




OVERVIEW

Fossil fuel industry influence in higher education: A review and a research agenda

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Abstract

The evolution of fossil fuel industry tactics for obstructing climate action, from outright denial of climate change to more subtle techniques of delay, is under growing scrutiny. One key site of ongoing climate obstructionism identified by researchers, journalists, and advocates is higher education. Scholars have exhaustively documented how industry-sponsored academic research tends to bias scholarship in favor of tobacco, pharmaceutical, food, sugar, lead, and other industries, but the contemporary influence of fossil fuel interests on higher education has received relatively little academic attention. We report the first literature review of academic and civil society investigations into fossil fuel industry ties to higher education in the United States, United Kingdom, Canada, and Australia. We find that universities are an established yet under-researched vehicle of climate obstruction by the fossil fuel industry, and that universities' lack of transparency about their partnerships with this industry poses a challenge to empirical research. We propose a research agenda of topical and methodological directions for future analyses of the prevalence and consequences of fossil fuel industry–university partnerships, and responses to them.

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climate change, conflict of interest, corporate obstruction, fossil fuels, higher education

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1 | INTRODUCTION

The fossil fuel industry is significantly intertwined with higher education around the world.¹ Fossil fuel companies and their affiliated foundations fund climate and energy research, host student-recruitment events at campuses, sit on university governance boards, and more (Table 1). Such ties have been observed as early as the 1920s (Slobodian, 2018),² and the “corporatization” of higher education since the 1980s has further incentivized industry–university collaborations (Brownlee, 2015; Crittenden, 1981; MacLeod, 1998; Washburn, 2005). Yet only in the last few years have scholars, journalists, civil-society organizations, and university faculty and students spotlighted the pervasiveness of partnerships between fossil fuel companies and higher education institutions (Figure 1).³

Public discourse on such links has historically focused on the fossil fuel divestment movement (Healy & Debski, 2017). However, since at least 2020, divestment campaigns have widened their focus to “kicking oil companies out of school” entirely through “dissociation,” calling on institutions to reject fossil fuel funding and other partnerships (Tabuchi, 2022). Journalists, civil society organizations, and faculty–student groups have provided detailed accounts of such partnerships to highlight the dangers of fossil fuel influence on university teaching, research, and administration. But empirical scholarly research on the prevalence and consequences of this phenomenon, and on responses to it, is limited.

Why should scholars investigate the proliferation of fossil fuel industry ties to higher education?

First, prior research shows that industry-sponsorship creates conflicts of interest (COIs) that historically have biased research in favor of numerous industries, including tobacco, pharmaceutical, junk food, sugar, and lead (Fabbri et al., 2018; Legg et al., 2021; Lesser et al., 2007; Oreskes et al., 2015). For example, a systematic review of pharmaceutical-industry-sponsored studies found them more favorable toward the sponsor’s product than non-industry-sponsored studies (Lundh et al., 2012). Academic partnerships benefit industry in additional ways, such as providing opportunities for student recruitment, affording some control over research agendas and publications, and legitimizing the industry among academics, policymakers, and the public (Legg et al., 2021).

Second, archival documents show that the fossil fuel industry deliberately uses university partnerships to further its own interests. A 1978 manual for industries facing regulation, for instance, advised “co-opting” academics and “identifying the leading experts in each relevant field and hiring them as consultants or advisors, or giving them research grants and the like...it must not be too blatant, for the experts themselves must not recognize that they have lost their objectivity...” (Franta, 2022; Owen & Braeutigam, 1978).⁴ A leaked 1998 internal strategy memo from the American Petroleum Institute (API) on “build[ing] a case against precipitous action on climate change” advised establishing “cooperative relationships with all major scientists whose research in this field supports our position,” and organizing “campus/community workshops/debates on climate science” (API, 1998). More recently, an internal 2017 campaign strategy memo presented by a public relations firm to BP proposed targeting Princeton University as a “partner” helpful in “authenticating BP’s commitment to low carbon” (Brunswick Group, 2017), while the company’s latest projections show their commitment to growing fossil fuel production (Bouso et al., 2023). Similarly, scholars have documented how fossil fuel interests have deliberately targeted K-12 education in the United States (U.S.), United Kingdom (U.K.), and Canada since at least the 1940s (Eaton & Day, 2020; Ladd, 2019; Tannock, 2020; Worth, 2021).

These documents suggest that higher education is an established and evolving site of organized climate obstructionism by the fossil fuel industry (Brulle & Dunlap, 2021). While scholars have shown how fossil fuel interests have employed public relations firms, lobbyists, front groups, and other actors to obstruct climate action (Brulle, 2021), there is a dearth of research into the industry’s relationship with higher education.

Third, research on fossil fuel–university ties contributes to a broader literature on “critical university studies” (Boggs & Mitchell, 2018). This literature, which examines the impacts of declining public funding for research and education since the 1970s and the concomitant corporatization of Western universities, suggests that these trends have increased universities’ focus on private-sector partnerships and on technological innovation useful to industry (Berman, 2012; Brownlee, 2015; Washburn, 2005).

These trends are particularly troubling given the central role of universities in tackling complex societal challenges through research, teaching, and advocacy (Vakulchuk & Overland, 2024). The increasing impacts of climate change on society have led several scholars to emphasize the untapped potential of higher education, not only to further understand the causes and consequences of the crisis, but also to model and contribute to a just transition to a more healthy, climate-stable, and equitable future (Stephens, 2022; Urai & Kelly, 2023). The fossil fuel industry’s apparent strategic effort to influence higher education thus threatens to distort climate knowledge and action and also compromises universities’ supposed objective and unbiased role.

TABLE 1 Types of fossil fuel industry ties to higher education.

Type of involvement	Example
Fossil fuel industry personnel serving in university posts and governing boards	<ul style="list-style-type: none"> University of Alberta's board of governors has previously included current and former executives from Syncrude Canada, Encana, Oil Sands Developers Group, Suncor, and Epcor (Adkin, 2021). Former Senior Vice President of ExxonMobil serves as Vice Chair of Northeastern University's Board of Trustees as of 2024 (Northeastern University, n.d.).
Academic personnel consulting for or serving on fossil fuel company boards	<ul style="list-style-type: none"> The director of the Corporate Responsibility Initiative at Harvard University sat on ExxonMobil's Sustainability Advisory Council as of 2021 (Fossil Fuel Divest Harvard, 2021). The founder of Harvard Law School's Environmental and Energy Law Program served on ConocoPhillips' Board of Directors from 2012 to 2023 (Fossil Fuel Divest Harvard, 2021; Noor, 2023).
Fossil fuel industry sponsoring academic research centers	<ul style="list-style-type: none"> BP sponsors Princeton University's Climate Mitigation Initiative as of 2024 (Bragg et al., 2021; Climate Mitigation Institute, n.d.) In 2018, ExxonMobil became the founding member of the Singapore Energy Center at Nanyang Technological University and National University of Singapore (ExxonMobil, 2023).
Fossil fuel industry endowing academic posts	<ul style="list-style-type: none"> Fossil fuel companies such as ConocoPhillips and Enbridge have endowed chairs and professorships at the Universities of Alberta and Calgary (Adkin, 2021). Shell Oil donated \$2 million to Colorado State University for an endowed chair in Restoration Ecology (Proctor, 2011).
Universities naming buildings after fossil fuel interests	<ul style="list-style-type: none"> The BP Institute at University of Cambridge (since renamed the Institute for Energy and Environmental Flows) carries out energy and engineering research (Banks et al., 2020). INEOS, a chemical manufacturing company that participates in fossil fuel production, sponsored the Oxford INEOS Institute for Antimicrobial Resistance (Oxford Climate Justice Campaign, 2021).
Fossil fuel industry sponsoring scholarships, internships, and field trips for students	<ul style="list-style-type: none"> Shell Canada sponsored the Shell Enhanced Learning Fund at University of Alberta, which enables students in environmental studies to take field trips and attend conferences (Adkin, 2021). Since 2012, Oxford University students can apply for Oxford's BP Scholarships for £3000 (Oxford Climate Justice Campaign, 2021).
Fossil fuel industry sponsoring university lectures and conferences	<ul style="list-style-type: none"> In 2013, Imperial College London hosted the Chairman of Shell at the "Energy Futures Lab Annual Lecture" (Lander, 2013). The 2021 MIT Energy Conference's sponsors included Iberdrola and Abangrid, and featured speakers from Chevron, Shell, and ExxonMobil (MIT Energy Conference, 2021).
Fossil fuel industry hosting career recruitment events for students	<ul style="list-style-type: none"> As of 2013, Imperial College London's careers events were attended by BP, Shell, Schlumberger, and Total (Lander, 2013). In 2022, ExxonMobil and SLB hosted recruiting events at Brown University (Carpenter et al., 2023).
Fossil fuel industry advising course curricula and degree offerings	<ul style="list-style-type: none"> Dozens of fossil fuel industry representatives were involved in the development and teaching of the undergraduate program at the School of Oil and Gas Engineering at the University of Western Australia (Hamilton & Downie, 2007). BP, Shell, and Equinor advised universities such as Oxford, Edinburgh, and University College London on degree courses in geoscience and engineering (Corderoy et al., 2023).
Universities participating in training services for fossil fuel industry personnel	<ul style="list-style-type: none"> Esso (Exxon) has contracted with London Business School to provide a Graduate Development Programme for all new staff (Muttitt, 2003). In 2013, San Juan College expanded its School of Energy with donations from BP, Merriam Oil and Gas Corp., and ConocoPhillips. The college president said "We're the North American, on-shore trainer of choice for BP American. We provide the training for all new and existing BP employees" (Miller 2013; Robinson Avila 2013).

(Continues)

TABLE 1 (Continued)

Type of involvement	Example
Fossil fuel industry leasing university-owned land for fracking	<ul style="list-style-type: none"> Carrizo Oil & Gas has drilled for natural gas on the campus of University of Texas—Arlington (Food & Water Watch, 2013). In 2013, the University of Tennessee-Knoxville opened up 8600 acres of the Cumberland Forest for bidding by fossil fuel companies to study “best practices” for fracking (Deese & Brown, 2013; Horn, 2013).

Note: Fossil fuel companies involve themselves in higher education in myriad ways, including sponsoring research, lectures, and student programming. These examples highlight the range of fossil fuel industry involvement in universities in the United States, United Kingdom, Canada, Australia, and beyond.

How can researchers shed light on ties between the fossil fuel industry and universities? The growing and seemingly consequential nature of these ties necessitates a review of existing work and an agenda for further research. In this article, we report the first literature review of English-language research in peer-reviewed and academic as well as civil society publications on fossil fuel–university partnerships (Section 2). This yielded publications on fossil fuel industry ties to higher education in the U.S., U.K., Canada, and Australia. These four countries lead the world in fossil fuel production and per capita carbon dioxide emissions, are among the countries historically responsible for holding back international climate negotiations, and have witnessed drastic cuts to state funding of higher education (Desjardins, 2019; Worldometer, 2023).⁵

Our review highlights the existence of COIs in fossil fuel–university partnerships. These are concerning given the extensive literature showing that COIs with other industries have biased research and other academic outcomes, not to mention early evidence of biases in fossil fuel-funded research. Our review also indicates that lack of transparency about fossil fuel–university partnerships hinders research on COIs. We propose topical and methodological directions for future research on the prevalence and consequences of fossil fuel industry involvement in higher education, and on responses to it. We suggest ways that researchers may access data and we encourage universities to commit to transparency and public disclosure about all industry partnerships.

2 | FOSSIL FUEL–UNIVERSITY TIES: A LITERATURE REVIEW

To assess the current state of knowledge and identify opportunities for further research in this field, we conducted a review of English-language publications on relationships between fossil fuel companies and universities. Given the limited literature on this topic, we examined both peer-reviewed and academic publications as well as reports by civil society organizations or “gray literature.” We identified publications in four ways: (1) keyword searches of electronic databases, (2) collation of personal archives, (3) hand searches of references in each publication, and (4) forward citation searches of each publication, modeling our method on Fabbri et al. (2018) and Legg et al. (2021) (Supplementary Section S1). This yielded 35 publications (14 peer-reviewed and academic publications, 21 reports) on fossil fuel–university ties in the U.S., U.K., Canada, and Australia in 2003–2023.⁶ To our knowledge, this is the first extensive literature review of research into fossil fuel industry ties to higher education.

2.1 | Review of peer-reviewed and academic literature on fossil fuel–university partnerships

We identified 14 peer-reviewed and academic articles and book chapters that discuss fossil fuel influence in higher education; all but three (Barday, 2008; Gustafson, 2012; Shah, 2013) were published after 2018 (Figure 1). These publications fall into three categories: (1) critical analysis of fossil fuel–university partnerships, (2) documentation of prevalence and networks of partnerships, and (3) evaluation of bias and other consequences of partnerships.

2.1.1 | Critical analysis of partnerships

One subset of publications critically analyzes the relationships between fossil fuel interests and higher education institutions (Gustafson, 2012; Ladd, 2019; Piccari et al., 2023; Shah, 2013; Thacker, 2022).

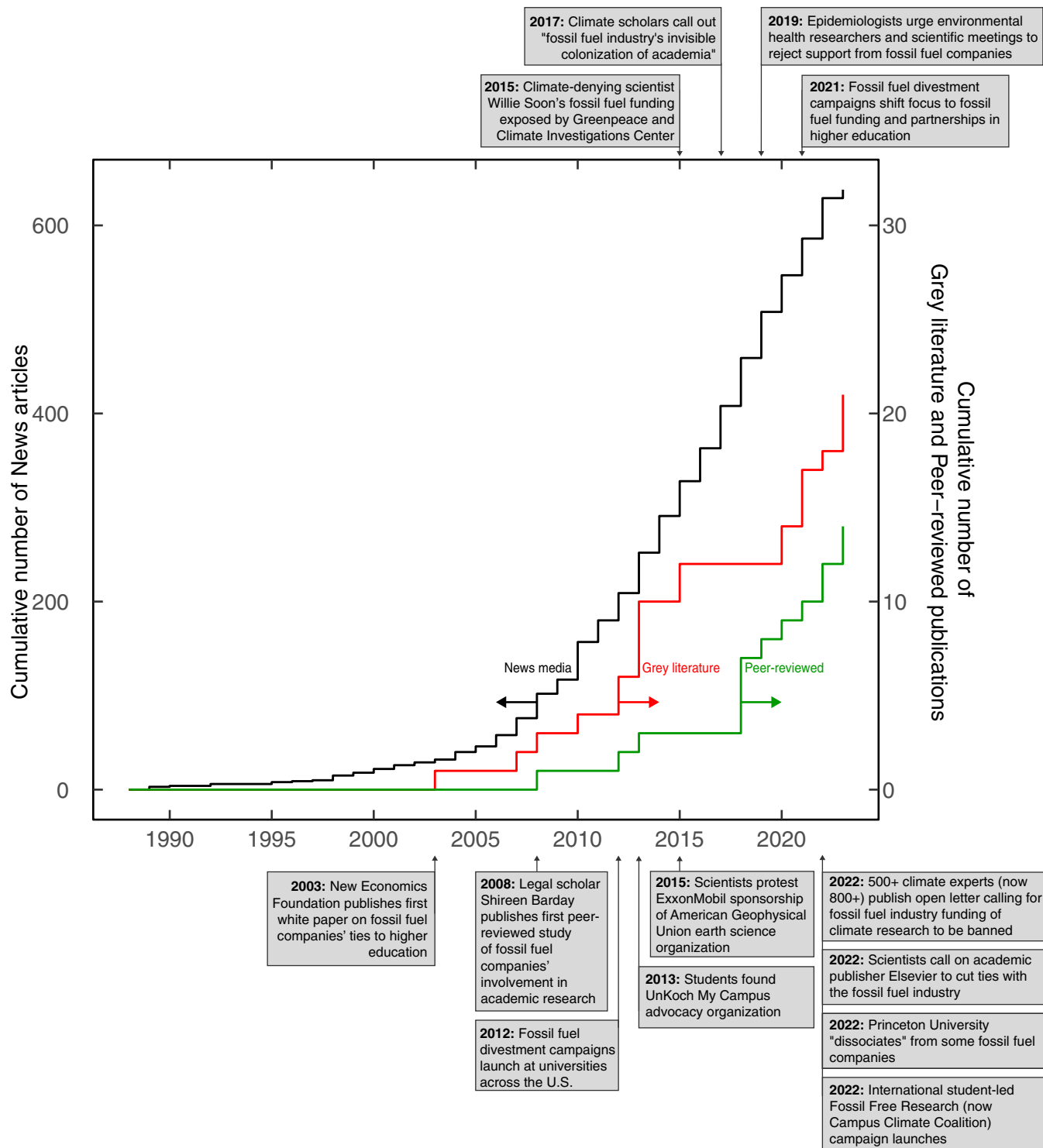


FIGURE 1 Timeline of the cumulative number of gray literature (red, right axis) and peer-reviewed and academic publications (green, right axis) addressing potential conflicts of interest due to fossil fuel companies' ties to higher education. For comparison, the cumulative number of news articles (newspapers, magazines, blogs, wire feeds) since 1988 concerning fossil fuel industry funding of higher education is shown in black (left axis). Key research and advocacy milestones are indicated by text boxes. See Supplementary Materials sections S1 and S2 for methods.

Anthropologist Gustafson (2012) theorizes that fossil fuel industry support for university research in the U.S. shapes the production of “fossil knowledge” more broadly; that is, “representations of truth, sentiment and experience produced by, or in relation to, the oil, gas and coal industries” (p. 313). He suggests fossil fuel companies have embedded

themselves in universities as one way of promulgating fossil knowledge, which in the social sciences is characterized by “propagation of fear and a discourse of security, the notion of inevitable technological innovation,” and “growth and maintenance of current patterns of consumption” (p. 315). For example, out of 82 publications from fossil fuel-sponsored academic energy centers at Rice University and Oxford University, 74 concerned financial markets, geopolitical disputes, and security; only 5 were on renewable energy. Gustafson concludes that fossil knowledge is maintained through “diverse, multi-scalar interventions into public life,” of which university partnerships are one piece (p. 321).

Ladd (2019) examines the historical underpinnings of fossil fuel ties to U.S. universities, and the role this corporate philanthropy plays in supporting fossil fuel interests. He critically assesses how oil and gas companies, including those engaged in the controversial practice of fracking, have formed hundreds of partnerships with colleges and universities. Some universities located atop shale oil and gas reserves have even leased their land for fracking. Ladd describes how two historical trends set the stage for what he calls “Frackademia”: the aforementioned corporatization of universities, and the fossil fuel industry's historical influence over the U.S. political economy and cultural landscape. University ties benefit fossil fuel companies in myriad ways, Ladd argues, such as “greenwashing” their image, reducing corporate tax burdens through educational contributions, and reducing employment costs by, effectively, training future employees through universities. Ladd speculates that fossil fuel companies “are not investing in technologies that will help solve our energy problems...so much as *perpetuate* our carbon addiction” (p. 22).

Thacker (2022) similarly describes the historical backdrop to the prevalence of U.S. academic energy centers funded by fossil fuel companies, focusing on parallels with the tobacco industry's strategy, since the 1950s, of offering “funds directly to university-based scientists [to] enlist their support and dependence” (p. 1). Thacker's investigation centers on interviews with students and researchers who express concern that fossil fuel funding of academic centers that aim to tackle the climate crisis presents a clear COI.

Shah (2013) and Piccari et al. (2023) describe fossil fuel companies' involvement in public health and medical research. Shah (2013) focuses on ExxonMobil's “Malaria Initiative,” which supported malaria research by foundations, humanitarian groups, and universities, such as the Harvard School of Public Health. She reveals a COI due to ExxonMobil's support of the authoritarian government in Equatorial Guinea, which is home to large oil reserves and whose poor governance has contributed to high rates of malaria. After surveying 31 organizations receiving support from ExxonMobil's Malaria Initiative and receiving only one reply, Shah uncovered a notable lack of transparency around these relationships and uses the case of ExxonMobil to advocate for greater transparency and improved management of COIs in public-health research.

Piccari et al. (2023) highlight how fossil fuel production and use harms respiratory health through air pollution and wildfires, and document how fossil fuel companies have underwritten respiratory research.⁷ For example, the American Gas Association funded a recent peer-reviewed article that concluded: “the epidemiology literature...does not provide sufficient evidence regarding causal relationships between gas cooking or indoor NO² and asthma or wheeze” (Li et al., 2023). Piccari et al. (2023), like Shah (2013), recommend greater funding transparency and disassociation from fossil fuel companies by universities and medical associations.

These five papers highlight the history behind widespread fossil fuel industry involvement in higher education. They call attention to its apparent prevalence, compare it to the tobacco industry's strategy of funding academics, and raise concerns about the potential for COIs and bias in research. The researchers conclude that these relationships lend legitimacy to fossil fuel companies and compromise disciplines ranging from climate and energy studies to public health.

2.1.2 | Documentation of prevalence and networks of partnerships

Another subset of articles builds on these critical assessments by empirically documenting the relationships between fossil fuel interests and Canadian universities (Carroll, Graham, Lang, et al., 2018; Carroll, Graham, & Zunker, 2018; Graham, 2020; Gray & Carroll, 2018).

Carroll, Graham, Lang, et al. (2018) conducted a network analysis of the directors and top executives from the 238 largest Canada-based fossil fuel corporations and the governing boards of 46 universities and 19 research institutes, also examining think tanks and business advocacy groups. They found that fossil fuel companies were deeply embedded in universities and research institutes and were especially concentrated in a “carbon-centered scientific-industrial complex” in the oil-producing province of Alberta. Carroll, Graham, Lang, et al. (2018) similarly analyzed links between fossil fuel companies and universities and research institutes as an example of corporate influence in universities.

Sociologist Graham (2020) conducted a network analysis to investigate the institutional networks that produce research aiming to “green” the fossil fuel industry, including topics such as carbon capture and storage, enhanced oil

recovery, and ecological remediation of extraction sites. Graham found that the 238 largest fossil fuel companies and 21 industry associations were deeply embedded in 34 university and government research institutes researching technologies intended to “green” fossil fuel production, with the bulk again concentrated in Alberta.

Sociologists Gray and Carroll (2018) conducted another network analysis of fossil fuel-companies and three universities in major oil-producing provinces in Canada. They too found that fossil fuel companies were consistently connected to universities. To examine how these connections result in industry *influence* on universities, they presented two case studies of fossil fuel–university partnerships: between University of Calgary and energy company Enbridge, and between Calgary School of Public Health and coal company TransAlta. We detail each of these below to illustrate the dynamics of such partnerships.

The University of Calgary–Enbridge case showed how a fossil fuel company sought to influence and benefit from a university partnership, and how university staff debated it. At the time of writing, the university and company were linked in multiple ways: Enbridge endowed the Enbridge Center for Corporate Sustainability inside the university's school of business, and the university's then-president served on Enbridge's corporate board and held Enbridge stock. A Canadian Broadcasting Company analysis revealed clear evidence of corporate influence: Enbridge had the right to stop funding at any time if dissatisfied with the center; sought influence over staffing, student awards, and board membership for the center; and negotiated opportunities for its executives and clients to meet researchers at the business school (Bakx & Haavardsrud, 2015). Its PR company also managed the center's image. In response to faculty concerns, university administrators defended the company's right to “to use this investment as a way to make amends and possibly receive some positive PR” (Gray & Carroll, 2018, p. 498).

The second case focused on the coal company TransAlta's funding of research by a public health professor at University of Alberta, Dr. Warren Kindzierski. In direct contrast to previous research on the negative health impacts of coal plant emissions, Kindzierski reported that coal plants did “not negatively impact the health of local residents” (Gray & Carroll, 2018, p. 501). Emails uncovered by a Freedom of Information (FOI) request showed that the company was heavily involved in assigning, reviewing, and publicizing this research, and that Kindzierski requested company feedback on proposals and drafts. The TransAlta-Kindzierski partnership yielded (non-peer-reviewed) research that favored TransAlta, which was then used by TransAlta, the President of the Coal Association of Canada, and several mayors to lobby the Alberta government against phasing out coal plants.

Gray and Carroll (2018) conclude that fossil fuel companies benefited from these partnerships by effectively purchasing the academic credibility and public trust afforded to universities, which enabled them to use academic work products to lobby policymakers.

The Canadian Broadcasting Company investigation into Enbridge's ties with the University of Calgary sparked national discourse on academic integrity, corporate influence in higher education, and the role of fossil fuel interests in public institutions amid debates on climate change (Bakx & Haavardsrud, 2015). In another study, McCartney and Gray (2018) showed that corporate news media supported the partnership whereas public media was more critical.

Political scientist Adkin (2020) complements this social-network research by highlighting the “enormous influence of fossil fuel industry interests in shaping priorities of *government* research funding,” which in turn shapes academic research directions in Canada (p. 17, emphasis added). Adkin measured how government energy-research priorities evolved between 1999 and 2016 in Alberta. Her analysis of federally-funded energy or environmental science researchers at the Universities of Alberta and Calgary revealed that far more researchers—52%—conducted fossil fuel-related research (e.g., reservoir exploration, hydraulic fracturing) compared to 15% working on renewable energy, biofuels, or energy efficiency combined. Fossil fuel-related research received more funding than all other energy research combined. Moreover, the number of researchers and amount of government funding for fossil fuel-related research *increased* between 1999 and 2016, whereas funding for renewable energy research saw only a modest increase.⁸

These studies highlight the pervasive links between the fossil fuel industry and universities in Canada and show how fossil fuel companies' ties to universities and government agencies appear to support the academic production of knowledge that furthers fossil fuel dependence, such as petrochemical production and hydraulic fracturing.

2.1.3 | Evaluation of bias and other consequences of partnerships

A final group of articles evaluates the consequences of relationships between the fossil fuel industry and higher education (Almond et al., 2022; Al-Saleh & Vora, 2023; Barday, 2008). These studies most closely resemble previous research

on COI and bias in industry-funded research that compares outcomes between industry- and non-industry-sponsored research.

Barday (2008) analyzed law review articles from 1992 to 2007 that acknowledged outside funding sources and discussed punitive damages (a court can demand punitive damages from a defendant when their behavior is considered particularly harmful). University- and government-funded articles overwhelmingly defended punitive damages, whereas corporate-funded articles argued against this measure.⁹ Exxon was the most common non-university funder of articles on punitive damages. For example, Barday describes how Exxon paid a Harvard Law School professor to write about “why punitive damages awards are inappropriate in today’s civil justice system” in 1997, when Exxon was appealing a \$5 billion punitive damages award after the Exxon Valdez oil tanker spill in Alaska (p. 715). Barday reports another professor receiving a call from Exxon “exploring...whether it’s feasible to get something published in a respectable academic journal, talking about what punitive damage awards do to society, or how they’re not really a very good approach” (p. 712).

Exxon’s funding of law review articles not only contributed to legal *scholarship* in its favor but impacted legal *proceedings* more broadly. To assess this impact, Barday (2008) measured how many times the articles in her sample were cited by courts and legal briefs. Exxon-funded articles—some critiqued for faulty methodology—were cited by courts at all levels in support of Exxon and other cases seeking to limit punitive damages awards. She hypothesized that this occurred because attorneys representing corporations such as Exxon would be aware of articles funded by, and favorable to, those corporations and their legal strategies. She observed a lack of transparency in legal proceedings around funding relationships. When Exxon attorneys cited Exxon-funded articles in their briefs, they did not mention that Exxon had supported the research, so these articles were likely erroneously viewed as objective.

Analyzing academic energy center reports in the U.S., U.K., and Canada from 2009 to 2010, Almond et al. (2022) found that reports published at MIT, Harvard University, and Stanford University receiving significant funding from fossil fuel companies were on average more positive toward natural gas and less positive toward renewable energies compared to centers less dependent on funding from fossil fuel companies. The positive sentiment in reports from fossil fuel-funded centers was indistinguishable from that of reports by the American Gas Foundation and American Gas Association. Almond et al. concluded that fossil fuel industry funding of the investigated centers has measurably biased their reports in favor of natural gas. This bias may be consequential beyond higher education, they warn, as center reports often make policy recommendations and are invoked by policymakers. For example, the U.S. Senate Energy and Natural Resources Committee heard testimony on a 2011 MIT energy center report funded by the fossil fuel industry (Almond et al., 2022). Almond et al. suggest that policymakers, journalists, and the public may view these centers as independent of corporate interests because donations to them are often not reported or emphasized.

Al-Saleh and Vora (2023) conducted an ethnographic and archival study of the Texas A&M branch campus in Qatar to examine how fossil fuel–university partnerships shaped students’ perceptions of the industry and their career aspirations. They found that the Qatari government has described educational institutions such as Texas A&M as “key player [s]” in the country’s “national long-term climate change strategies” (p. 4). Al-Saleh and Vora also observed that universities facilitate fossil fuel industry operations by providing “petro-education” to students: a “mode of training and socialization that channels and appropriates student desires for and questions regarding alternatives to fossil fuels toward the oil and gas industry.” Students interviewed revealed that they experienced contradictory messages from Texas A&M, which touted “sustainability” yet encouraged them to major in petroleum engineering, take fossil fuel jobs, and focus on “greening” the industry.

2.2 | Review of gray literature on fossil fuel–university partnerships

To date, peer-reviewed and academic literature on fossil fuel–university partnerships is limited. We supplemented our review with gray literature, which has historically played an important role in motivating academic research. Investigative journalism, advocacy-organization reports, and whistleblower accounts have sounded early warnings about the health risks of products like tobacco (Kluger, 1997), asbestos (Schneider & McCumber, 2005, and fracking (Webb, 2010), often preceding academic research confirming these dangers (Pappas & Williams, 2011). Gray literature can identify research gaps, offer real-time insights, allow for diverse perspectives, and share preliminary findings that inform peer-reviewed research (Adams et al., 2016; Christensen et al., 2022; Hudson & Bruce-Miller, 2023; Pappas & Williams, 2011). On the current topic, the earliest gray literature we identified was Muttitt (2003), published over a decade before most peer-reviewed work (Figure 1) and this gray literature is cited in much of the peer-reviewed and

academic research above. For these reasons, while gray literature is not peer-reviewed and is sometimes intentionally normative and politically motivated, we would be remiss to disregard its insights.¹⁰

We identified 21 civil-society reports on fossil fuel involvement in higher education, primarily in the U.S. and U.K. but also in Canada and Australia. Approximately half were commissioned by NGOs; the remainder were written by students or faculty. These reports, like the academic literature, paint a picture of pervasive fossil fuel industry involvement in universities, describing a high proportion of government and industry spending on fossil fuel-related academic research, university–industry contracts that threaten to undermine academic freedom, and myriad examples of how fossil fuel companies insert themselves into higher education (Table 1). Authors variously (1) analyzed government and industry funding data, (2) reported case studies of university–industry partnerships and examined their contracts, and (3) provided on-the-ground, detailed perspectives from students and faculty on the presence of fossil fuel companies on campus.

2.2.1 | Quantitative analyses of government and industry funding data

A first subset of articles analyzes government and industry funding data. Muttitt (2003) and Lander (2013), and Adkin and Cabral (2020), who respectively investigated fossil fuel industry sponsorship in the U.K. and Canada, emphasized the role of government in encouraging fossil fuel–university partnerships and research on fossil fuel extraction. Governments directly subsidize fossil fuel-related academic research and indirectly set research priorities that encourage such research, for example by encouraging industrial partnerships and applications and reducing public spending on higher education—which can increase researchers' reliance on industry funding.¹¹ For example, from 1999 to 2015, over 60% of funding for energy and environmental research from the Canadian Natural Sciences and Engineering Research Council to the Universities of Alberta and Calgary went to fossil fuel-related research such as carbon capture and storage, hydraulic fracturing, and pipelines; only 11.2% went to research on renewable energy and energy conservation (Adkin & Cabral, 2020; Adkin, 2021, discussed above, presents similar analyses).

In the U.S., Kumar (2023) drew on IRS 990 forms, fossil fuel foundation reports, newspaper coverage, and voluntary disclosures by universities to measure fossil fuel industry funding in universities. She identified at least \$770 million in donations to U.S. universities from six fossil fuel companies and their associated foundations and allies (e.g., Koch Foundation) in 2010–2020.

2.2.2 | Case studies and qualitative analyses of partnership contracts

Many reports described case studies of fossil fuel–university partnerships. For example, Food and Water Watch (2013) and the Public Accountability Initiative (PAI) released a number of reports about “Frackademia,” detailing examples of fossil fuel industry sponsorship of fallacious, pro-fracking academic studies (many of which did not disclose this) and of university-owned land leased for fracking operations. PAI reports have examined how academic research minimizing the environmental harms of fracking involved sponsorship and participation by the natural gas industry (Connor et al., 2012a, 2012b; Connor & Galbraith, 2013; Galbraith & Armstrong, 2015). For example, the influential study by the MIT Energy Initiative “The Future of Natural Gas,” which endorsed natural gas as “a bridge to a low carbon future,” involved several authors with financial ties to and funding from the oil and gas industry (Connor & Galbraith, 2013).

Another five reports qualitatively analyzed how university–fossil fuel partnerships threaten to undermine academic freedom (Canadian Association of University Teachers, 2013; Climate Justice, 2022; Goozner & Gable, 2008; Mulvey & Shulman, 2015; Washburn, 2010). For example, research contracts (when available) were found to restrict the creation or publication of research, to permit donors and corporate partners to have majority control of academic governing boards, and to give industry sponsors first rights to intellectual property.

2.2.3 | Student and faculty reports on partnerships

Students and faculty have published detailed reports about their own universities. In 2007, Hamilton and Downie published case studies of fossil fuel industry influence on teaching, research, and scholars' public comments in three Australian universities. Since 2020, at least five student organizations in the U.S., U.K., and Canada have released

reports reflecting the emergence of campus activism on this issue, often as an extension of fossil fuel divestment campaigns (Gilchrist & Kaufman, 2022; Tabuchi, 2022). These groups have each compiled dozens of examples of fossil fuel company ingratiation with their universities: Harvard University, University of Oxford, University of Cambridge, University of British Columbia, and Brown University (Banks et al., 2020; Carpenter et al., 2023; Climate Justice, 2022; Fossil Fuel Divest Harvard, 2021; Oxford Climate Justice Campaign, 2021). The non-profit project UnKoch My Campus, which has investigated relationships between wealthy donors, corporations, and educational institutions, published a series of reports on funding of higher education by Koch Industries and its affiliates (e.g., UnKoch My Campus, 2021).¹² Most of these reports focus on fossil fuel industry involvement in the physical sciences, though reports by the student organization Fossil Fuel Divest Harvard and its alumni faction have also scrutinized the presence of fossil fuel interests on Harvard's primary governing board and in its law and policy schools (Fossil Fuel Divest Harvard Alumni, 2023). Bragg et al. (2021) cite this student-led research in their report "The Big Con," describing fossil fuel companies' involvement in academic research in the U.S. and U.K. as a strategy to "validate net zero climate plans" that are heavily reliant on technologies such as carbon capture and storage.

These civil-society reports use a range of data sources and methods to show that fossil fuel companies' ties to higher education are prevalent and multifarious, and argue that this trend must be addressed. Almost all offer specific recommendations for how to limit this influence, including ending university research funding, lectures, recruitment events, advertising, and governance positions by fossil fuel companies and their representatives. Authors also recommend creating public registries disclosing universities' relationships with fossil fuel companies, developing enhanced ethical guidelines for accepting donations, and eliminating all education and research relevant to fossil fuel production, regardless of sponsor (see Section 3.4 for further discussion).

2.3 | Reflections on an emerging field: New climate denialism, parallels to other industries' influence on research, and lack of university transparency

Our review reveals a nascent field in need of further empirical research into the prevalence and consequences of fossil fuel companies' involvement in higher education and responses to it, and the broader trend of higher education as an avenue for climate obstruction. Because this review focused only on published reports and literature, it likely underrepresents the prevalence and consequences of more recent partnerships. Nonetheless, our review highlights three key themes in this emerging field: (1) the fossil fuel industry's shift from *denying* climate change to *delaying* climate action, (2) parallels to previous research on COIs and bias in university partnerships with other industries, and (3) how universities' lack of transparency about their relationships with fossil fuel interests hinders this research and academic accountability.

2.3.1 | New climate denialism

Our literature review shows that partnerships between fossil-fuel companies and universities can grant substantial material and reputational benefits to the industry (Gray & Carroll, 2018). Materially, they often result in research that favors the industry's interests, such as reports supportive of fossil-fuel-friendly litigation and policies (Almond et al., 2022; Barday 2008). They also afford opportunities to train and recruit future fossil fuel industry employees (Al-Saleh & Vora, 2023). Reputationally, fossil fuel sponsors inherit, by association, some of the public trust and academic credibility of universities, which helps position those companies as key players in addressing the climate crisis. The authors of several reviewed articles expressed concern over the normalization—even flouting—of industry influence in higher education (Gray & Carroll, 2018; Thacker, 2022).

Carroll, Graham, Lang, et al. (2018) argued that these partnerships thus institutionalize a "new climate denialism." Whereas previously, fossil-fuel companies denied basic climate science and its implications, today, they have shifted to primarily spreading more subtle "discourses of climate delay" (Lamb et al., 2020, emphasis added). Among these discourses of climate delay are narratives that "push non-transformative solutions," such as Fossil Fuel Solutionism and Technological Optimism. Regarding the former, fossil-fuel companies effectively forestall action by supporting innovation (and employment pipelines) that facilitates continued fossil-fuel exploration and production, such as petroleum extraction, refining, and transportation (Adkin, 2021). Meanwhile, Technological Optimism is perpetuated by fossil fuel industry sponsorship of economically or technologically unproven technologies, such as carbon capture and storage

(Thacker, 2022). These narratives, in turn, can be weaponized to greenwash a company's public image, contributing to what Supran and Oreskes (2021) have termed the industry's "Fossil Fuel Savior" framing of the climate crisis.

2.3.2 | Parallels to industry influence in research

How does this emerging literature compare to previous research on industry COIs in higher education? The studies reviewed here revealed parallels between fossil fuel industry strategies and those of industries like tobacco and pharmaceuticals (Fabbri et al., 2018; Legg et al., 2021; Pinto, 2017; White & Bero, 2010). For example, fossil fuel companies have supported research that had commercial applications (e.g., hydraulic fracturing) or was otherwise favorable to their legal and policy positions (e.g., anti-punitive-damages law review articles). Similar to research comparing pharmaceutical-funded to non-pharmaceutical-funded studies (Lundh et al., 2012), scholars such as Barday (2008) and Almond et al. (2022) found that fossil fuel-funded research made conclusions more favorable to the industry. Previous COI research has noted how the pharmaceutical industry stands out for arguing that it produces *beneficial* products, whereas industries like tobacco and lead seek to minimize the apparent harms of their products. The fossil fuel industry today appears to do both, and notably positions itself as an innovator of purportedly beneficial climate solutions, such as natural gas and carbon capture and storage.

To date, the literature on fossil fuel industry ties to higher education has focused on implications for climate mitigation and a renewable-energy transformation, with less discussion about the ramifications for complementary efforts to address the immediate public-health harms of fossil fuel pollution. This sets this literature apart from previous COI research that has focused on potential biases in research on the direct health impacts of tobacco, lead, chemicals, junk food and drink, alcohol, and mining industries. Though fossil fuel production has direct health impacts, such as air and radioactive-waste pollution, the studies in this review focus more on the implications for energy innovation and climate litigation and policy. In our research agenda, we propose further study of the fossil fuel industry influence on health research, as described by Shah (2013) and Piccari et al. (2023), and of its influence on energy research and policy.

2.3.3 | University non-disclosure hinders research on fossil fuel–university ties

Across the publications assessed here, authors highlighted their difficulties obtaining data from universities about their relationships with fossil fuel companies. Data on funding amounts and contract stipulations in these partnerships were particularly elusive (Almond et al., 2022; Hamilton & Downie, 2007; Shah, 2013; Washburn, 2010). Because partnerships are commonly not reported publicly and systematically on university websites and publications,¹³ multiple authors contacted universities to request funding and other data. Almond et al. (2022), for example, requested funding data from energy-research centers at MIT, Harvard, and Stanford; all declined. The Canadian Association of University Teachers, in its 2013 review of university–industry collaborations, reported that most universities “refused to provide copies of the agreements.” Fossil Fuel Divest Harvard Alumni (2023) reported that only 12 of 104 Harvard departments, institutes, and graduate schools they contacted disclosed whether they receive fossil fuel funding.

Limited data hinders researchers' ability to document the prevalence and consequences of these partnerships. As Almond et al. (2022) wrote, “more precise information on funding amounts and timing would permit stronger empirical tests” of whether and how academic research is influenced by fossil fuel industry funders.

How can researchers continue to illuminate the prevalence and consequences of fossil fuel–academic partnerships despite these data limitations? In some cases, faculty, staff, and students may have information about funding and contract details but be unable to disclose it publicly. There may be a role for media and civil-society organizations to help publish leaked data, although such strategies put whistleblowers at risk. Researchers can sometimes use FOI requests, though this is limited to public universities, is typically time-intensive and costly, exposes academics to retaliation, and may include impractical redactions (Box 1). As the Canadian Association of University Teachers (2013) has put it, universities' refusal to share their agreements with fossil fuel companies with researchers and civil-society organizations “forc[ed] reliance on formal requests under access to information legislation. That process took a considerable period of time, as denials had to be appealed....In other cases, agreements were so heavily redacted that it was impossible to analyze them” (p. 9).

Researchers may also attempt to bypass the lack of publicly accessible data on fossil fuel–university partnerships by obtaining information through personal observations, scraping university and industry websites, searching archives, analyzing funding acknowledgements in publications and reports, conducting media searches, scrutinizing company

BOX 1 Using freedom of information requests: A case from Canada

Freedom of Information (FOI) laws in many countries allow members of the public to request access to records and information generated in public institutions. FOI requests can be submitted to public universities, but their success depends on local protection of privacy provisions and the power of local authorities to order the release of information. An author of this article (EE) spent more than 3 years trying to obtain basic information about fossil fuel and climate change research funding and contracts (name of funder, title of project, amount of funding, and unit receiving the funding) from the public University of Regina, Canada, where she is a professor. After the university refused to provide the names of the funders and the units receiving the funding, EE appealed to the government's Information and Privacy Commissioner who released a report recommending the disclosure of the information. The university continued to refuse to release the information, which left EE no choice but to appeal to the provincial court. After the university lost its application to have the proceedings held privately, the court ruled that the university could not exempt the information from disclosure and the documents were released to EE in April 2021. FOI requests can take years, cost tens of thousands of dollars, and garner significant collegial and institutional blowback, even where academic freedom protects against loss of employment. On the other hand, establishing legal precedents may help with future FOI requests, even in different jurisdictions.

tax disclosures, and other approaches (Kumar, 2023). Indeed, our review shows that researchers have often had to be creative in their methods.

3 | FUTURE RESEARCH DIRECTIONS

Despite data limitations, our literature review suggests an emerging field of research into fossil fuel companies' relationships with higher education. Compared to industry involvement in research on tobacco, pharmaceuticals, and other products, however, peer-reviewed investigations of fossil fuel industry funding and partnerships in higher education are scarce. A search of Web of Science in December 2023 for articles with abstracts mentioning bias or COI and funding or sponsorship yielded about 14,000 items; only seven of which mentioned fossil fuels, most of them irrelevant to our purposes. Similar searches in PubMed, ProQuest, Scopus, and JSTOR confirmed a lack of academic research on this topic (see Section S1). By comparison, searches specifying tobacco, pharmaceuticals, and food and drink yield hundreds of articles.¹⁴

Below, we synthesize three domains where researchers may deepen knowledge about fossil fuel industry ties to higher education: prevalence, consequences, and responses. Section 3.1 (Prevalence) proposes ways to uncover additional evidence of ties. Section 3.2 (Consequences) discusses how researchers may move beyond simply identifying COIs, by also developing evidence and understanding of the effects of COIs and their causal mechanisms. Section 3.3 (Responses) proposes research avenues on how universities, students, scholars, policymakers, and others have responded to fossil fuel industry involvement in higher education.

Our distinction between prevalence and consequences reflects the fact that observing a COI (e.g., a fossil fuel company funding climate-policy research) is distinct from observing the effects of that COI. In terms of observing COIs, our literature review has shown unambiguously that, by definition, COIs exist between fossil fuel interests and some researchers and higher-education institutions. Meanwhile, decades of research have shown that COIs in industry–university partnerships can lead—and often have led—to consequences such as research bias in favor of numerous sponsoring industries, including tobacco, pharmaceutical, junk food, sugar, and lead (Lesser et al., 2007; Oreskes et al., 2015). Taken together, these two observations imply that fossil fuel ties to higher education pose a risk of research that is biased or at least appears biased.

3.1 | Prevalence

Existing research largely compiles anecdotal examples of fossil fuel–university partnerships from personal observations by students and faculty. Some researchers have also systematically collected data from university and fossil fuel

industry webpages, funding disclosures in publications, media coverage, tax forms, and other sources (Adkin, 2021; Adkin & Cabral, 2020; Kumar, 2023; Muttitt, 2003; Washburn, 2010).¹⁵ This research shows that such partnerships are not rare—they are prevalent at least in the U.S., U.K., Canada, and Australia. Media reports, fossil fuel company websites (e.g., ExxonMobil 2023), and emerging research elsewhere (e.g., Al-Saleh & Vora, 2023) suggests this trend probably extends to many other countries.

Nonetheless, non-systematic methods and limited data do not yet allow assessment of the full extent of fossil fuel–university relationships (in absolute terms, and at meaningful units of analysis, such as universities or countries), or of the relative dominance of fossil fuel companies in university programming and research. Almond et al. (2022) and Barg and Supran (forthcoming) provide preliminary estimates of the *relative* proportions of funding from fossil fuel companies in energy and climate research at select universities.

Lack of data also prevents analysis of how fossil fuel–university partnerships are evolving *over time*. Since universities play an important role in informing climate discourse and policy, and the fossil fuel industry has a documented track-record of denial and delay, it is critical to better understand how pervasive industry involvement is in higher education and how it is changing over time and geography. Specific questions for further research include:

- *What is the nature of fossil fuel–university partnerships internationally?* Our English-language search primarily yielded research conducted in—and focused on—the U.S., U.K., Canada, and Australia. But these partnerships are not limited to these countries (e.g., Al-Saleh & Vora, 2023; Ferguson & Matthews, 2023). ExxonMobil, for example, partners with universities around the world, including in China, Qatar, and the Netherlands (ExxonMobil, 2023).
- *What is the nature of fossil fuel industry involvement in research beyond energy and climate studies?* Most studies in our review examine fossil fuel industry involvement in the physical sciences and engineering, but preliminary evidence suggests these companies may also be influential in disciplines such as economics, psychology, and in particular public health (Piccari et al., 2023; Shah, 2013; UnKoch My Campus, 2021). Franta (2022) reports a case study of how fossil fuel companies funded consultants to produce flawed economic analyses that were weaponized by industry and politicians to undermine climate policy, while Fossil Fuel Divest Harvard (2021) documents fossil fuel company involvement in Harvard's policy school.
- *What other fossil fuel interests are involved in higher education?* We have focused on oil and gas producers, but fossil fuel interests also include automobile, airline, and utility companies, and foundations and think tanks with close links to the industry (e.g., the Koch network; see Mayer, 2016). For example, Almond et al.'s (2022) sample of academic-energy centers includes centers receiving funding from Toyota, Boeing, and utility companies.

3.2 | Consequences

Previous COI research has outlined various industry strategies to influence research and its use in policy, including producing research favorable to industry and creating a distorted picture of the evidence base to undermine unfavorable research (Legg et al., 2021). Legg et al.'s (2021) “Science for Profit Model” identifies five “macro strategies” used by various industries to “influence science and the use of science in policy and practice,” and concludes that the fossil fuel industry has engaged in all five. The strategies comprise influence on the (1) conduct, (2) interpretation, (3) reach, and (4) application (by policymakers) of science, and (5) greenwashing of sponsors. Additional work is required to expand and tailor this model to climate-change obstructionism by fossil fuel interests, and especially to examine the relationship between demonstrable COIs with any consequences.

Scholars have for several years speculated that fossil fuel–university partnerships could have similar consequences (Supran & Franta, 2017) and have provided initial empirical evidence of biases (Almond et al., 2022; Barday, 2008). Anecdotal accounts suggest that fossil fuel–university relationships may also induce institutional COIs in university policy decisions. For example, Franta (2020) describes faculty at Stanford University citing fossil fuel sponsorship of research as a reason to vote against the university's endowment divesting from fossil fuel companies. However, causal evidence of bias in fossil fuel-affiliated university research and other activities is limited, as are detailed explanations of the mechanisms by which COIs lead to such effects.

Future research on the consequences of fossil fuel–university ties may examine such mechanisms and effects within and outside higher education, as well as perceptions of these ties, by asking questions such as:

- *What are the consequences of fossil fuel ties within universities?* What are the effects of fossil fuel ties on research, teaching, and university sustainability efforts, such as divestment? What are the effects on students, faculty, and administrators? How do psychological, organizational, and other processes connect COIs to biased research and behavior?
Barday (2008) and Almond et al. (2022) provide initial evidence of influence on research, and Al-Saleh and Vora (2023) on students and faculty, but demonstrations of influence on teaching and personnel are more limited. For this area, academics are uniquely positioned to draw on—and formalize—their own observations of the consequences of fossil fuel–university partnerships (e.g., see Adkin’s (2021) “inside view,” in which she describes what she observed at her university in Alberta).
- *What are the consequences of fossil fuel ties outside of higher education?* How does fossil fuel industry presence in higher education shape outcomes outside of it, for example in litigation and policymaking? One well-documented example is the aforementioned MIT Energy Initiative report funded by the natural gas industry. It presented natural gas as a “bridge” to a low-carbon future, ignoring research on emissions from methane leaks, and was cited by President Obama in his State of the Union address advocating natural gas.
Another question of interest is: How does fossil fuel-funded research shape other influential climate and energy reports by institutions such as the Intergovernmental Panel on Climate Change (IPCC) or U.S. National Academies of Sciences, Engineering, and Medicine? Previous research has examined biases in IPCC reports resulting from disparities in participation by geography and discipline (Corbera et al., 2016). To our knowledge, similar studies on potential fossil fuel–industry-driven biases do not yet exist. Corbera et al. (2016) report that IPCC authors have mostly worked and studied at a small set of U.S. and U.K. universities; fossil fuel–university partnerships at certain universities may thus have disproportionately large influences on climate policy.
- *How are fossil fuel–university ties perceived?* What is the awareness of—and what are the attitudes toward—the prevalence and consequences of fossil fuel–university partnerships among the public, students, faculty, university administrators, and policymakers? Scholars suggest that the public, academics, and policymakers have little knowledge of the prevalence of these partnerships (Almond et al., 2022; Ladd, 2019; Supran & Franta, 2017), though polling suggests that most of the public endorses ending these partnerships (Kumar, 2023; Scott-Buechler, 2022). Researchers could conduct interviews, surveys, and experiments to examine awareness and attitudes and to investigate how such knowledge shapes perceptions of fossil fuel companies, universities, and research outcomes (Fabbri et al. (2018) provide examples of research on perceptions of other industry–university partnerships).

3.3 | Responses

Research is also needed on responses to fossil fuel–university ties. How have universities, students, scholars, policymakers, and others responded to fossil fuel industry involvement in higher education? How do these responses compare to those toward other industries?

Several authors have expressed concerns about lack of university transparency about industry partnerships, academic freedom, and how fossil fuel industry involvement in universities may obstruct climate action. For example, McCartney and Gray (2018) argued that “fossil fuel companies are leveraging publicly funded centers of education and learning to promote a carbon-intensive future...the very definition of corporate obstruction in democracy” (p. 320).” Authors of the gray literature in particular recommended specific courses of action to limit the presence and influence of fossil fuel companies in higher education. However, neither gray nor peer-reviewed and academic publications evaluated the relative merits, impacts, or limitations of different actions.

Initial research questions could include:

- *How have universities, policymakers, and other actors attempted to respond to industry influence in higher education historically?* Researchers may document responses to industry influence and empirically assess their relative merits and drawbacks. Previous examples of academic bodies countering industry influence include Harvard’s School of Public Health refusing donations from the tobacco industry in 2002 (Charatan, 2002). In 2010 the U.S. government passed the Sunshine Act to mandate disclosure of—and publicize information about—research funded by the pharmaceutical industry.
- *How have universities, policymakers, and other actors acted to limit fossil fuel industry influence in higher education so far?* Students and faculty have launched campaigns to make their universities “fossil-free” in the U.S., U.K., and

BOX 2 Academic activism against fossil fuel industry ties to universities

Students and researchers are calling on their universities to dissociate from fossil fuel companies. Some universities have acted (or pledged) to limit the presence of fossil fuel companies on their campuses.

Students

- The Campus Climate Network (previously Fossil Free Research) campaign was launched in 2022 to “end the toxic influence of fossil fuel money on climate change-related research in universities” (Fossil Free Research, 2023a).
- Students have called for an end to funding relationships with fossil fuel companies at University of California at San Diego, University of Minnesota-Twin Cities, University of Toronto, University of Oxford, Brown, Duke, Ohio State, Tufts, University of British Columbia, Stanford, George Washington, Harvard, Cambridge University, and other universities (Lee, 2022).

Faculty and researchers

- Members of the American Geophysical Union (AGU) published a report in 2016 arguing that ExxonMobil's sponsorship of AGU violated the association's bylaws that prohibited funding relationships with organizations that promote disinformation and anti-science policymaking. They successfully called for the relationship to be terminated (Achakulwisut et al., 2016).
- In 2019, epidemiologists Manolis Kogevinas and Tim Takaro called on organizations representing environmental health researchers and their scientific meetings to reject support from fossil fuel extraction companies. They also called on the International Society for Environmental Epidemiology to become more vocal on this issue (Kogevinas & Takaro, 2019).
- In 2022, scientists signed a petition launched by the Union of Concerned Scientists and Scientists for Global Responsibility calling on the academic publisher Elsevier to cut ties with the fossil fuel industry (Stancil, 2022; GS signed the petition).
- In 2022, Stanford University researchers called on universities to cut research links with fossil fuel companies in a correspondence piece in *Nature* (Kashtan et al., 2022).
- As of March 2023, over 800 researchers, mostly from the United States and United Kingdom, have signed a letter coordinated by Campus Climate Network calling on universities to stop accepting research funding from the fossil fuel industry (Fossil Free Research, 2023b; Harvey, 2022).

Universities

- Princeton University announced in 2022 that it would reject financing from 90 fossil fuel companies, including a long-standing partnership with ExxonMobil (BP continues to fund Princeton University's Climate Mitigation Initiative; Princeton University, 2022).
- Brown University President Paxson pledged in 2022 to update the university's business ethics policies to halt collaboration with individuals and organizations involved in science disinformation, following faculty criticism of donations from the Charles Koch Foundation, which promotes climate change denial (Noor, 2022).

Canada. Some universities have responded: Princeton University, for example, disassociated from 90 fossil fuel companies and ended a relationship with ExxonMobil in 2022 (Princeton University, 2022) (Box 2).

- *What is the potential for third-party sustainability evaluators to account for relationships with fossil fuel companies in their ratings?* The Sustainability Tracking, Assessment, & Rating System and United Nations Global Compact corporate reporting framework are two examples of evaluators.

3.4 | Enabling research and action on fossil fuel–university partnerships

How can we help scholars research this topic? More research funding (from foundations, nonprofits, and universities, for example) and more data transparency (by universities and patrons) are needed. Funding PhD students and early-career researchers is an important way to support the next generation in researching climate-change obstruction. The Climate Social Science Network (CSSN), which includes a working group on Special Interest Influence in Higher Education, already supports this work.¹⁶ The student-led and academic-advised Campus Climate Network (CCN, previously Fossil Free Research) has initiated a research group on this topic. Researchers, including those whose work has been reviewed in this article, could encourage more research by making their data and code public and easily navigable (Data Citation Synthesis Group, 2014).

Beyond research, many scholars and students have advocated on this topic. Across the U.S., U.K., and Canada, students have called on their universities to reject funding from fossil fuel companies (Lee, 2022), and faculty and researchers have published open letters, signed petitions, and launched campaigns to the same effect (Box 2). As of March 2023, over 800 researchers signed a letter calling on universities to stop accepting research funding from the fossil fuel industry (Harvey, 2022; GS signed the letter). These actions are consistent with calls by academics such as Jessica Green (2020): “as climate scholars, it is our professional responsibility to engage in climate politics and use our expertise to serve as advocates, to identify the political causes of climate inaction as well as solutions to overcome them” (p. 152).¹⁷

4 | CONCLUSION

In an era of widespread concern about corporatization and declining public funding of higher education, and a worsening climate crisis met by limited government action, fossil fuel companies have embedded themselves in universities across the U.S., U.K., Canada, Australia, and beyond. They and their representatives fund research, sit on governing boards, host recruitment events, advise curricula, and more (Milman, 2023). Faculty, students, journalists, and civil-society organizations have documented hundreds of fossil fuel–university relationships, despite universities' widespread lack of transparency on funding ties, amounts, and contract details. Research has also linked these relationships to outcomes biased toward the fossil fuel industry, with implications for universities, litigation, and policymaking. Our review suggests that universities are an established yet under-researched vehicle of climate obstruction by the fossil fuel industry, complementary to its documented history of climate denial, delay, and lobbying. Previous research on COIs and bias in university partnerships with other industries suggests that the academic integrity of higher education is at risk.

We recommend that scholars interested in industry–university ties, climate obstruction, and higher education's role in climate action engage urgently in research into the *prevalence* of fossil fuel–university partnerships across countries, disciplines, and fossil fuel interest types; the *consequences* of such partnerships (and their underlying mechanisms) for students, scholars, universities, litigation, and policymaking; and *responses* to these partnerships and their effects. Scholars also have an opportunity to go further than research: to communicate their findings widely, to advocate for the policy implications of their work, and to support others in doing so (Box 2). Finally, research on the relationships between the fossil fuel industry and higher education requires greater transparency. We call on universities around the world to disclose their financial and contractual ties with fossil fuel companies.

AUTHOR CONTRIBUTIONS

Sofia Hiltner: Conceptualization (lead); investigation (lead); methodology (lead); project administration (lead); visualization (lead); writing – original draft (lead); writing – review and editing (lead). **Emily Eaton:** Conceptualization (equal); writing – original draft (equal); writing – review and editing (equal). **Noel Healy:** Conceptualization (equal); writing – original draft (equal); writing – review and editing (equal). **Andrew Scerri:** Conceptualization (equal); project administration (lead); writing – original draft (equal); writing – review and editing (equal). **Jennie C. Stephens:** Conceptualization (equal); writing – original draft (equal); writing – review and editing (equal). **Geoffrey Supran:** Conceptualization (lead); methodology (equal); visualization (lead); writing – original draft (equal); writing – review and editing (lead).

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CONFLICT OF INTEREST STATEMENT

JS and GS have previously written and spoken in support of university disassociation from fossil fuel companies. GS sits on the Advisory Board of Campus Climate Network (CCN).

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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ENDNOTES

- ¹ Our article is generally concerned with fossil fuel industry influence in higher education, so by default we use the term “higher education” throughout this article. We define institutions of higher education as degree-granting educational institutions beyond secondary or high schools, including colleges and universities with varying degrees of emphasis on undergraduate education and (post-)graduate research. However, in specific contexts we use the term “university” for brevity or accuracy. For example, “fossil fuel–higher education partnerships/ties” is shortened to “fossil fuel–university partnerships/ties.” We write “fossil fuel industry support for university research” because academic research is mostly conducted at universities rather than colleges. Finally, we use whichever term most accurately characterizes studies described in our literature review.
- ² For example, Standard Oil, now ExxonMobil, supported efforts by scholars such as Ludwig von Mises to establish the Graduate Institute for International Studies in Geneva.
- ³ Forms of fossil fuel industry ties to academia vary; we use the terms “partnerships” and “ties” in this article (see Table 1).
- ⁴ See review in Franta (2022).
- ⁵ The United States, Canada, Australia, and United Kingdom are respectively the 2nd, 7th, 14th, and 17th highest per-capita emitters of CO₂ globally (Worldometer, 2023). The United States, Canada, and Australia are among the top 10 producers of fossil fuels globally; the US contributes 20% of all global fossil fuel production (Desjardins, 2019).
- ⁶ We concluded our search in December 2023. As of April 2024, two additional articles meet the search criteria: Lachapelle et al. (2024) and Morris & Jacquet (2024).
- ⁷ For example, recent research suggests that air pollution from fossil fuel production and use contributes to millions of premature deaths per year globally (Gregory, 2023; Lelieveld et al., 2023).
- ⁸ See Vakulchuk and Overland (2024) for a more recent and global analysis of higher education programs and degrees oriented toward fossil fuels and renewable energy. They find that 68% of energy-focused education degrees focused on fossil fuels, whereas only 32% concerned renewable energy.
- ⁹ Importantly, “university” funding sources did not “condition release of funds upon university’s approval of a specific research project (i.e., that did not require a grant proposal or vetting process)...Unlike corporate and think tank underwriters, university grants do not raise serious questions as to the quality of the research because scholars have full control over their own work and do not depend on anyone else’s decision to provide funding” (Barday, 2008, p. 717).

- ¹⁰ Scholars defined “gray literature” variously (see Adams et al., 2016; Christensen et al., 2022; Hudson & Bruce-Miller, 2023; Pappas & Williams, 2011). For our purposes, we define gray literature simply as non-peer-reviewed research reports from nonprofits and advocacy groups. We do not include journalistic reporting.
- ¹¹ Muttitt (2003) analyzes Centre for Marine and Petroleum Technology’s International Petroleum Research Directory (IPRD) data from 1997. The directory, which ceased publication in 1998, lists nearly 1000 research projects in 54 U.K. universities on fossil fuel exploration and production.
- ¹² For further reading on the Koch Network, see Mayer (2016) and Wilson and Kamola (2021).
- ¹³ Almond et al. (2022) observe: “Only 23% of reports published between January 2009 and December 2020 by MIT–EI, Columbia CGEP and Stanford’s Natural Gas Initiative included explicit funding acknowledgements” (p. 6), which makes it difficult to gauge the impartiality of academic energy-center research and recommendations.
- ¹⁴ In Web of Science, searches in 2023 for (“conflict of interest” OR bias) AND: Tobacco = 102; Pharma* = 630; Sugar/food/soda/beverage = 269; Mining/silicosis = 38.
- ¹⁵ See the Corporate Genome Project and Think Tank Network Research Initiative for further examples of these methods.
- ¹⁶ The present authors are affiliated with CSSN and this working group. The co-chairs, SH and AS, receive stipends to administer the working group. GS co-founded CSSN, and GS and NH were previously awarded research funding from CSSN for projects on other topics. GS sits on CCN’s advisory board and has regranted funding to CCN’s research group.
- ¹⁷ For those skeptical of engaged scholarship, climate scientist Gavin Schmidt (2015) reminds us that personal values *do* shape scientists’ views, and argues that it would be irresponsible to obscure “what is being advocated for and how the intersection of values and science led to that position” (p. 72). “Scientists and philosophers have long distinguished between descriptions of what IS (derived from scientific investigations of the real world),” writes Schmidt (2015), and “what OUGHT to be (based on one’s value system), and suggestions for what one SHOULD do in the face of this knowledge” (p. 2).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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