when the execution of the order execution began. For a discussion of these explicit and implicit costs, see Zvi Bodie, Alex Kane, and Alan J. Marcus (2009) *Investments*, 8th ed., McGraw-Hill Irwin, at p. 71.

33. The most recent data from the National Association of College and University Business Officers indicates that U.S. colleges and universities hold, on average, 52 percent (on a dollar-weighted basis) of their endowment holdings in "alternative strategies," a category that is largely focused on private equity, hedge funds, and venture capital funds. This does not include simple holdings of stock or bond mutual funds or ETFs, which also appear to be popular among university endowments.

liquidate “between a third and a half of the entire endowment” in order to divest.³⁴ Swarthmore College has similarly stated that divestment would require it to sell 36 percent of its total portfolio value.³⁵

In some cases, a divestment pledge may essentially make particular classes of investments entirely off limits for an endowment. For instance, private equity has taken on an increasingly large role in many university endowments.³⁶ But I am not aware of any major private equity funds that have vowed to avoid fossil fuel investments. Hence, an endowment seeking to avoid such fossil fuel holdings might have to substantially scale back or even eliminate investments in private equity.

Another reason why divestment likely entails substantial transaction costs is that endowments, which quite appropriately have long-term investment horizons, hold relatively large shares of their portfolios in illiquid assets which have high transactions costs. For instance, the aforementioned private equity funds typically have only a very thin secondary market, unlike say exchange-traded stocks. A discount of 10 percent or more is not unusual for investors wanting to exit private equity holdings.³⁷ Similarly, holdings of real estate or other real assets may involve significant commissions and other transaction costs to liquidate.

In a recent study of 30 university endowments of different sizes, I estimated these transaction costs would range between 0.60 percent and 2.69 percent of the value of a typical large university endowment.³⁸ The smaller figure is a more appropriate measure of the cost of a minimal divestment action, similar to the cases discussed above of endowments that only divested “direct holdings.” The larger figure is a more appropriate estimate of the cost of a full fossil fuel divestment. These costs are unrecoverable and constitute immediate losses to the endowment. The foregone wealth is effectively transferred from the university endowment to brokerage firms and to those who purchase the divested securities, potentially including high frequency trading firms, banks, and hedge funds.

34. 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/>.

35. 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/>.

36. “North American foundations and endowments,” Private Equity International, https://www.privateequityinternational.com/north_american_foundations_and_endowments/ (“The largest university endowments rank among the most prominent investors in the asset class [private equity]. The University of California Regents Endowment Fund and University of Michigan endowment placed 29th and 49th respectively in the LP50 – a ranking of the biggest and most active investors into private equity during 1 March 2012 and 28 February 2013.”).

37. 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.”).

38. Hendrik Bessembinder (2016) “Frictional Costs of Fossil Fuel Divestment,” Working Paper, June 3, 2016, at pp. 16-17. Transaction costs for smaller endowments would be lower, but still material.

Transaction costs would generally only be incurred once, when divestment is implemented. However, there are likely to also be additional *ongoing* costs for an endowment to maintain compliance with any particular divestment vow. This is most clearly illustrated by the fact that money managers and fund managers who specialize in environmental investing charge fees for their services, and in fact, charge more than managers who do not specialize in environmental issues. In recent research, I compared typical fees charged by institutional equity mutual funds with an explicit environmental focus to fees charged by other popular (non-environmental) funds. I found that the environmental funds charged between 0.38 and 0.73 percentage points per year more than other funds (as a share of total assets under management), depending on whether one focuses on passive or actively-managed funds.³⁹

Of course, a university endowment fund could attempt to perform the same tasks that these environmental fund managers perform, but they are unlikely to be able to do so effectively, at least without substantial cost. An essential reason that complying with a divestment mandate is difficult and often requires specialized expertise is that what constitutes a “fossil fuel company” worthy of divestment is not always objectively clear. As a consequence, there is likely to be continuing costly re-evaluation of the companies in an endowment’s portfolio to assess which should be divested and which should not. This is not a task well-suited to generalist university fund administrators.

As an example of the challenges in identifying “fossil fuel companies,” another recent economic study of fossil fuel divestment found that there is very little overlap between competing divestment advocates’ lists of companies that should be divested.⁴⁰ At its core, these types of disagreements arise because the burning of fossil fuels reflects consumer demand for energy, while firms labeled as “fossil fuel companies” respond to that demand. For example, if an employee of the XYZ Corporation drives to work every day in a Chevrolet using gasoline purchased from a Shell gas station, there is no objective or simple way to allocate the carbon footprint of that activity between the driver, the XYZ Corp. that employs him, General Motors that manufactured the car, Shell Oil Co., whose logo appears on the service station, and the independent service station owner who distributes the fuel under the Shell brand, even putting aside all of the other companies that made the tires, built the road, and supported the processes that allowed for the hydrocarbons to be developed, processed, refined and transported to the gas station.

As I noted in my recent study, even ExxonMobil Corporation – viewed by some as the purest exemplar of a “fossil fuel company” – may not in fact be worthy of divestment in some advocates’ eyes. In fact, 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.”⁴¹ If reasonable observers do not agree as to whether ExxonMobil qualifies as a

39. Bessembinder (2016), *supra*, at p. 24.

40. See Daniel R. Fischel (2014) “Fossil Fuel Divestment: A Costly and Ineffective Investment Strategy,” at pp. 10 -11 (comparing the companies on the “Carbon Underground 200” and the “Greenhouse 100 Polluters Index,” and finding that there is no overlap among the top 10 companies, and only 11 companies on both lists overall).

41. <https://www.msci.com/documents/10199/e82d0059-d504-4f82-84e0-20a25194f3bf>.

suitable candidate for divestment, it is unlikely that endowment fund administrators can make a simple or objective determination for many companies. For these reasons, endowment funds are more likely to turn to specialist money managers with an environmental focus who can certify that a portfolio is “fossil free.” As noted, these managers do not work for free, and thus, divestment will likely generate additional ongoing costs to pay their fees. These fees comprise additional losses to an endowment that accumulate to reduce value year after year.

An additional ongoing cost of divestment that may be more hidden, but which is nevertheless also important for investors to recognize, is the lost diversification that comes with eliminating a major segment of the economy from a portfolio. The benefits of diversification in terms of risk reduction comprise a mathematical fact that appears in standard finance texts and is taught in business schools and economics departments around the world. In short, when the returns of two assets are not perfectly correlated, an investor can earn higher expected returns with the same level of risk (or experience lower portfolio risk at the same expected return) by splitting his investment dollars across the two assets instead of holding only a single asset. The lower the correlation in returns, the greater the benefit from choosing a well-diversified portfolio.

Fischel (2014) found that, of major sectors of the economy, the energy sector was the *least* correlated with the equity market as a whole. This implies that the diversification benefits of holding energy stocks, which would be foregone in the event of divestment, are especially large.⁴² Based on data over the last 50 years, he found that an optimally-diversified equity portfolio divested of energy stocks would be expected to underperform an optimal portfolio that included energy stocks by approximately 0.5 percent per year on average, on a risk-adjusted basis.⁴³ Of course, particular endowments’ portfolios may differ from the optimal ones analyzed by Fischel (2014). Indeed, Cornell (2015) studied five particular university endowments, and found a range of diversification losses due to divestment causing reductions in returns between 0.12 percent and 0.30 percent per year.⁴⁴ But there is no avoiding the mathematical fact that reduced diversification implies decreased expected return for a given level of risk, other things equal.⁴⁵

42. Fischel (2014), *supra*, at p. 8.

43. *Id.*, at p. 11. On a non-risk-adjusted basis, the difference is 0.7 percent per year.

44. Bradford Cornell (2015) “The Divestment Penalty: Estimating the Costs of Fossil Fuel Divestment to Select University Endowments,” at p. 4.

45. Other analysts have also attempted to estimate the diversification costs of divestment and come to different conclusions, but these studies are flawed in important ways. For instance, studies that compare stock returns for a specified index with returns to a similar index stripped of fossil fuel stocks often do not adjust for differences in risk between the divested and undivested portfolios. *See, e.g.*, Zahra Hirji (2015) “Fossil Fuel Divestment Has Grown to \$2.6 Trillion in Assets,” *InsideClimate News*, September 23. Other studies that do adjust for risk do not focus on an optimized portfolio, which reduces the relevance for investors. *See, e.g.*, Patrick Geddes, Lisa Goldberg, Robert Tymoczko, and Michael Branch (2016) “Building a Carbon-Free Equity Portfolio.” One recent unpublished academic study asserts that there are no appreciable portfolio costs to divestment, but focuses on “alpha” for a divested and a non-divested portfolio. As such, the evidence simply verifies that portfolios of divested and non-divested securities are properly priced by the market, on average. *See* Arjan Trinks, Bert Scholtens, Machiel Mulder, and Lammertjan Dam (2017) “Divesting Fossil Fuels: The Implications for Investment Portfolios,” University of Groningen SOM Research School working paper.

Assessing the Trade-Offs Necessitated by Divestment

The transactional costs of divestment reduce the value of an endowment immediately, while the ongoing costs of divestment reduce the rate of growth (or increase the rate of shrinkage, should the assets lose value) in the endowment over time. These costs imply that the university must reduce either current or future spending from the endowment, or some combination thereof. To assess the magnitude of the reductions in the spending that can be sustained by an endowment due to divestment, I make some simplifying assumptions.

First, I assume that the endowment is intended to fund spending on an open-ended, *i.e.*, perpetual, basis. Second, I assume that the endowment assets earn a constant annual return, R . Third, I assume that, in each year, the university spends a fixed percentage of the endowment's value as of the end of the prior year. That is, dollar spending in each year t is $S_t = s \times V_{t-1}$, where s is the fixed spending rate, and V denotes endowment asset value.

Given these simplifying assumptions, standard time-value formulae imply that the annual growth rate of the endowment value (and, given s is held fixed, the growth rate in endowment spending) is $g = R - s$. Equivalently, $s = R - g$.⁴⁶ That is, a university's choice of current spending rate implicitly determines the rate at which its endowment and endowment spending will grow through time. Of course, a higher rate of investment return, R , allows for higher spending for any given growth rate, or higher growth for any given spending rate.⁴⁷

The effects of divestment costs on endowment spending can be assessed in terms of this simple framework by noting that transactions costs affect current year spending $S_t = s \times V_{t-1}$ even with a constant spending rate, s , because transactions costs directly reduce the value of endowment assets, V . In addition, ongoing divestment costs reduce R , the return earned on endowment assets other things equal, and therefore require a reduction in the current spending rate, s , or in the future growth rate g of the endowment and endowment spending.

In Exhibit A, I demonstrate the required reduction in endowment spending implied by fossil fuel divestment for a representative university, when calibrated to actual data. I set the pre-divestment expected investment return, R , equal to 5.0 percent, which reflects the average annual return on university

46. The expression $s = R - g$ is simply a restatement of the "growing perpetuity" formula that is presented in any standard Corporate Finance or Investment textbook. *See, e.g.*, expression 4.12 in Stephen A. Ross, Randolph W. Westerfield, and Jeffrey Jaffe (2013) *Corporate Finance*, 8th edition, McGraw-Hill Irwin, at p. 108.

47. For simplicity, I ignore new contributions to the endowment. If new contributions are c percent of endowment value in each year, then the endowment value and endowment spending can grow over time at the rate $g = R + c - s$. The implication is that my calculations of g understate sustainable endowment growth rates by c percent per year. However, my calculations of the tuition increases or instructional expenditure decreases required to offset divestment costs and maintain endowment growth are unaffected.

Exhibit A
Estimated Change in Spending from Endowment Caused by Fossil Fuel Divestment

		[1]	[2]	[3]	[4]	[5]	[6]
<i>Pre-Divestment</i>							
Expected Annual Return on Funds ¹	[1]	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Annual Spending Rate ²	[2]	4.3%	4.3%	3.3%	5.3%	4.3%	4.3%
Implied Spending and Endowment Growth Rate	[3] = [1] - [2]	0.7%	0.7%	1.7%	-0.3%	0.7%	0.7%
Spending per \$100 of Endowment	[4] = \$100 x [2]	\$4.30	\$4.30	\$3.30	\$5.30	\$4.30	\$4.30
<i>Post-Divestment</i>							
Share of Endowment Subject to Increased Costs	[5]	75%	75%	75%	75%	50%	25%
Ongoing Management Costs ³	[6]	0.56%	0.56%	0.56%	0.56%	0.56%	0.56%
Diversification Costs ⁴	[7]	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%
Total Ongoing Costs of Divestment	[8] = [5] x ([6] + [7])	0.59%	0.59%	0.59%	0.59%	0.40%	0.20%
Expected Annual Return on Funds	[9] = [1] - [8]	4.41%	4.41%	4.41%	4.41%	4.61%	4.80%
Spending Rate	[10] = [9] - [3]	3.71%	3.71%	2.71%	4.71%	3.91%	4.10%
One-Time Transaction Costs of Divestment ⁵	[11]	1.65%	0.00%	1.65%	1.65%	1.65%	1.65%
Spending per \$100 of Pre-Divestment Endowment	[12] = \$100 x (1-[11]) x [10]	\$3.65	\$3.71	\$2.66	\$4.63	\$3.84	\$4.03
Percent Reduction in Spending from Endowment	[13] = ([12] / [4]) - 1	-15.20%	-13.78%	-19.31%	-12.64%	-10.68%	-6.17%

Notes:

1. Average Ten-Year Return for U.S. Higher Education Endowments and Affiliated Foundations for Periods Ending June 30, 2016, 2016 NACUBO-Commonfund Study of Endowments.
2. Average Annual Effective Spending Rates for U.S. College and University Endowments and Affiliated Foundations, Fiscal Years 2016 to 2007.
3. Based on midpoint of 0.38% - 0.73% range estimated in Bessembinder (2016).
4. Based on weighted average diversification cost calculated by Cornell (2015).
5. Based on midpoint of 0.60% - 2.69% range estimated in Bessembinder (2016).

endowment funds over the past ten years.⁴⁸ In the first two columns of Exhibit A, I set the spending rate *s* to 4.3 percent per year, which is consistent with the average annual spending rate for U.S. college and university endowments in 2016.⁴⁹ By the formula above, these choices imply sustainable growth in the endowment and, by consequence, in endowment spending, of 0.7 percent per year on average.

A university that sells a relatively modest share of its assets as part of a fossil fuel divestment program will nevertheless incur ongoing costs that apply to non-divested assets as well. This reflects that the broader portfolio suffers from reduced diversification and ongoing compliance costs. However, some portions of the endowment (*e.g.*, government bond holdings) might not be meaningfully subject to such increased costs. In column [1] of Exhibit A, I report the results obtained when I assume that the increased divestment costs apply to 75 percent of the endowment's portfolio.

48. Average returns for public and private universities are identical. 2016 NACUBO-Commonfund Study of Endowments, "Average Annual One-, Three-, Five-, and Ten-Year Returns for U.S. Higher Education Endowments and Affiliated Foundations for Periods Ending June 30, 2016."

49. 2016 NACUBO-Commonfund Study of Endowments, "Average Annual Effective Spending Rates for U.S. College and University Endowments and Affiliated Foundations, Fiscal Years 2016 to 2007." Again, the average spending rate for public universities (4.0 percent) is similar to that for private universities (4.4 percent).

For the portion of the portfolio subject to such costs, I assume that ongoing annual compliance costs are 0.56 percent per year (the midpoint of the 0.38 percent – 0.73 percent range discussed earlier), and that ongoing diversification costs are 0.23 percent per year, consistent with the weighted average across five large university endowments estimated by Cornell (2015).⁵⁰ In addition, I assume one-time trading costs are 1.65 percent (the midpoint of my 2016 estimate for divestment at a large endowment fund). Under these assumptions, the outcome (row 13 of column [1]) is that sustainable endowment spending is reduced, immediately and on an ongoing basis, by 15.2 percent due to divestment.

One-time transaction costs are less important over the long run as compared to the ongoing costs of divestment. To illustrate, in column [2] of Exhibit A, I repeat the calculations from column [1], except that one-time transaction costs are ignored. In this case, endowment spending falls by 13.8 percent. This estimated reduction in endowment spending applies every year under divestment.

In columns [3] and [4] of Exhibit A, I consider how the results would be altered for universities that spend from their endowment at a lower current rate ($s = 3.3$ percent, implying higher future endowment and spending growth) or a higher current rate ($s = 5.3$ percent, implying lower future growth) than average. The results indicate that lower current spending implies that spending must be decreased by a larger percentage as a result of divestment, and *vice versa*.

In columns [5] and [6] of Exhibit A, I consider how the results would vary if the endowment was able to reduce the proportion of assets subject to greater ongoing costs. For instance, if a university undertook a less rigorous divestment, or excluded major categories of assets from a divestment pledge, this could obviously reduce the costs of divestment – although presumably weakening whatever benefits may be thought to follow from divestment as well. Reducing the percentage of assets to which ongoing divestment costs apply from 75 percent (column [1]) to 50 percent (column [5]) implies that sustainable spending decreases by only 10.7 percent rather than 15.2 percent. Reducing the proportion of assets subject to increased ongoing costs to 25 percent of the endowment (column [6]) implies that the requisite decline in sustainable spending is further reduced to 6.2 percent. These computations highlight the reasons that universities may seek to placate divestment activists while minimizing the proportion of the endowment actually divested or pledged to remain fossil-free.

Who Pays the Costs of Divestment?

What do these costs of divestment mean for the stakeholders in the university? The answer depends, of course, on how the university responds to the reduction in sustainable endowment spending caused by divestment. In principle, the university could continue to fund the same amount of spending as before, notwithstanding a diminution in endowment fund returns. However, this level of spending would not be sustainable, and would simply imply that future students, faculty, and alumni would be forced to bear all the costs of divestment. Nevertheless, I will assess this possibility more fully below.

50. Bradford Cornell (2015) “The Divestment Penalty: Estimating the Costs of Fossil Fuel Divestment to Select University Endowments,” at p. 4.

The available evidence indicates that universities would likely respond to a decrease in endowments' abilities to fund spending with budget cuts. A study by Brown, *et al.* (2014) finds that shocks to endowments generally lead to immediate changes in payout rates from the endowment to the university budget.⁵¹ In particular, they find that a ten percent reduction in endowment value leads to an average 8.2 percent reduction in payout to the university.⁵² A recent study by Kantor and Whalley (2014) similarly finds that university expenditures vary by nine cents for every dollar of endowment value.⁵³

Case studies of university responses to the recent financial crisis are also consistent with this conclusion. For instance, Conti-Brown (2010-2011) documents that even the universities with the largest endowments made significant cuts during the crisis. For instance, Harvard University laid off 275 employees, offered early retirement to others, cut hot breakfasts from undergraduate dining halls, cut undergraduate student advising, eliminated student employment opportunities at university facilities, cut shuttle services for students at distant dorms, increased section sizes, and suspended annual conferences.⁵⁴ Other studies of university actions in response to the financial crisis come to similar conclusions.⁵⁵

In Exhibits B-1 and B-2, I calculate what the reductions in sustainable endowment spending by a university mean when stated in terms of tuition or instructional expenditures. Exhibit B-1 is calibrated to data on public universities, and Exhibit B-2 is calibrated to data on (nonprofit) private universities. I first consider outcomes if universities make up for reduced endowment spending capacity by increasing tuition.

51. Note that ongoing compliance costs of divestment occur in the future, and unlike the effects of the recent financial crisis, are not manifest in an immediate reduction in the market value of endowment assets. However, both ongoing compliance costs and a reduction in current asset value imply a reduction in sustainable spending from the endowment, other things equal.

52. Jeffrey R. Brown, Stephen G. Dimmock, Jun-Koo Kang, and Scott J. Weisbenner (2014) "How University Endowments Respond to Financial Market Shocks: Evidence and Implications," *American Economic Review* 104(3):931-962. These findings are based on shocks to the market value of a university endowment, whereas the costs of divestment mainly reflect a persistent drag on returns. Therefore, the impact of divestment on university budgets may be even larger than estimated in this study, since endowments cannot simply smooth out the shocks by borrowing against higher returns in some future year.

53. Shawn Kantor and Alexander Whalley (2014) "Knowledge Spillovers from Research Universities: Evidence from Endowment Value Shocks," *Review of Economics and Statistics* 96(1):171-88, at p. 178, *See also* Alexander Whalley and Justin Hicks (2013) "Spending Wisely? How Resources Affect Knowledge Production in Universities," *Economic Inquiry* 52(1):35-55, at p. 43 (describing "first-stage" empirical results, in which endowment market value is found to impact university research spending).

54. Peter Conti-Brown (2010-2011) "Note: Scarcity Amidst Wealth: The Law, Finance, and Culture of Elite University Endowments in Financial Crisis," *Stanford Law Review* 63:699-749, at pp. 744-45. Cuts of a similar nature took place at Yale University, Stanford University, Princeton University, and other schools with large endowments. *Id.*, at pp. 745-747.

55. *See, e.g.*, Ronald G. Ehrenberg (2009) "Demystifying Endowments," Cornell University ILR School Research Studies and Reports; Eric Hand and Alexandra Witze (2009) "Universities struggle as value of endowments falls," *Nature* 457(January), at p. 11.

As shown in Exhibit B-1, at the average public university in the U.S., six percent of the budget is derived from endowment returns, while 20 percent of the budget is derived from tuition and fees.⁵⁶ Rows

Exhibit B-1
Potential University Reactions to Endowment Losses Caused by Fossil Fuel Divestment
Public University

		[1]	[2]	[3]	[4]	[5]	[6]
Percent Reduction in Spending from Endowment	[1] = From Exhibit A (row [13])	-15.20%	-13.78%	-19.31%	-12.64%	-10.68%	-6.17%
<i>Tuition Increased to Fill Budget Hole from Divestment</i>							
Share of University Budget Funded by Investments ¹	[2]	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
Share of University Budget Funded by Tuition/Fees ¹	[3]	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Tuition Increase (%)	[4] = [1] x [2] / [3]	4.56%	4.13%	5.79%	3.79%	3.21%	1.85%
Mean Tuition/Fees (2013-2014 Dollars) ¹	[5]	\$6,639	\$6,639	\$6,639	\$6,639	\$6,639	\$6,639
Tuition Increase (\$)	[6] = [4] x [5]	\$303	\$274	\$385	\$252	\$213	\$123
<i>Instruction Expense Cut to Fill Budget Hole from Divestment</i>							
Share of University Budget Spent on Instruction ²	[7]	26.00%	26.00%	26.00%	26.00%	26.00%	26.00%
Instruction Expense Cut	[8] = [1] x [2] / [7]	3.51%	3.18%	4.46%	2.92%	2.47%	1.42%
<i>Future Spending Cut to Fill Budget Hole from Divestment</i>							
Expected Annual Return on Funds (Absent Divestment)	[9] = From Exhibit A (row [1])	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Annual Spending Rate (Absent Divestment)	[10] = From Exhibit A (row [2])	4.30%	4.30%	3.30%	5.30%	4.30%	4.30%
Implied Spending and Endowment Growth Rate	[11] = From Exhibit A (row [3])	0.70%	0.70%	1.70%	-0.30%	0.70%	0.70%
Spending Growth Over 10 Years	[12] = (1 + [11]) ¹⁰ - 1	7.22%	7.22%	18.36%	-2.96%	7.22%	7.22%
Spending Growth Over 50 Years	[13] = (1 + [11]) ⁵⁰ - 1	41.73%	41.73%	132.30%	-13.95%	41.73%	41.73%
Total Ongoing Costs of Divestment	[14] = From Exhibit A (row [8])	0.59%	0.59%	0.59%	0.59%	0.40%	0.20%
One-Time Transaction Costs of Divestment	[15] = From Exhibit A (row [11])	1.65%	0.00%	1.65%	1.65%	1.65%	1.65%
Spending Rate After Divestment	[16] = [10] / (100% - [15])	4.37%	4.30%	3.36%	5.39%	4.37%	4.37%
Spending Annual Growth Rate After Divestment	[17] = [9] - [14] - [16]	0.04%	0.11%	1.05%	-0.98%	0.23%	0.43%
Spending Growth Over 10 Years	[18] = (1 + [17]) ¹⁰ - 1	0.35%	1.08%	11.03%	-9.39%	2.35%	4.39%
Spending Growth Over 50 Years	[19] = (1 + [17]) ⁵⁰ - 1	1.78%	5.52%	68.76%	-38.93%	12.33%	23.95%
Reduction in Future Spending							
In 10 Years	[20] = (1 + [18]) / (1 + [12]) - 1	-6.41%	-5.73%	-6.19%	-6.63%	-4.54%	-2.65%
In 50 Years	[21] = (1 + [19]) / (1 + [13]) - 1	-28.19%	-25.55%	-27.35%	-29.03%	-20.74%	-12.55%

Notes:

1. Postsecondary Institution Revenues, National Center for Education Statistics, May 2016 (Public postsecondary institutions)
2. Postsecondary Institution Expenses, National Center for Education Statistics, May 2016 (Public postsecondary institutions)

4 and 6 of column [1] of Exhibit B-1 show that a 15.2 percent reduction in endowment spending (as derived in Exhibit A) would imply that, on average, a public university would need to raise tuition and fees (or decrease tuition scholarships by an equivalent amount) by 4.6 percent, or \$303 per year, to maintain its budget after divestment. Results for the other columns of Exhibit A are also reported in Exhibit B-1, and show that under other reasonable sets of assumptions, the tuition increase that would be necessary to cover the costs of divestment is material.

The requisite tuition increase attributable to divestment would be larger for universities where a greater proportion of the budget is funded by endowment spending, as is the case for a typical private

56. "Postsecondary Institution Revenues," National Center for Education Statistics, May 2016, https://nces.ed.gov/programs/coe/indicator_cud.asp.

university. Under the same assumptions as employed in column [1] of Exhibit B-1, column [1] of Exhibit B-2 shows that a private university would need to increase tuition by 12.7 percent, or \$2,571 per year, to maintain its overall budget after divestment. The impact on private universities is larger because they tend to fund more of their budget through endowment investment returns than do public universities. The other columns of Exhibit B-2 demonstrate the robustness of these results to alternative assumptions.

Exhibit B-2
Potential University Reactions to Endowment Losses Caused by Fossil Fuel Divestment
Private University

		[1]	[2]	[3]	[4]	[5]	[6]
Percent Reduction in Spending from Endowment	[1] = From Exhibit A (row [13])	-15.20%	-13.78%	-19.31%	-12.64%	-10.68%	-6.17%
Tuition Increased to Fill Budget Hole from Divestment							
Share of University Budget Funded by Investments ¹	[2]	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Share of University Budget Funded by Tuition/Fees ¹	[3]	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%
Tuition Increase (%)	[4] = [1] x [2] / [3]	12.67%	11.48%	16.09%	10.54%	8.90%	5.14%
Mean Tuition/Fees (2013-2014 Dollars) ¹	[5]	\$20,293	\$20,293	\$20,293	\$20,293	\$20,293	\$20,293
Tuition Increase (\$)	[6] = [4] x [5]	\$2,571	\$2,330	\$3,265	\$2,138	\$1,807	\$1,043
Instruction Expense Cut to Fill Budget Hole from Divestment							
Share of University Budget Spent on Instruction ²	[7]	33.00%	33.00%	33.00%	33.00%	33.00%	33.00%
Instruction Expense Cut	[8] = [1] x [2] / [7]	11.52%	10.44%	14.63%	9.58%	8.09%	4.67%
Future Spending Cut to Fill Budget Hole from Divestment							
Expected Annual Return on Funds (Absent Divestment)	[9] = From Exhibit A (row [1])	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Annual Spending Rate (Absent Divestment)	[10] = From Exhibit A (row [2])	4.30%	4.30%	3.30%	5.30%	4.30%	4.30%
Implied Spending and Endowment Growth Rate	[11] = From Exhibit A (row [3])	0.70%	0.70%	1.70%	-0.30%	0.70%	0.70%
Spending Growth Over 10 Years	[12] = (1 + [11]) ¹⁰ - 1	7.22%	7.22%	18.36%	-2.96%	7.22%	7.22%
Spending Growth Over 50 Years	[13] = (1 + [11]) ⁵⁰ - 1	41.73%	41.73%	132.30%	-13.95%	41.73%	41.73%
Total Ongoing Costs of Divestment	[14] = From Exhibit A (row [8])	0.59%	0.59%	0.59%	0.59%	0.40%	0.20%
One-Time Transaction Costs of Divestment	[15] = From Exhibit A (row [11])	1.65%	0.00%	1.65%	1.65%	1.65%	1.65%
Spending Rate After Divestment	[16] = [10] / (100% - [15])	4.37%	4.30%	3.36%	5.39%	4.37%	4.37%
Spending Annual Growth Rate After Divestment	[17] = [9] - [14] - [16]	0.04%	0.11%	1.05%	-0.98%	0.23%	0.43%
Spending Growth Over 10 Years	[18] = (1 + [17]) ¹⁰ - 1	0.35%	1.08%	11.03%	-9.39%	2.35%	4.39%
Spending Growth Over 50 Years	[19] = (1 + [17]) ⁵⁰ - 1	1.78%	5.52%	68.76%	-38.93%	12.33%	23.95%
Reduction in Future Spending							
In 10 Years	[20] = (1 + [18]) / (1 + [12]) - 1	-6.41%	-5.73%	-6.19%	-6.63%	-4.54%	-2.65%
In 50 Years	[21] = (1 + [19]) / (1 + [13]) - 1	-28.19%	-25.55%	-27.35%	-29.03%	-20.74%	-12.55%

Notes:

1. Postsecondary Institution Revenues, National Center for Education Statistics, May 2016 (Private nonprofit institutions)
2. Postsecondary Institution Expenses, National Center for Education Statistics, May 2016 (Private nonprofit institutions)

Alternatively, of course, a university could choose not to raise tuition, but could instead cut other expenses to offset the costs of divestment. But potential impacts of these cuts are largely fungible: unless there is serious waste in university spending that administrators can identify and target, these cuts will also harm students, faculty, and alumni, potentially as much as tuition hikes would. The biggest category of expenses at most universities is faculty/instruction costs. At an average U.S. public university, these

costs constitute 26 percent of all expenses.⁵⁷ As shown in column [1] of Exhibit B-1, I calculate that a 15.2 percent reduction in payout from the endowment (as calculated in Exhibit A) could be financed by a 3.5 percent reduction in faculty costs, which in turn can be obtained by offering fewer classes or by increasing class sizes. The equivalent figure in column [1] of Exhibit B-2 for private universities would be a larger 11.5 percent reduction in faculty costs, again reflecting that private institutions tend to be more heavily reliant on endowment funding.⁵⁸

As noted previously, endowment managers could (in principle) continue making payouts to the university as before, at least in the short run, and hence, not require any immediate tuition increases or spending cuts. However, this serves to increase the amount of future tuition increases or spending cuts that would be required. As a third possible outcome, I also estimated in Exhibits B-1 and B-2 the future spending reduction that would be required in order to maintain current spending.

The results of this calculation are the same for public and private universities. Focusing on column [1] of either Exhibit B-1 or B-2, the pre-divestment spending rate was 4.3 percent (or \$4.30 per \$100 of endowment value). Since transaction costs of divestment immediately reduce the value of the endowment, if the university wanted to maintain this dollar value of spending, the smaller base would require a slight increase in the current spending rate s , from 4.3 percent to 4.4 percent. More important, the ongoing costs of divestment mean that the annual increase in spending each year due to a larger endowment will be reduced. In particular, as shown in column [1] of Exhibits B-1 and B-2, the sustainable growth rate in the endowment value and hence, endowment spending, $g = R - s$, is reduced from 0.7 percent before divestment to approximately zero (technically, 0.04 percent) after divestment.

That is, a decision to maintain current endowment spending despite divestment costs implies lower endowment values and lower endowment spending in the future. The costs of divestment are not avoided, but are simply passed on to future university stakeholders. The magnitude of the future spending reductions depends on elapsed time. For example, relying on the assumptions delineated in column [1], the implied reduction in dollar spending 10 years in the future is 6.4 percent, and the implied reduction 50 years in the future is 28.2 percent.⁵⁹

These calculations, though illustrative in nature, help to make concrete the real costs to university stakeholders from divestment. Endowments exist to help universities attain institutional goals, and the costs of divestment are not just entries in an accounting ledger. Rather, divestment costs reduce the university's ability to fulfill its educational and research missions, and these costs are borne by university stakeholders, present and/or future.

57. "Postsecondary Institution Expenses," National Center for Education Statistics, May 2016, https://nces.ed.gov/programs/coe/indicator_cue.asp.

58. The same National Center for Education Statistics data as cited *supra* indicates that the average private (not-for-profit) university spends 33 percent of its budget on faculty/instruction.

59. One final possibility is that the reduction in an endowment's ability to support current and future spending attributable to divestment costs could be offset by new donations. Even then, the divestment would not be costless, as the increased donations required to offset divestment costs could otherwise have been used to fund other praiseworthy initiatives.

As noted above, having failed to gain much traction with university endowments, divestment advocates are increasingly turning to public pension funds as the next frontier for their cause. The same basic issues that make divestment costly for university endowments also apply to pension funds. While I have not analyzed in detail the magnitude of transaction costs, ongoing management costs, and diversification costs arising from investment at a typical pension fund, there is no doubt they would be material, and the estimates obtained for universities likely provide a useful guide.

Exhibit C
Estimated Benefits Cut Necessary to Fill Budget Hole
Caused by Fossil Fuel Divestment
Public Pension Fund

		[1]	[2]
<i>Pre-Divestment</i>			
Expected Annual Return on Funds (Absent Divestment) ¹	[1]	7.3%	7.3%
Length of Pension Obligation (Months)	[2]	360	360
Annuity Factor (Absent Divestment) ²	[3] = See Footnote 2	149.3	149.3
Maximum Sustainable Benefit Per \$100 of Pension	[4] = \$100 / [3]	\$0.67	\$0.67
<i>Post-Divestment</i>			
Share of Portfolio Subject to Increased Costs	[5]	75%	75%
Ongoing Management Costs ³	[6]	0.56%	0.56%
Diversification Costs ⁴	[7]	0.175%	0.175%
Total Ongoing Costs of Divestment	[8] = [5] x ([6] + [7])	0.55%	0.55%
Expected Annual Return on Funds	[9] = [1] - [8]	6.75%	6.75%
One-Time Transaction Costs of Divestment ⁵	[10]	1.65%	0.00%
Annuity Factor	[11] = See Footnote 2	157.4	157.4
Maximum Sustainable Benefit per \$100 of Fund Assets	[12] = \$100 x (1-[10]) / [11]	\$0.62	\$0.64
Percent Reduction in Maximum Sustainable Benefit	[13] = ([12] / [4]) - 1	-6.7%	-5.2%

Notes:

1. Cliffwater 2015 Report on State Pension Asset Allocation and Performance, September 8, 2015.
2. Expected Annual Return (r_a) is converted to monthly rate (r_m) based on the formula $r_m = (1+r_a)^{(1/12)} - 1$.
Then the annuity value is calculated as $(1/(r_m) \times (1 - (1+r_m)^{-360}))$.
3. Based on midpoint of 0.38% - 0.73% range estimated in Bessembinder (2016).
4. Based on midpoint of 0.15% and 0.20% calculated by FischeI, *et al.* (2017).
5. Based on midpoint of 0.60% - 2.69% range estimated in Bessembinder (2016).

For pension funds too, the costs of divestment are borne by the funds' stakeholders. Divestment costs reduce the monthly benefits that can be paid by a fund with a given value of pension assets. To maintain monthly benefit payments therefore requires larger contributions by pre-retirement workers or employers. In the absence of larger contributions, monthly benefits must fall to offset divestment costs.

Exhibit C provides an illustrative example of the magnitude of reductions in monthly benefits to pensioners that might be caused by pension fund divestment. I assume for these calculations that the pension is fully funded, and has promised fixed monthly payments to a given retiree over thirty years.⁶⁰ I consider the same full and partial divestment costs previously described for my computations in Exhibit A, except that for the ongoing diversification costs of divestment, I employ the more recent pension-focused estimates of Fischel, *et al.* (2017), who estimates a range of annual costs between 0.15 percent and 0.20 percent.⁶¹ I assume that the pension fund would, absent divestment earn 7.3 percent per year, based on historical returns.⁶² Under these assumptions, the pension fund could pay a maximum monthly benefit of \$0.67 per \$100 of pension assets (row [4]). Divestment costs would reduce the maximum monthly benefit that could be paid to the pensioners by 6.7 percent (including transaction costs) or 5.2 percent (absent transaction costs.)⁶³

Are There Benefits from Divestment?

The costs described above are clearly substantial and have the potential to seriously affect the ability of institutions like universities and pension funds to fulfill their objectives. But, if portfolio divestment could somehow substantially reduce fossil fuel emissions, and if such a reduction could indeed avoid potentially catastrophic environmental outcomes, even very large costs would be money well spent.

However, portfolio divestment, even if widely adopted, is unlikely to reduce emissions attributable to fossil fuel use. Emissions depend on real decisions as to what fuels are used and what energy is consumed, as well as advances in relevant technologies. As noted, portfolio divestment simply shifts the ownership of targeted company securities from divesting institutions to other owners. Unlike a boycott or other forms of reduction in consumer demand, divestment has no direct effect on any real company decision that alters emissions.

Divestment advocates may have in mind that divestment will reduce the market value of the securities issued by targeted companies, and thus in some way place pressure on companies to change their activities. However, the theory of financial economics provides little reason to believe that this will occur, and even if it does occur, it is unclear if reduced emissions will result.

Any analysis of security prices must begin with the fundamental viability and expected profitability of the company in question. A company's fundamental value depends on its ability to generate positive cash flow from its operations, as well as on the real investments required to sustain its

60. In terms of time value equations found in textbooks, I here assume that the pension pays a level annuity, in contrast to the growing perpetuity that I assumed for endowments.

61. Daniel R. Fischel, Christopher R. Fiore, and Todd D. Kendall (2017) "Fossil Fuel Divestment and Public Pension Funds."

62. This is the average ten year median annualized return for state pensions, according to Cliffwater, LLC, "Cliffwater 2015 Report on State Pension Asset Allocation and Performance," September 8, 2015.

63. The calculation assumes that the pension fund remains fully funded. Of course, the fund could alternatively allow its asset values to dwindle, but this merely transfers the costs of divestment to future pension beneficiaries (or taxpayers, if the fund ultimately requires a bailout).

operations.⁶⁴ Divestment, which merely causes securities to change hands, conveys no information about the fundamentals that determine security values. By analogy, selling one's house changes the matter of who lives in it, but it doesn't change the house itself (or the community in which it is situated).

Economic theory does allow that large trades can *temporarily* reduce security prices in the marketplace.⁶⁵ Indeed, such temporary price impacts are part of the reason that large trades incur transactions costs. However, these temporary price effects are effectively transfers of wealth from the seller to the buyer (being part of the transaction costs implicitly paid by the seller), and in any case are soon reversed.

Some economists have also asserted that long run demand curves for individual securities may be downward sloping, implying that a sufficiently large amount of selling could decrease prices even if the sales involve no new information about fundamentals.⁶⁶ In principle, if this reasoning applied to divestment-based sales, the result could be a slightly higher cost of capital for targeted companies. However, it is unclear whether such an increased cost of capital, even if it occurred, would reduce investments in fossil fuel production. Many firms involved with fossil fuels also invest in renewable energy technologies, and an increased cost of capital could result in reductions in these investments instead. In any case, the available evidence from past divestment efforts, as discussed above, shows that even this hypothetical outcome is unlikely, as past portfolio divestment did not depress target firm share prices on a permanent basis.

Some divestment advocates have claimed that, regardless of the impact on fossil fuel companies, divestment is simply a smart investment management decision, since these companies' stock prices are "bound" to fall as the world moves to greener energy and as fossil fuel assets become "stranded." Such claims become particularly prominent at times when energy stock prices happen to be low (such as in 2015), often accompanied by the observation that, if investors had heeded earlier calls to divest from fossil fuels, they would have avoided losses.

These claims essentially amount to the assertion that the stocks of companies targeted for divestment are overvalued in the marketplace, presumably because the current owners fail to see the looming threats to their long run viability. Yet, I am aware of no evidence to support the proposition that divestment advocates are particularly adept at forecasting stock values or giving investment advice. Nor have divestment advocates articulated why the current owners of target company securities, who are often sophisticated institutions, would be unaware of the relevant facts or risks.⁶⁷

64. See, e.g., Stephen A. Ross, Randolph W. Westerfield, and Jeffrey Jaffe (2013) *Corporate Finance*, 8th edition, McGraw-Hill Irwin, at Chapter 5 (Stock Valuation).

65. See, e.g., Larry Harris (2003) *Trading and Exchanges: Market Microstructure for Practitioners*, Oxford University Press, at pp. 414 & 432-3.

66. See, e.g., Andrei Shleifer (1986) "Do Demand Curves for Stocks Slope Down?" *Journal of Finance* 41(3):579-590.

67. Even if divestment advocates are correct that fossil fuels are doomed in the long run, this does not necessarily mean that *companies* now involved with fossil fuels are doomed. These companies are in the business of energy production, and are likely to find it in their interest to switch to producing other types of energy as economic conditions allow; keeping abreast of energy market trends is obviously a key part of their business.

In practice, it is extremely difficult for even financial market professionals to consistently predict which securities will rise or fall by unusual amounts in the future.⁶⁸ This reflects the fact that securities markets are extremely competitive. In a competitive security market, predictions that a certain group of securities will have abnormal high or low future returns have roughly a fifty percent chance of being correct. The potential future gains or losses from divestment that occur because the divested securities subsequently rise or fall in price are, quite literally, speculative. In contrast, the existence of transaction costs, compliance costs, and diversification costs attributable to divestment are guaranteed.

All of this is not to say that no one benefits from divestment. As discussed above, divestment involves the payment of transaction costs as securities are sold and then replaced. Middlemen who effectively make markets in these securities – typically large banks or specialized investment and trading firms – capture these costs as their own revenues. Further, the increased ongoing compliance costs paid by university endowments and pension funds that divest are realized as revenues by those who manage “fossil free” portfolios. These managers benefit from divestment, and unsurprisingly, many of them have been at the forefront of divestment advocacy. In a nutshell, divestment transfers wealth from university and pension fund claimants, including faculty, students, and retirees, to the financial sector.

Conclusion

The field of economics studies how firms and markets allocate resources. The profit motive incents firms to deliver those goods and services that consumers value highly enough to more than cover the costs involved. That is, fossil fuel companies deliver energy sourced from hydrocarbons because their customers demand it, and are willing to pay more than the costs involved in their production.

Unlike a potential boycott, which would require individuals and companies to reduce their consumption of energy sourced from fossil fuels or goods that rely on such, divestment does not change the essential economics involved in fossil fuel production. Portfolio divestment changes who owns a portion of the securities issued by fossil fuel firms, as each divested financial asset is purchased by another investor, but has no direct effect on demand for energy produced from fossil fuel, and no demonstrable effect on the targeted companies. Since divestment does not directly affect either demand for energy provided from fossil fuels or the cost of delivering such energy, divestment is unlikely to alter the volume of emissions derived from fossil fuels that enters the atmosphere.

However, divestment transfers wealth from endowments or pension funds that divest to financial sector firms, in the form of transactions costs and ongoing compliance costs. The loss of endowment or pension fund value due to divestment is not simply an entry in an accounting ledger. These costs must ultimately be borne by endowment and pension fund stakeholders, potentially including students in the form of higher tuition or lower scholarships, faculty and staff in terms of higher workload or lower compensation, and pensioners in terms of reduced monthly benefits.

68. Burton G. Malkiel (2011) *A Random Walk Down Wall Street*, W.W. Norton & Co., at p. 167 (“Security analysts have enormous difficulty in performing their basic function of forecasting company earnings prospects.”)