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RESEARCH ARTICLE

Fossil fuel divestment in U.S. higher education: Endowment dependence and temporal dynamics

Alexander R. Barron^{1,*} , Rachel C. Venator¹, Ella V. H. Carlson¹, Jane K. Andrews¹, Junwen Ding¹, and David DeSwert¹

Since 2011, students and others have pushed U.S. higher education institutions (HEIs) to divest their endowments from fossil fuel producing industries. In the past decade, fossil fuel divestment (FFD) has become the fastest growing divestment movement in history, with over 140 U.S. HEIs announcing divestment commitments. We conduct a quantitative analysis of the phases of U.S. 4-year HEI divestment announcements (as well as rejections of divestment) to better understand the dynamics. Announcements began (2012–2017) with a number of schools divesting, followed by a second phase, where new divestment announcements slowed. The third phase, which began around 2019, showed a renewed increase in divestments. Formal rejections of divestment followed a similar pattern in the early years, where rejections were slightly more common and represented more endowment value but have declined as some schools reversed public positions. Schools that have divested from fossil fuels now represent roughly 3% of 4-year U.S. HEIs and 39% of HEI endowment value in our data. Roughly 133% more endowment value is now associated with U.S. schools that have publicly divested from fossil fuels than with those that have explicitly rejected it. Early divestments from all fossil fuels came nearly exclusively from schools with a relatively low endowment dependence (the share of operating expenses derived from the endowment) although qualitative factors were also likely important. We discuss the implications of these findings in the context of different theories of change for the divestment movement. In particular, we note that 99% of 4-year HEIs representing roughly 95% of endowment value in our dataset are less dependent upon their endowment than at least one recently divested HEI, suggesting that large endowment or high dependence on endowment are no longer strict barriers to FFD for most schools.

Keywords: Fossil fuel divestment, Sustainability, Climate change, Coal, Leadership, Private equity

Background

With U.S. politics deeply divided on climate change and Congressional climate policy largely stalled over the last several decades, activists have pursued climate actions through other institutions and at other scales (e.g., state and local policy, corporate pressure, direct action; Ayling and Gunningham, 2017). The passage of the Bipartisan Infrastructure Law (2021) and the Inflation Reduction Act (2022) as well as regulatory actions by the Biden–Harris Administration have improved the outlook for near-term emissions reductions. However, analysts suggest that the U.S. emissions may be 33%–40% below 2005 levels by 2030, still well short of the U.S. 2030 target of 50%–52% below 2005 levels (Bistline et al., 2023). As part of the response to inadequate policy at multiple levels, fossil fuel divestment (FFD) has emerged globally as a rapidly growing climate action movement. Roughly 1500 institutions

with assets over US\$40 trillion have committed to divest from fossil fuels (Lipman, 2021).

The FFD movement has its roots in earlier movements to divest from South Africa, tobacco, and Sudan—which similarly engaged on the issues of human rights and public health. The movement aims to stigmatize the fossil fuel industry and revoke “moral license to operate” as well as serving as a movement building activity and tool to envision a post-fossil-fuel world (Grady-Benson and Sarathy, 2016; Hestres and Hopke, 2019). Like the broader socially responsible investing movement (King and Gish, 2015), activists see FFD as one tool in a broader tool kit. Messaging from the movement has connected it to the broader climate justice movement, combining themes around the ethics of climate action, social justice, fossil fuel industries as bad actors, and financial risks associated with fossil fuels (Mangat et al., 2018; Gibson and Duram, 2020).

The first FFD (all subsequent references to divestment refer to FFD) campaigns in U.S. higher education were in 2011 at Swarthmore College, the University of North Carolina at Chapel Hill, and the University of Illinois Urbana-Champaign and grew into a national effort spearheaded

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by Bill McKibben and 350.org. The first formal divestment announcement came from Unity College in 2012—a small college that bills itself as “America’s Environmental College” (Grady-Benson and Sarathy, 2016). The college announced it would divest from fossil fuels, limiting investments to less than 1% of the endowment (3%–5% of endowment at the time; Mogilyanskaya, 2013).

Since then the movement has grown rapidly, with 144 U.S. higher education institutions (HEIs) having divested (either fully or partially, see Methods). Campaigns have been roughly split in line with the mix of public/private HEIs in the United States and concentrated in coastal states (Gibson and Duram, 2020) and range from small institutions of around 100 students to the extensive University of California system.

As the movement has grown, it has also attracted the attention of researchers who have noted the potential of the movement to promote dialog and progression to goals beyond divestment and to move from compliance-oriented sustainability behavior toward a more proactive focus on intergenerational equity (Seidman, 2015; Healy and Debski, 2017). Researchers seeking to understand the movement have suggested that early divestment announcements tended to be at schools with smaller endowments and institutional values around sustainability and social justice (Grady-Benson and Sarathy, 2016). The movement has been primarily student-driven with faculty support also present in many cases (Stephens et al., 2018). Very little of this research has been quantitative, with Mikkelsen et al. (2021) finding that HEI divestment globally was positively correlated with ranking, but not with endowment size, endowment type, or number of students—but that study omitted small liberal arts colleges (they do not have international rankings) which compose a notable share of early U.S. FFD activity.

At the same time, not all campaigns have been successful—with many schools publicly rejecting divestment, arguing fiduciary responsibilities to their endowment, the lack of impact on fossil fuel companies, and other factors (Grady-Benson and Sarathy, 2016). For example, Swarthmore College, the first U.S. college to face calls for FFD, has still not divested after a decade of student activism (McKibben, 2021).

This research seeks to build on earlier work by analyzing a dataset of announcements and rejections of FFD for U.S. HEIs to date. We seek to understand 2 key questions. First, how has divestment activity and rejection of divestment changed over time? Second, what school characteristics could influence a school’s decision to divest or reject divestment? In particular, we examine endowment dependence (ED) as a potential structural influence on whether a school will divest. Previous research had already established that schools were likely to cite fiduciary responsibilities as a reason to reject divestment, which led us to hypothesize that the more dependent a school is on its endowment, the less likely (all other factors equal) it is to make a significant divestment action (e.g., full FFD)—so long as it perceives significant risk to returns associated with FFD. We discuss the implications of our findings for the success of the movement and future actions.

Methods

The first step of this project was to build a dataset of announcements and rejections of FFD in higher education, as we were not aware of a research database covering the desired details. We focus on public announcements regarding HEI FFD—those that are formalized by a public statement by the institution’s leadership (usually President, Vice President for Finance, or Board of Trustees). These public statements can take the form of press releases, emails/letters to the community, or—especially in the case of divestment—formal board resolutions. The 350.org website gofossilfree.org maintains a voluntarily reported list (now managed by divestmentdatabase.org), which we used to cross-check our results. Our list was constructed by reviewing prior research (e.g., Grady-Benson and Sarathy, 2016), setting Google news alerts, and following announcements covered by the Association for the Advancement of Sustainability in Higher Education and Inside Higher Education. Because these websites do not track rejections, we began with a non-peer-reviewed report (Wood and Peterson, 2015) and fact checked and updated the analysis with news searches. Statements associated with rejections were coded for the key motivations cited. In the same way that we do not count “quiet” divestments that are not announced or might not reflect a shift in policy, we do not count rejections unless a public statement could be located. This current analysis covers 2011 to April 1, 2023).

We limited subsequent analysis to currently operating 4-year U.S. HEIs ($n = 138$ of 144 total) as 2-year institutions have very different business models and often have small or no endowments and were much less frequently the subject of FFD campaigns. This includes campuses of a broader system that each report their own endowment.

Supplementary data about HEIs came from the U.S. Department of Education’s Integrated Postsecondary Education Data System (IPEDS) ($n = 1968$). IPEDS does not report endowment spend rates, so we estimated the rate for each school by using data reported by the National Association of College and University Business Officers for 2012–2021 (average endowment spending rate of 4.5%) (NACUBO and TIAA, 2022). ED was calculated as an estimated endowment spending as a share of operational expenses (where operational expenses were total expenses minus expenses likely to come from independent sources [research, hospital, independent operations, and auxiliary enterprises]) for reporting year 2020. We recognize that this metric is probably only a rough approximation as spending rates are variable from year to year and institution to institution and IPEDS reported data may not capture other aspects of spending.

Multiple metrics could be appropriate to measure FFD activity. From a purely fiscal perspective, the total size of the endowment of the HEIs making announcements serves as a useful indicator. However, because research suggests that activists are actually focused on other goals besides direct financial impact on companies (e.g., revoking moral license), we also track the number of institutions making announcements. While the amount of funds divested from fossil fuels as the result of the announcement would also be a very useful metric, we found that

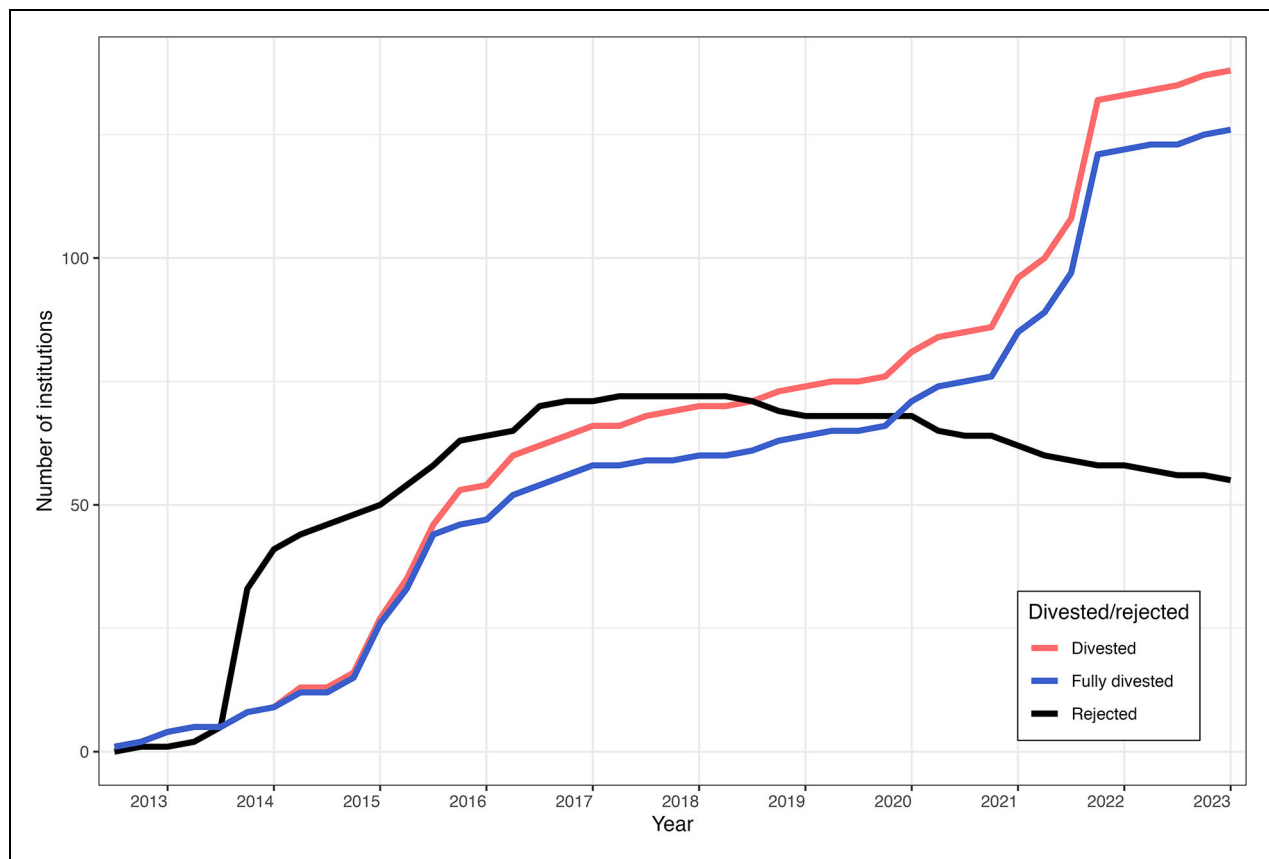


Figure 1. Cumulative U.S. higher education institutions announcing fossil fuel divestment (FFD; or rejecting divestment) by quarter. Divested includes partial divestments ($n = 138$ divesting schools [all forms of FFD], 126 fully divesting schools, and 76 rejecting schools [max 72], 4-year institutions).

many schools did not have an estimate of this number even when contacted directly.

In addition, we distinguished between different types of divestment activity. We distinguish 4 rough categories in our analysis based on our best interpretation of publicly available information about each commitment (see Supplementary Information for further discussion):

- Coal only—reflecting schools that pledge to divest only from coal companies. An institution was coded for “coal only” even if the announcement covered only direct investments but not indirect mutual funds and private equity.
- Coal and tar sands only—reflecting schools that pledge to divest from both coal and the also very high emissions tar sands (also known as oil sands). An institution was coded for “coal and tar sands only” even if the announcement covered only direct investments but not indirect mutual funds and private equity.
- Full—reflecting schools that commit to divest from all categories of fossil fuels—coal, tar sands, oil, and fossil/natural/methane gas for both direct and indirect (e.g., mutual funds, private equity) investments.
- Intermediate—This category reflects any institutions that do not meet the full criteria but are divesting beyond coal and tar sands. This may include institutions that are divesting from many fossil fuels but

not methane gas or ones whose announcements are vague about whether they are only addressing direct holdings and investment vehicles “solely invested” in fossil fuels, or all vehicles that include fossil fuels.

These classifications differ slightly from those used by gofossilfree.org, which includes a “fossil free” category that requires more detail about accountability and reporting. Given variability in the detail of public announcements, we found it difficult to reliably distinguish between “fossil free” and “full” categories. Note that, consistent with the practice in current announcements, a school may “fully” divest but still have a small share of the endowment associated with fossil fuels (e.g., in index mutual funds).

Assignments of divestment status and documentation are included in the data archive and more information on data collection and coding can be found in Text S1 (Detailed methods). In the rest of the text, we use the term “divesting” to refer to any form of FFD and specify “full divestment” for the most comprehensive category.

Results

Divestment and rejection over time

Analysis of the announcements of divestment of any kind reveals 4 distinct phases over time (**Figure 1**). In the first phase (2012–mid 2016), the number of schools divesting rose rapidly. This was followed by a period of relative stasis from late 2016 to early 2019 with a few new

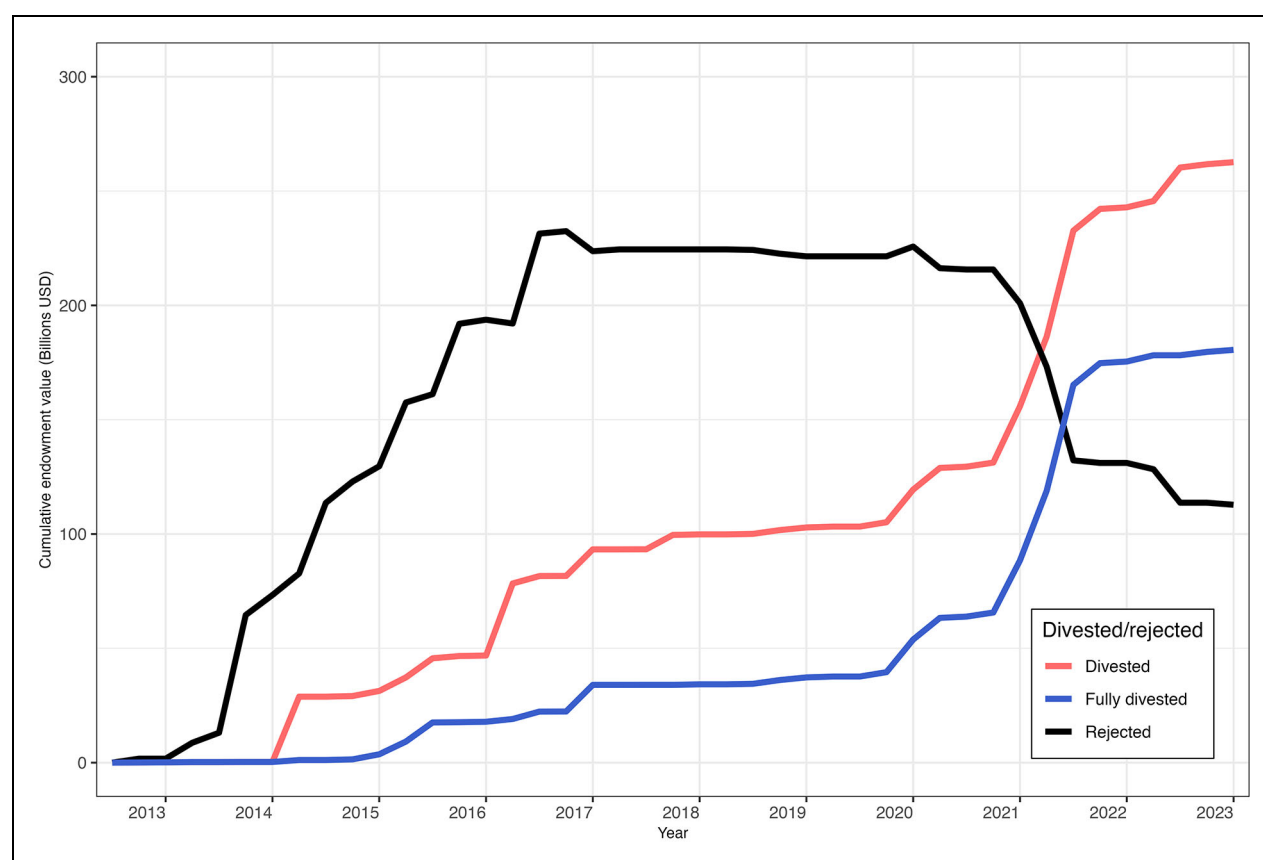


Figure 2. Cumulative endowment value of U.S. higher education institutions announcing or rejecting fossil fuel divestment. Sample sizes as in Figure 1, announcements tracked by quarter.

announcements. In the third phase, the number of announcements rises again, and in the (incipient) fourth phase, there appears to be yet another pause in the pace of announcements. Full divestments followed a very similar numerical pattern.

Interestingly, announced institutional rejections of FFD rose even more rapidly than divestments and represented (~18%) more institutions by 2016. However, since that time, the number of public rejections that we were able to document actually declined as several schools reversed earlier rejections and moved to divest (e.g., Middlebury College). In 2020, cumulative full divestments outpaced rejections for the first time. Note that these data may undercount leadership/board rejections of divestment because we can only track decisions that were made public. Leadership may choose to reject activist demands and simply remain quiet on the subject.

Divestments by the size of institutional endowment follow a slightly different pattern (Figure 2). Endowment value from 4-year institutions with any sort of divestment or from HEIs rejecting divestment follows the same general pattern of increasing to mid-2016 and then leveling off but the collective endowment value of schools rejecting divestment was over twice that of schools divesting. The amount of endowment value represented by schools fully divesting is comparatively small and rises only gradually until mid-2019 when it begins to rise rapidly. The year 2021 represents a crossover point, where more U.S. HEI endowment

value had committed to intermediate or even full divestment than those that had rejected divestment.

Shifts in endowment dependence (ED)

While earlier work focused on the size of endowment (smaller more likely to divest early), we also examined the role of ED (share of operating expenses coming from the endowment; Figure 3). While the 2 variables are associated with each other, there is not always a close alignment between the two (Figure S1). In particular, schools with endowments less than \$3B range in ED from near zero to nearly 100%, suggesting very little relationship at all for the majority of HEIs in this category. The limited correlation (0.33) across all 4-year HEIs appears to be driven by a handful of schools with very large endowments, which, not surprisingly, rely on them for a notable share of their operational expenses. A large state school might have a large endowment but be less reliant on it to meet expenses and therefore perceive less financial risk associated with divestment. Conversely, a very small school could rely heavily on a much smaller endowment to support free or reduced tuition (or for some other purpose)—making them very risk averse.

Full divestments before mid-2018 were all at institutions below 12% ED with the exceptions of Union Theological Seminary and Pacific School of Religion. No schools with an ED above 30% divested fully before Q3 2018 (Whitman College). The highest estimated ED of any full

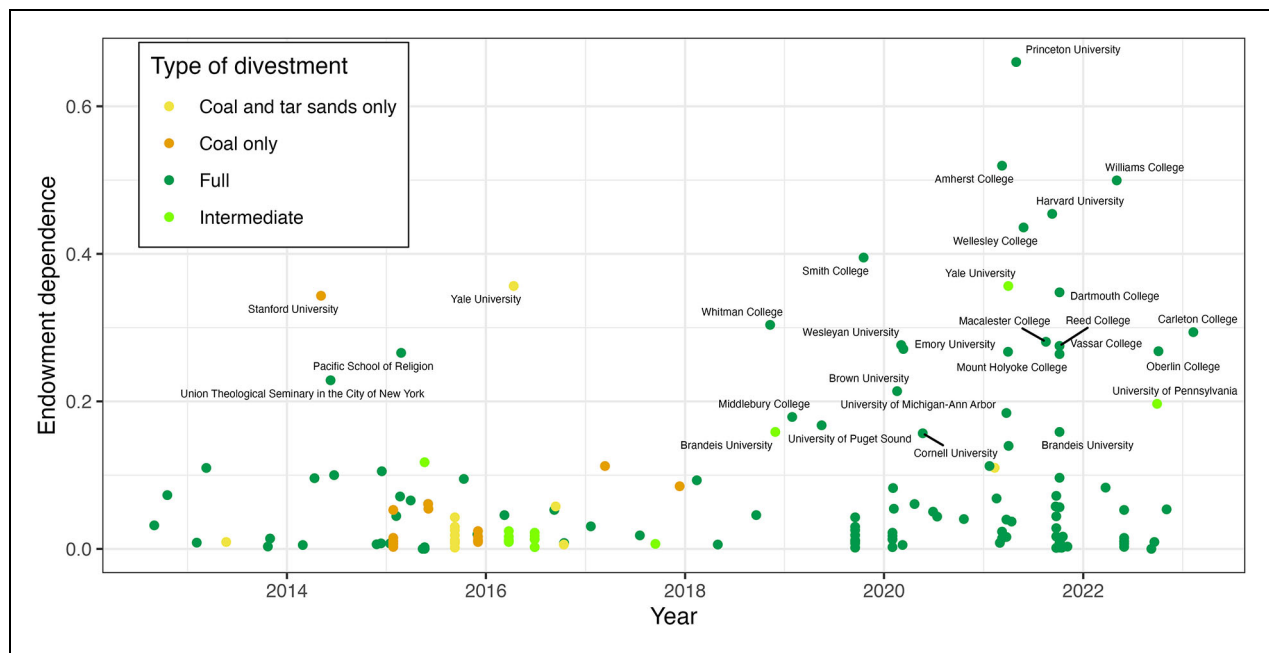


Figure 3. Divestment actions by year, type, and endowment dependence. Labels applied to high endowment dependence U.S. 4-year higher education institutions. $n = 138$ institutions, 35 updated announcements also plotted.

FFD in our dataset is Princeton University (approximately 66%). Logistic regression suggests that a low ED was associated with a higher likelihood of full divestment (odds ratio = 0.08, 95% CI [0.01, 0.64], $1.28 + (-2.48) \times \text{Endowment Dependence}$, $p(\text{ED}) < 0.018$, Akaike information criterion [AIC] = 197). Endowment size (Figures S2 and S3) was not predictive, on its own ($p = 0.25$, AIC = 202) or added to the model with ED ($p = 0.96$, AIC = 199). This regression did not include key qualitative factors, such as view of key leaders, board composition, institutional culture, institutional mission/values, and so on.

For the subset of schools that reported the share of endowment invested in fossil fuels (roughly 75% reported fossil fuel investment market value as a percentage of total investments), it is clear that schools that fully divested early tended to have low endowment dependence regardless of their exposure to fossil fuels (Figure 4a). It is only in late 2018 that schools began to make announcements that reflected a significant shift in stance with respect to all fossil fuels (i.e., full divestment) and a high ED (Figure 4b). University of Michigan–Ann Arbor, Smith College, and Princeton University represent the current horizon of action with a combination of significant exposure to fossil fuels and ED, with estimated EDs of less than 20% to over 60%.

Motivations for rejection of divestment

For schools that rejected divestment (Figure 5), a fiduciary responsibility to provide adequate growth in the endowment was by far the most common reason given—in over 60% of divestment rejections. A concern that divestment is ineffective at reducing emissions was the next most common reason, with a significant minority of schools planning to implement or highlighting existing alternative sustainability measures. Examples of text indicating various reasons for rejection are listed in Table S1.

Discussion

Divestment decision-making

Any quantitative analysis of FFD is a lens with only a partial view of the process. FFD decisions over time are inherently the result of a large number of dynamic factors. Each divestment decision results from the interaction of larger structural and temporal factors combined with institution-specific factors, some of which are very challenging to measure without detailed interview work, such as the views of key leadership positions (e.g., President and Vice President of Finance; Abrash Walton, 2018a, 2018b). Institution-specific characteristics like amount and effectiveness of student activism, institutional values, and the values and attitudes of key decision-makers interact with structural factors (e.g., school operating model and endowment structure, see the following sections) and other temporal factors (elections, COVID) to determine which schools divested in each phase. We lack the data to fully determine which of these multiple and interacting factors were most important, but we speculate on possible explanations for the observed dynamics here. However, it is clear that, at least in public statements rejecting divestment, concerns about impacts on the health of the endowment from divestment were the most common publicly stated concern for administrators (Figure 5; Deeks, 2017).

The 4 phases of divestment

Our analysis of higher education FFD announcements reveals clear patterns in divestment activity over time, but our interpretation of those patterns is necessarily speculative due to the large number of interacting factors described above. While we have attempted to capture all of the public FFD announcements by U.S. 4-year HEIs, any

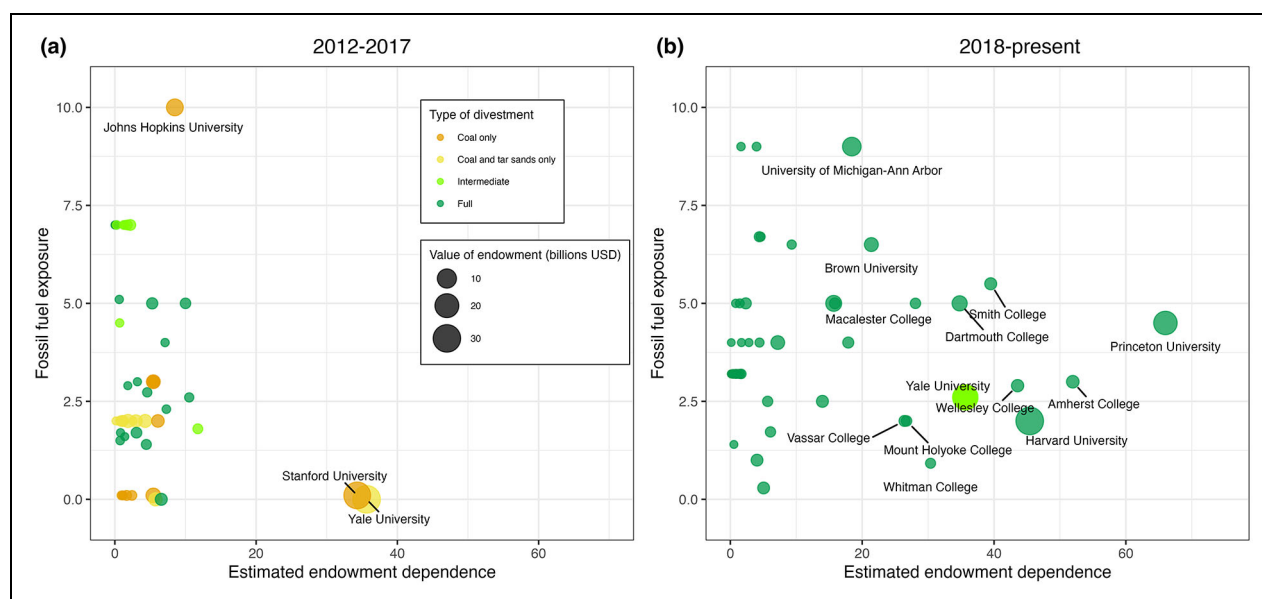


Figure 4. Endowment dependence versus fossil fuel exposure. Panel (a) shows estimated endowment dependence versus fossil fuel exposure (percentage of endowment invested in fossil fuels) of the endowment for schools, which reported fossil fuel exposure and divested 2012–2017 with all shares as percentages. Panel (b) shows announcements 2018–early 2023. Note that only 103 of 138 divesting 4-year schools reported fossil fuel exposure.

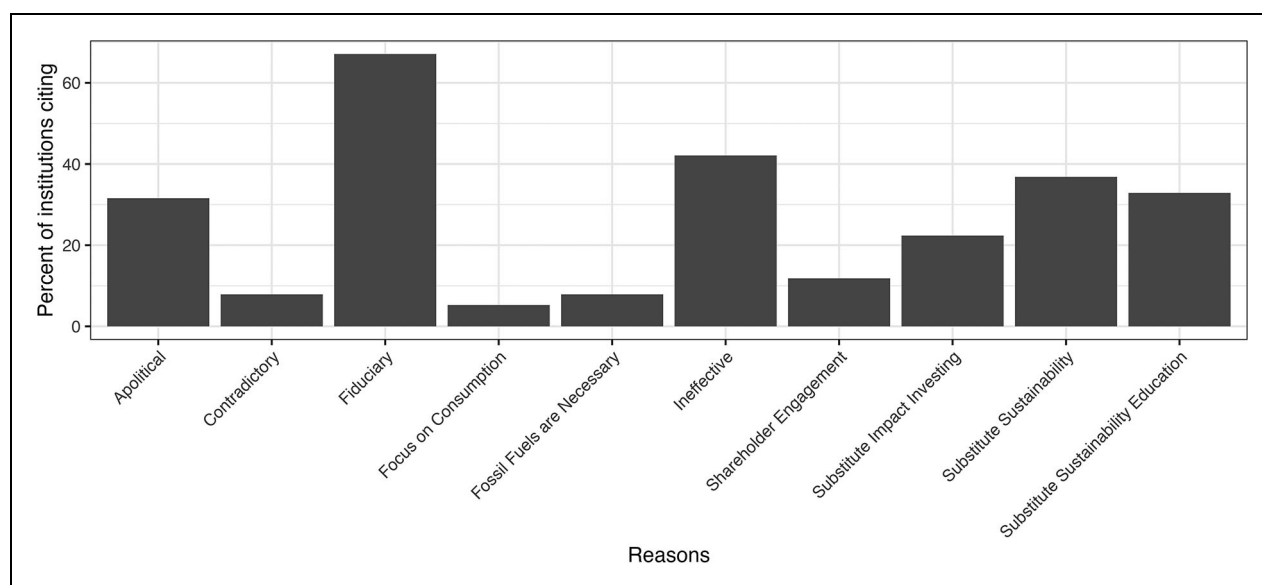


Figure 5. Top reasons for rejection from U.S. higher education institutions' rejections of fossil fuel divestment. Sample size = 76, includes schools that later divested.

announcements or rejections missing from our data could alter the patterns reported here.

The first phase of divestment (2012–mid 2016, see **Figures 1 and 2**) we would characterize as the “low hanging fruit”—these are schools where a low ED may have reduced the perceived risk of any decision to divest (see the following section). Even more critically, these are likely also schools with an alignment of active student groups, prominent environmental values, and leadership amenable to FFD (Grady-Benson and Sarathy, 2016). This is consistent with work showing alignment with institutional values as a key factor for FFD in foundations

(Abrash Walton, 2018b) and supported by the fact that the only 2 high ED institutions divesting in this time period were progressive seminaries (Union Theological Seminary and Pacific School of Religion). This early wave also included a few schools divesting from direct holdings in coal—another lower risk strategy, given that prices in the market for coal futures were rapidly declining during this time period and the general policy outlook for coal continued to be negative (Moritz Rabson, 2019). Rejections of divestment in this time period featured schools with higher endowment dependencies, for example, any school making a FFD announcement with an ED higher

than 40%—although these institutions may also have had different leadership, values, or other characteristics.

However, based on our data, the FFD movement seems to have relatively quickly exhausted the low hanging fruit and late 2016 to early 2019 was characterized by limited new announcements. We suspect many of the relatively straightforward targets for change had already been exhausted with many other schools in “study” mode or activists waiting for a turnover in leadership that might be more amenable to divestment. This pause in announcements is striking given that the 2016 election of Donald Trump as the President of the United States foreclosed any chance of near-term climate action to reduce fossil fuels at the federal level, potentially creating increased pressure on institutions to take their own steps (e.g., We Are Still In). Another plausible and nonexclusive explanation is that progressive campus activists confronted multiple issues during this time period (e.g., actions by the Trump Administration, Black Lives Matter, restrictions by conservative state legislatures), which may have diverted energy away from the push for FFD.

As we discussed above, institution-specific characteristics like the amount and effectiveness of student activism, institutional values, and the values and attitudes of key decision makers may have interacted with structural factors to determine which schools divested in these early phases. One structural feature is that HEIs with larger (i.e., >\$1 billion endowments) often hold a significant portion of the endowment in private equity and other specialty investments which allow higher returns (Piketty, 2014). In return for the promise of higher returns, private equity can often feature much longer investment commitments (often 10 years or longer) and therefore reduced liquidity, which make rapid divestment actions carry costly penalties.

In the third phase, conditions seem to have shifted, so that more schools are now willing to divest from fossil fuels, even those with considerably higher ED. While multiple factors may have contributed to this shift, we believe the availability of a new approach to divestment, combined with market conditions, may have played a role. Three of the earliest announcements in this phase were Whitman College (see Table S2), Middlebury College, and Smith College (our own institution) and all 3 took an approach to phasing out fossil fuels in private equity. Middlebury College and Smith College, which also have emissions commitments that will largely eliminate fossil fuels for electricity and thermal by 2028/2030, had endowments that were managed at the time by the same external investment office, Investure, LLC. In response to input from investors, Investure worked with these schools to focus on fossil-fuel specific managers (FFSM) for private equity. Both schools committed to an approach with no new investments with FFSM and a phase out of existing investments with FFSM, which would take roughly 15 years. This approach covers approximately 90% of each schools’ fossil fuel investments, omitting only diversified funds that may hold small amounts of fossil fuel investments. A clear pathway to “full” FFD without the expensive prospect of prematurely exiting private equity

investments at a discounted price seems to have enabled sufficient derisking for these schools and allowed them to respond to continued student and faculty pressure and support institutional value alignment in the endowments without compromising fiduciary responsibility. Smith College has subsequently shifted to internal management of its endowment—internal management should also tend to give HEIs more control over their FFD strategies.

At the same time, market conditions leading up to the start of the third phase were not particularly favorable for fossil fuels, especially in the coal sector where bankruptcies were common by the end of the decade (Moritz Rabson, 2019). More broadly, 10-year returns from a hypothetical U.S. renewable energy portfolio were roughly twice that of a comparable fossil fuel portfolio (Donovan et al., 2020). The University of California’s divestment announcement in 2019 stands out as flagging divestment as primarily a financial decision, stating “hanging on to fossil fuel assets is a financial risk . . . The reason we sold some \$150 million in fossil fuel assets from our endowment was the reason we sell other assets: They posed a long-term risk to generating strong returns for UC’s diversified portfolios” (Singh Bachher and Sherman, 2019). Some researchers have similarly found that the performance of FFD portfolios does not significantly differ in terms of risk and return from unrestricted portfolios (Trinks et al., 2018; Plantinga and Scholtens, 2020), which may have led some institutions to similarly reassess perceived risk from FFD. However, the recent invasion of Ukraine has driven up the value of some fossil fuel holdings (Nerlinger and Utz, 2022) leading to record profits for oil and gas companies in 2022 (Bousso, 2023), which has altered this dynamic, at least in the short run.

An incipient fourth phase of limited announcements (mid 2021–onward) appears at the most recent end of our dataset. This may represent exhaustion of the current universe of schools that can apply the new phaseout approach to private equity AND where management is amenable to such an approach. It may also represent a “wait and see” approach related to recent dynamics in fossil fuel markets (see above)—with some institutions reluctant to divest from a currently profitable sector. Finally, many HEI’s decision-making structures had to dedicate significant amounts of bandwidth to the response to the COVID-19 pandemic and associated fiscal impacts, which may have reduced the capacity to address FFD campaigns.

Endowment dependence (ED)

While a mechanistic link is impossible to establish given the large number of factors that might influence an FFD decision, ED does seem a potential factor in influencing which institutions pursue full FFD over time based on our data, especially in the early years of the movement. Unity College, the first school to fully divest only relied on its endowment for approximately 3% of operating expenses and, as we noted, no non-seminary schools with estimated ED above 15% divested fully before 2018 (**Figure 3**). This may be due to a combination of the perceived risk to finances associated with increased reliance on the

endowment, the fiduciary duties of trustees, and the logistical challenges associated with larger endowments that contain a larger share of private equity or other complex instruments. While Mikkelsen et al. (2021) find evidence for correlation with rankings, we believe ED provides a more direct explanation for the patterns we see here. Rankings are a challenging variable to interpret; they contain a wide range of factors, have been subject to manipulation (Gadd, 2021), and a high ED can be used to impact a large number of other factors in the ranking (Bulman, 2022). Additionally, we are not aware of a uniform ranking metric that would cover both larger research HEIs and small colleges in the United States. We stress that ED should be considered in the context of other nonquantified factors such as the views of key HEI decision-makers, the nature of activist pressure, and institutional values—all of which are likely to be important factors.

FFD in the context of activist goals

While critics of divestment often focus on the lack of a direct link between divestment and market impacts (Hansen and Pollin, 2020) or emissions or invoke other theories of change centered around carbon pricing (Tollefson, 2015), when judged by the movement's own goals of creating stigma and building a movement (Grady-Benson and Sarathy, 2016; Hestres and Hopke, 2019), our data suggest some success over time. Activists were able to quickly grow the number of campaigns and schools divesting and the long-term campaigns have begun to succeed at schools more dependent on their endowment—with Harvard and Princeton University being the latest high profile examples. We are unable to assess the movement building activity with our dataset, but we note that the Sunrise Movement, which played a major role in framing climate change as a key priority in the run up to the 2020 U.S. election, was founded by several individuals who began their climate activism in higher education FFD. The early rise in rejections can be viewed through multiple lenses. From one perspective, these can be regarded as failures—often with HEIs publicly distancing themselves from either goals or principles of the FFD movement; from another perspective, they can be seen as bringing attention to the issue, training activists, and pushing schools to other sustainability-related commitments. For example, while Yale University has yet to fully divest, they have adopted principles avoiding “high GHG emissions relative to energy supplied” as well as principles associated with firms that undermine regulations or climate science (Macey et al., 2021).

Collectively, 126 4-year U.S. HEIs representing roughly \$180B in endowment value have now committed to some form of full divestment, in some cases pushing external fund managers to adopt practices to support such actions. The system-scale numerical impact is modest but growing as schools that have divested from fossil fuels only represent roughly 3% of U.S. 4-year HEIs and 39% of U.S. 4-year HEI endowment value in our dataset. Roughly 133% more endowment value is now associated with U.S. schools that have publicly divested from fossil fuels than with those

that have explicitly rejected it (see **Figure 2**, excludes endowment value from schools taking no public action).

Strategies for FFD have also shifted over time to incorporate a broader range of approaches. Barnard College (2017) is the first school we are aware of that divested from companies that “deny climate science or otherwise seek to thwart efforts to mitigate the impact of climate change.” Princeton's recent announcement is notable not only because of the large size of the endowment (approximately \$36 billion in 2022) and large ED (approximately 66%), but because the announcement coincided with a decision to “dissociate from fossil fuel companies engaged in climate disinformation and those materially participating in the thermal coal and tar sands segments of the fossil fuel industry unless able to meet a rigorous standard for greenhouse gas emissions.” Dissociation includes not just removal of fossil fuel funds from the endowment, but also “refraining, to the greatest extent possible, from any relationships that involve a financial component with a particular company. It includes no longer soliciting or accepting gifts or grants from a company, purchasing the company's products, or forming partnerships with the company that depend upon the exchange of money” (Princeton University, 2022). While no companies met the “exceedingly high” bar for dissociation on the basis of disinformation, roughly 90 companies were identified based on revenue or production/processing. We are not aware of any other U.S. schools that have taken this approach, but it seems likely that others will investigate the option. Similarly, many institutions may increase their focus on proactive investment in climate solutions (e.g., impact investing) or shareholder activism as part of their response to social pressure and shifting markets (Abrash Walton, 2018a).

Our results offer some perspective on future FFD campaigns. First, our results emphasize that a large endowment or high dependence on endowment are no longer apparent structural barriers to FFD; 99.6% of U.S. schools (in our data for which we can estimate endowment dependence) have an endowment dependence below 66% (the highest ED of a divesting school, i.e., Princeton University). Collectively, these schools represent 95% of total HEI endowment value. At the same time, schools with very high dependence on endowments may continue to be challenging targets for activists. Indeed, Swarthmore College—the first U.S. school to be targeted by a student FFD campaign—is, in retrospect, one of the more challenging targets that could have been chosen as its ED is nearly 60%, in the top 24% of U.S. institutions in our data. Given the prominence of fiduciary concerns in our rejection data, many institutions may continue to be resistant to FFD until the market consensus about fossil fuels as an investment (or, more specifically, Board of Trustee views) shifts further. Markets likely have not fully internalized the roughly \$1T in potential stranded assets under scenarios of robust climate action (Semieniuk et al., 2022). For some high endowment (dependence) schools, near-term campaigns around other climate actions such as on-campus decarbonization (Barron et al., 2021) or investments in research and teaching may be more successful.

Conclusion

Ultimately, it is impossible to evaluate a movement driven by norms and values by analyzing quantitative metrics alone. It is clear that the FFD movement has had an impact on discourse about climate change and fossil fuels (Mangat et al., 2018)—as part of a larger campaign (Hestres and Hopke, 2019) for climate action. Our results suggest that continuing activist pressure, combined with structural changes in markets and fund management, has now made FFD an action with comparable precedent for virtually all U.S. HEIs. However, as we note above, several recent high profile announcements should be considered in balance with the fact that the movement has yet to impact the majority of either HEI institutions or endowment value.

It is unclear how the pace of divestment announcements will change going forward. Recent geopolitical unrest had led to rallies in both oil and coal stocks, while the recent passage of the Inflation Reduction Act, combined with climate action at the federal/state level and abroad, should accelerate the transition away from fossil fuels. Markets continue to offer more and more climate focused environment, social, and governance (ESG) offerings, while schools in Republican-led states may have to contend with emerging anti-ESG legislation. Student (and faculty/staff) activist pressure seems likely to continue (Svrluga, 2022), with calls for dissociation becoming more frequent, but a primary focus on divestment comes with potentially significant opportunity costs relative to other finance strategies and other climate actions (Deeks, 2017). HEI's decisions to divest will depend upon how they weigh these trends and risks against a range of other policy considerations. It will also be interesting to see whether the (fiscal) conservatism often associated with Boards' fiduciary responsibilities shifts as ESG markets continue to develop and board compositions turn over through the years or whether the general financial hardships due to shifting patterns of enrollment and deferred maintenance facing many institutions reduce willingness for FFD. Increasingly, analysts may be able to compare returns for schools or other institutions that have divested with those that have not, which may impact Boards views on any investment risks.

At the same time, pressure is rising on all institutions to take rapid action toward decarbonization (Barron et al., 2021), which may prompt institutions to focus on the planning and physical capital investments required to eliminate fossil fuel combustion on campus instead of holdings in the endowment (although many in our dataset do both). For contrast, while schools do not always report when they complete their divestment commitment, the number of schools that have *completed* divestment is likely larger than the relatively small number of schools (approximately 14) that have announced carbon neutrality (Barron et al., 2021) and larger still than the number of U.S. HEIs that have fully eliminated fossil fuels from campus operations (to our knowledge, zero).

Data accessibility statement

The following data were generated:

- Dataset of U.S. higher education institution (HEI) divestment announcements, including fossil fuel share of endowment where available (but see also divestmentdatabase.org).
- Dataset of U.S. HEI rejections of divestment, including coding for reasons given.

All data and R code are available at: <https://github.com/barronlab/heidivest>.

Supplemental files

The supplemental files for this article can be found as follows:

Text S1. Detailed methods.

Figure S1. Relationship between endowment size and dependence.

Figure S2. Endowment dependence and endowment size between fully divesting and rejecting institutions 2012–2017.

Figure S3. Divestment actions by year, type, and endowment size.

Table S1. Examples of rejection statements.

Table S2. Examples of divestment statements.

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Competing interests

The authors declare no conflict of interest but note that EC and JA were involved with Divest Smith College during their time as students. AB has consulted in the past, including for the Environmental Defense Fund, on topics unrelated to this article. DD was a member of Smith's Advisory Committee on Investor Responsibility when fossil fuel divestment decisions were made.

Author contributions

Contributed to conception and design: ARB, DD.

Contributed to acquisition of data: ARB, RCV, EVHC, JKA.

Contributed to analysis and interpretation of data: ARB, RCV, EVHC, JKA, JD.

Drafted and/or revised the article: ARB, RCV, EVHC, JKA, JD, DD.

Approved the submitted version for publication: ARB, RCV, EVHC, JKA, JD, DD.

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