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Market reaction to fossil fuel divestment announcements: Evidence from the United States

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Abstract

Fossil fuel divestment movements have gained momentum since 2011, aimed at ending fossil fuel use and a move toward a cleaner, affordable, and sustainable energy system, for business and society. The present study investigates the direct impact of fossil fuel divestment announcements on stock prices of firms listed on the United States' stock exchanges. Using an event study and guided by the United Nation's sustainable development goals (SDGs), we test the effects of 116 divestments announcements between 2014 and 2019 on 51 publicly traded fossil fuel companies. Our results suggest that there is a negative effect of these announcements on fossil fuel firm stock prices. Also, we find that the type of fossil fuel firm (coal or oil and gas), the type of divestment (partial, coal only, or full), the timing of the announcement, and the size of the divesting investor have some explanatory power in relation to the (cumulative) abnormal returns following the divestment announcements. While the negative impact on stock prices is not surprising, the reaction from the divested firms after such large divestitures is not consistent with

what may be expected, given past reactions to divestitures seeking to achieve different social goals. Given the SDGs, it seems clear why investors are divesting themselves from fossil fuel firms, but why has the reaction to the 116 divestments led to very little change in the way these publicly traded fossil fuel firms do business given their direct and growing impacts on society? We conclude the study with some suggestions for future research.

KEYWORDS
divestment, fossil fuels, sustainable development goals, United States of America

1 | INTRODUCTION

Fossil fuel divestment campaigns kick-started in 2011 aimed at negative screenings and motivating institutional investors to withhold capital from companies involved in fossil fuels. The divestment movement calls for a shift away from fossil fuel investments to reduce global carbon emissions (Bergman, 2018) and ensure that the global community achieves the sustainable development goals (Absar et al., 2021; Tuokuu et al., 2019) so as to mitigate the impacts on society over time. Over the last couple of years, the divestment movement has gained momentum in their quest to promote cleaner energy production (Ayling, 2017; Hunt et al., 2017). For instance, asset manager Octopus Investments has stated that nearly 2,000 investors representing over $14 trillion in assets have divested or pledged to divest from fossil fuel companies (Ho, 2021). Indeed, it is said to be one of the fastest growing social movements in history (Halstead et al., 2019). Also, the Norwegian sovereign wealth fund announced in March 2019 that it will dispose of $7.5 billion in investments in oil and gas companies (Milne, 2019). Similarly, one of Britain's largest fund managers, Legal and General Investment Management, started selling shares in Exxon Mobil Corp., saying America's largest oil company is not doing enough to address climate change. In 2019, Goldman Sachs divested from mountaintop removal projects, coal mines, and arctic oil. These divestment campaigns are also on the radar of fossil fuel companies. For example, Royal Dutch Shell listed divestments as a material risk in its latest annual report as well as its 10 K and Sustainability Report filings (Nuaman, 2019). BP's CEO, Bob Dudley, has stated that divestment movement threatens energy security and the world economy (Raval, 2018). These examples confirm the growing interest in the movement and to what extent this could potentially alter the investment landscape toward more environmentally sustainable investment.

A leader of the divestment movement, 350.org, which has been at the forefront in the fight against fossil fuel, argues that there should be no fossil fuel anywhere in the world, as it is the main cause of the climate crisis the world is experiencing today (350.org, 2020). Consequently, a fight against climate change is a fight against injustice in the world (350.org, 2020). And to fight injustice and the global climate crisis, Walton (2018) believes that fossil fuel divestment is one of the steps businesses all over the world could pursue. The reason being that "fossil fuel reserves would emit nearly five times the CO2 that is in the carbon budget through 2050," which

will further deepen the inequalities that exist between the developed and the developing world (Bergman, 2018, p. 1).

Despite all the campaigns, the divestment movement is often criticized for lacking the financial muscle to challenge the big fossil fuel corporations and their financiers (Bergman, 2018). Also, the fossil fuel industry has aggressively attacked the divestment movement, leading to a contest for legitimacy and the norms they both stand for (Ayling, 2017). While fossil fuel industry players argue that their businesses will provide affordable electricity for the poor in society, the divestment movement, on the other hand, states that fossil fuel will rather deepen poverty, particularly in developing countries, because of their impact on carbon emissions (Bergman, 2018). Some have argued that divestment may have negligible influence in combatting carbon emissions if demand for fossil fuel continues to rise. This has been the situation even though 25 coal firms have filed bankruptcy since 2014 and many small to medium sized oil and gas firms have done the same due to pricing fluctuations and weakened demand in the wake of economic downturns. All of these have implications for fossil fuel divestment announcements by companies.

Although several studies (see, e.g., Bergman, 2018; Dordi & Weber, 2019; Halcoussis & Lowenberg, 2019; Hansen & Pollin, 2020; Henriques & Sadorsky, 2018; Hunt & Weber, 2019; Hunt et al., 2017; Plantinga & Scholtens, 2021; Trinks et al., 2018) have examined the financial impact of fossil fuel divestment and their announcements, as far as our research has identified, only a few of them focus on the effects of divestment on the stock prices of fossil fuel companies. Consequently, this study seeks to bridge this knowledge gap and to explore the direct short-term effects of divestment announcements on stocks of fossil fuel companies. Our contributions are twofold.

First, we aim to strengthen the case that divestment announcements influence share/stock prices, consider the long-time horizon, and address the criticisms in extant literature by including an extra regression. Second, the study addresses the implications of our findings on business and society and the fossil fuel firms themselves. As noted by Wood (1991), business and society are interwoven and not mutually exclusive and cannot be separated from each other. We show that the decision to make fossil fuel divestments could be driven by the intended and unintended consequence on the share prices of divestment firms.

Following the introduction, the rest of the paper is structured as follows. In Section 2, we briefly provide the theoretical basis to guide the study. Section 3 discusses the issues and prospects associated with fossil fuel divestment announcements. In Section 4, we describe the methodology and our research design. The results of the study are presented in Section 5. We present the discussion section in Section 6. We conclude the study in Section 7 with some useful suggestions for future studies.

2 | THEORETICAL FRAMEWORK

This study employs the sustainable development goals (SDGs) framework as the theoretical basis to understand why investors are divesting themselves of fossil fuel stocks and why such divestment strategies may have an impact on stock prices. The SDGs were adopted in 2015 by the global community to promote the well-being of humanity and that of the earth (see Tuokuu et al., 2019). Represented in Figure 1 below, the SDGs are 17 goals with 169 targets and 230 indicators (Hak et al., 2016; Tuokuu et al., 2019). These goals are "limited in number, aspirational, and easy to communicate, addressing all three dimensions of sustainable development" (National Development Planning Commission, 2015, p. 3), environmental, social, and economic dimensions. In

FIGURE 1 Sustainable development goals (SDGs). *Source*: (MDG Monitor, 2015; Tuokuu et al., 2019)

particular, goal 7 focuses on affordable and clean energy, a departure from fossil fuel dependence, as it aims to ensure access to affordable, reliable, sustainable, and modern energy for all by substantially increasing the share of renewable energy in the global energy mix (UN, 2016). Thus, by renewable energy, it means businesses and households are encouraged to divest from fossil fuels and move toward cleaner production of energy, such as solar, wind, hydro, and geothermal. Goal 12 also aims to have firms move away from fossil fuel dependence as it aims to ensure sustainable consumption and production patterns by achieving the sustainable management and efficient use of natural resources (UN, 2016).

For the global community to attain Goal 7 of the SDGs, there is now an emerging consensus that investing heavily in technology and providing the needed financial support will ensure cleaner production of energy for business and society. Consequently, the president of the United States proposed in his clean energy revolution plan to invest $1.7 trillion over the next ten years (Biden, 2021). This ambitious plan is expected to help the country to build a more resilient and sustainable economy and to achieve a net-zero emissions not later than 2050.

According to Melink (2021), the following are strategies businesses can adopt to generate and use their own clean and affordable energy:

First, businesses should declare a bold step that they will become carbon neutral by 2030; second, businesses should invest in solar array for their buildings; third, businesses should replace their oil and gas burning equipment immediately; fourth, businesses should invest in electric vehicles, charges, and offer incentives for employees to buy or lease electric vehicles; and, fifth, spread the word for suppliers and stakeholders to emulate your example.

It is expected that strategies such as the ones proposed by Melink (2021), together with commitments by State and Federal governments, will convince institutional investors to move away from fossil fuel into clean energy investments. This will ensure that goals 7 and 12 of the UN sustainable development goals are achieved.

Although the SDGs present a clear blueprint on how the global community can attain a sustainable future, while some critics have indicated that the goals are too many and unattainable, others say the goals are unattainable because funding is not available for member countries to implement the SDGs (see Tuokuu et al., 2019).

3 | FOSSIL FUEL DIVESTMENT ANNOUNCEMENTS: ISSUES AND PROSPECTS

The role of the fossil fuel divestment campaigns around the world particularly in western countries confirms the growing importance of the movement in climate change policy (Ayling & Gunningham, 2015). We must state again that several studies have been conducted on the role of fossil fuel divestment. Therefore, we would briefly mention some of them here in order not to be repetitive (see, e.g., Fabozzi et al., 2008; Hong & Kacperczyk, 2009; el Ghoul et al., 2011). Of these divestment campaigns, those targeting South African Apartheid have been studied most extensively (Davidson et al., 1995; McWilliams & Siegel, 1997; Meznar et al., 1994, 1998; Posnikoff, 1997; Teoh et al., 1999; Wright & Ferris, 1997). Although the nature and circumstances of the divestment during the South African Apartheid are different from the fossil fuel divestment,[1] the literature on the South African Apartheid divestment movement is mentioned in this section of the paper because it provides some valuable insights on how social movements can lead to organized actions to alter a firm's investment choices.

Studies concerning these divestment campaigns tried to test whether a divestment announcement by a company influenced the stock price of that company. To test this effect, these studies generally conducted event studies. For instance, Posnikoff (1997) concluded that announcements disclosing a divestment from South Africa have a significant positive effect on stock prices of the divesting firm. By contrast, Meznar et al. (1994, 1998) and Wright and Ferris (1997) found that divestment announcements had a significant negative effect on stock prices of divesting firms. Again contrastingly, Davidson et al. (1995), McWilliams and Siegel (1997), and Teoh et al. (1999) concluded that there is no evidence that stock prices of firms were either positively or negatively affected by divestment announcements. According to Meznar et al. (1998), an explanation for these contradictory findings can be attributed to the timing of the divestment announcements. With "timing effects," the authors are describing at which stage of the divestment movement a company announced it will divest. The authors conclude that the results of the study will differ depending on how the study deals with these timing effects. Another explanation for different outcomes of the studies is that the various studies use different event windows and methods to calculate the abnormal returns. For example, while Meznar et al. (1994) used an event window of 41 days, McWilliams and Siegel (1997) used shorter event windows.

It could very well be argued that divestment related to sin stock is more relevant to this paper. With sin stock divestment, the shareholders decide to no longer invest in the stock because of the business model of the company as is also the case with the fossil fuel divestment movement. However, the studies on sin stocks are primarily concerned with portfolio performance and not with the effects of divestment on the firms themselves.

[1]The nature of these two divestments is different because in the case of the South African Apartheid it was the companies themselves that divested from the South African economy, whereas in the case of fossil fuel companies it is the shareholders of the companies that are divesting (because they no longer agree with or see enough value in the business of fossil fuel companies).

Hong and Kacperczyk (2009) find that the cost of equity for sinners is higher than for "neutral" stock because sin stocks are generally avoided more often. El Ghoul et al. (2011) came to a similar conclusion with regard to tobacco and nuclear energy stocks. Findings from Durand et al. (2013) also support the conclusion from Hong's and Kacperczyk's paper. Apart from these studies, we do not know of any study that has been conducted on the effects of divestment announcements on these stocks. The available studies either look at the movement from a theoretical point of view or empirically test the effects of divestment. For instance, a study by Ansar et al. (2013) explores whether the divestment campaign can impact fossil fuel assets and, if so, in which way. They identify certain direct and indirect effects that the divestment movement can have on fossil fuel companies. With regard to the direct effects, they conclude that the divestment campaign will only have limited direct effects on (stock prices) of fossil fuel companies. The authors reason that the divestment outflows will have a very limited effect on the equity valuations of fossil fuel companies because of the massive market capitalizations of the fossil fuel companies ($212 trillion according to Roxburgh et al., 2011) and the fact that the divestment outflows will be compensated by inflows from investors who are less concerned with the outlook for the fossil fuel industry. However, Ansar et al. (2013) do think that coal companies might experience some direct effects of divestment because of their much smaller market capitalization relative to oil and gas companies and because their business is more climate unfriendly. According to these authors, the divestment campaign can have large indirect effects on both oil and gas and coal companies, especially in the long run. They further argue that divestment can eventually change market norms and result in stigmatization of fossil fuel stock. In turn, this might lead to a new and more stringent regulation as more investors and the general public are proponents (or at least less opposed) to new regulations.

To the best of our knowledge, there are only two known studies that test the effects of divestment announcements empirically. First, a study by Linnenluecke et al. (2015) looked at the effects of the divestment by the Australian National University in 2014. The study concluded that the companies that were divested were confronted with significant abnormal returns during a 7-day event window. However, their sample only consisted of seven companies and a single announcement. Apart from that, they did not control for other variables that might have influenced the returns of the companies in question. As a consequence, their results might not be unbiased.

Dordi and Weber (2019) also employed an event study to test the direct effects of divestment on fossil fuel companies. For them, they employed a larger sample size than the study by Linnenluecke et al. (2015). They also considered 24 announcements between January, 1, 2012, and December, 31, 2015, for 200 fossil fuel companies. The authors concluded that divestment announcements have a statistically significant negative effect on fossil fuel stock prices. However, their study also did not control for other influences, such as changes in oil prices. In an article by Griffin et al. (2015), they looked at the stock market's reaction following a paper in *Nature*, which concluded that only a fraction of the world's fossil fuel reserves can be used so to prevent global warming exceeding a 2°C temperature rise above pre-industrial levels in 2050. Although the topics of the paper and the one by Linnenluecke are not identical, they share similarities. Both studied the effects of related news events on stock prices of fossil fuel companies. Griffin et al. (2015) used a sample of 63 fossil fuel companies and controlled for other variables that might influence the stock prices as well. More specifically, the authors controlled for the percentage change in daily oil prices and for energy news in general. They concluded that the news event in question resulted in an average stock price drop of 1.5% to 2%.

This section of the paper paints a mixed picture in relation to the effects of divestment announcements on stock prices of firms. Studies on earlier divestment movements do not

conclusively answer the question of divestment having a direct effect on stock prices of relevant companies. Although Linnenluecke et al. (2015) and Dordi and Weber (2019) suggest that fossil fuel divestment might have direct effect on divestment, these two studies are not without flaws. Our paper generally aims to correct the flaws of these studies and to provide new insights on fossil fuel divestment in the United States.

4 | METHODOLOGY

4.1 | Sample selection and data collection

In this section of the paper, the selected events (the divestment announcements) are discussed. Also, the selected fossil fuel firms and the other selected data are discussed (Table 1).

4.1.1 | Selected events

Using Nexis Uni, we identify 116 divestment announcements from 2014 until 2019. The years before 2014 were not considered in this study because there were only very little divestment announcements. These divestment announcements were covered or referenced in large (financial) newspapers such as the Financial Times, The Guardian, and The New York Times. After identifying an announcement, we verified the exact date of the announcement (see Table 8) and collected certain additional information relating to the announcement. We then verified the date of the announcement by checking the press release from the investor in question. In almost all cases, we were able to find a press release from the investor to verify the event date. In the few cases where there was no press release, we chose the publication date of the newspaper article as the event date. If the divestment announcement was made on a Saturday, Sunday, or bank holiday, the following workday was selected as the event date.

Additionally, we collected the assets under management for each investor that pledged to divest from fossil fuel companies. The assets under management were found on the corporate websites of the investors in question. The investors were subdivided in three very broad categories: small, medium-sized, or large investors. Table 2 provides some information in relation to investor size. Table 8 contains our initial sample of divestment announcement events. We did not

TABLE 1 Overview of types of divestments

Categories	Count	Percentage
Full	49	42.2%
Partial	27	23.3%
Coal only	40	34.5%

TABLE 2 Overview of investor size

Categories	Subdivisions (€ million)	Count	%
Small-sized	<1	35	30.2%
Medium-sized	1–25	44	37.9%
Large-sized	>25	37	31.9%

find relevant information for some divestments numbers 48, 53, 68, and 77. However, based on the newspaper articles, we were able to deduce in which category the investors most likely fell.

4.1.2 | Selected companies

From the NGO FossilFreeIndexes, we did an overview of the 200 listed companies with the largest reserves of fossil fuels. From this overview, we selected the fossil fuel companies that are listed on U.S. stock exchanges (48 listed on the NYSE and three on the NASDAQ). The companies listed on U.S. stock exchanges were selected because data on these stocks is most readily available. Additionally, compared to the U.S. stock exchanges, there are much fewer fossil fuel companies exclusively listed on other stock exchanges. The stock prices of these companies are from the WRDS database. Of the 51 selected companies, 12 (or 23.5%) are coal mining companies. The other 39 companies are oil and gas companies that are mainly focused on upstream and midstream oil and gas activities. Also, it should be noted that one company (Foresight Energy) was delisted in November 2019.

4.1.3 | Other data

To control for some different influences during the event windows, the change of oil prices and the year of announcement were also selected as relevant variables. Similar to Griffin et al. (2015), this paper controls for the percentage changes in crude oil prices. The main reason for this is to filter out stock price effects that were driven by news other than the divestment announcements. However, by controlling for oil price changes, it might also be the case that some of the relevant effects of the announcements are removed (Griffin et al., 2015). The downside of using oil price changes is that coal companies are expected to respond less to these changes relative to oil and gas companies. However, no readily available metric (derivative or index) that captured changes in both oil, gas, and coal prices was found. Since oil and gas companies outnumber coal companies in the sample, we decided to use oil prices as a control variable. Additionally, there is some evidence that crude oil and coal prices are to some extent related (Zamani, 2016). The data on daily oil prices—more specifically, the WTI Crude Oil Spot Price—between 2013 and 2020 were found via the website of the U.S. Energy Information Administration. In turn, they collected these data from the Thomson Reuters database. Using these data, the percentage change in the oil price was calculated for each event window.

Additionally, the year in which a divestment announcement was made is used as a control variable. This controls for timing effects as is suggested by Meznar et al. (1998). Also, the year of the announcement could be viewed as an explanatory variable. The divestment movement has grown over the last years and fossil fuel companies have called it a threat. As a result, investors are becoming more sensitive to these types of announcements. Thus, more recent announcements may have a larger effect on the stock price.

4.2 | Methodology

In order to test the effects of divestment announcements on fossil fuel stock prices, an event study was conducted. The results of the event study will be further analyzed by way of a regression. For both analyses, the methodology is outlined in this section.

4.2.1 | Event study methodology

Event studies compare the actual returns of stocks to the expected normal returns for a specified time window. The difference between these returns is the abnormal return, which captures the effect of a specific event on a stock. Because of the relatively large sample size (116 announcements × 51 companies), and to ensure validity and reliability of the event study, the event study was conducted using the event study tool in WRDS. For this, CUSIP numbers were collected via websites of the stock exchanges and the corporate websites of the companies in question. Then, the event dates (see Table 8) and the CUSIPs were combined and inserted in the event study tool. This resulted in cumulative abnormal returns (CARs) for each company for each announcement. Thus, each individual announcement in combination with each individual company was regarded as an event (so, in total, there were about 5,000 events). This was necessary to break down the CARs during the regression analysis.

We apply the market-adjusted model as a benchmark model for normal returns. The market index used is the CRSP value-weighted market index. We select event windows starting from 150 days prior to the event date and ending 50 days before the event date. Eight different event windows are used to test the effects of announcements over different time periods. Four of the event windows were concentrated some days around the event: (−0, +0), (−2, +2), (−5, +5), and (−10, +10). The other four event windows each looked at increasingly larger event windows, namely, (−2, +10), (−2, +30), (−2, +60), and (−2, +90). The reasoning behind the longer event windows is that investors might need time to appraise the announcements and sufficiently price that into stocks. By extension, divestments are related to the overall business strategy of firms that may be viewed as long term in nature. Since strategy is a long-term concept, the market might need time to adjust to the announcements. However, a drawback of longer event windows is that other events or circumstances might also influence the abnormal returns (i.e., confounding effects) (McWilliams & Siegel, 1997). Confounding effects are less likely to play a role in shorter windows. For that reason, we used both shorter and longer event widows to test our hypothesis and limit any potential confounding events on our results.

As mentioned previously, the CARs were provided by the WRDS event study tool. By combining these CARs for each event window, the cumulative average abnormal returns (CAARs) can be calculated. These CAARs capture the impact of all observations over the complete event window. To obtain the CAARs for each event window, the average of the CARs was taken for each event window. The CAARs were tested for significance using a simple *t* test and a sign test. The *t* values for the CAARs were provided by the event study tool as well. Since CARs and CAARs are generally not normally distributed, the results of the event study were also tested for significance by way of a non-parametric test.

4.2.2 | Regression analysis methodology

Following the event study, a regression analysis is used to further analyze the abnormal returns. More specifically, the regression analysis is used to explain which factors influence the CARs (i.e., the market reaction to the news) and to which degree they do so. The regression analysis was conducted using STATA. Three event windows were selected for the regression analysis: (−2, +2), (−2, +10), and (−2, +60). These three event windows were selected because these are relatively evenly distributed among the eight event windows. For each selected event window, two regressions were run. The first regression for each selected window is a regression on the full

model as presented later in this section. The second regressions were chosen based on the significance levels of the first regressions. The relatively less significant parts of the first regressions were omitted from the second regressions.

We provide our variable measurements and description below;

First, oil and gas (O and G) relative to Coal (C): a dummy variable that takes the value of (1) if the firm in question is an oil and gas company and (0) if the firm is a coal mining company. We predict that the effect of an announcement is stronger (more negative) for coal companies in light of the theory discussed in Section 2.

Second, Large Institution and Medium Institution (relative to Small Institution): dummy variables representing the type of investor that is pledging to divest from fossil fuel. *Large Institution* equals (1) if the AUM of the investor in question falls within category specified in Table 8; otherwise, it is (0). The same principle applies to the variable *Medium Investor*. The intuition is that the effect on an announcement might differ depending on the size of the institutional investor.

Third, Partial and Coal Only (relative to Full): These variables are dummy variables that represent the nature of the divestment. *Partial* equals (1) if the divestment announcement in question announces that the investor will only divest from fossil fuels partially. Otherwise, *Partial* equals (0). The same principle applies to *Coal Only*. Please see Table 8 for a more detailed description of these variables. The intuition behind the inclusion of these variables is that the different types of announcements may have different effects on the CARs.

Additionally, two types of control variables are used:

Y2015, Y2016, Y2017, Y2018, and Y2019 (relative to Y2014): dummy variables representing the year (time series) in which the announcement was made. The intuition for this is discussed in Section 4.1.3.

OilPriceChange: The percentage oil price change between the first day of the event window compared to the last day of the event window. Please see Section 4.1.3 above for an explanation of this control variable.

This results in the following main regression function:

$$CAR_i = \beta_0 + \beta_1{}^{*}O\&G_i + \beta_2{}^{*}Partial_i + \beta_3{}^{*}CoalOnly_i + \beta_4{}^{*}$$
$$MediumInvestor_i + \beta_5{}^{*}LargeInvestor_i + \beta_6{}^{*}Y2015_i + \beta_7{}^{*}Y2016_i + \beta_8{}^{*}$$
$$Y2017_i + \beta_9{}^{*}Y2018_i + \beta_{10}{}^{*}Y2019_i + \beta_{11}{}^{*}OilPriceChange_i + \varepsilon_i.$$

In line with best practice of causal analysis, we check for unusual data points. We control for many properties of OLS and minimized their effects on our results. There were quite some large outliers for the CARs. However, that is to be expected with financial data. So these data points were not removed or cleaned in any other way but rather winzorized. Heteroskedasticity was present since CARs essentially are derived from stock returns. To control for this, we used robust standard errors. Serial correlation might lead to problems since the standard errors might be biased due to correlation between errors of different periods. This potential problem was tackled by using robust standard errors. Multicollinearity was investigated. The mean VIF for none of the regressions was higher than 2.5, and the overall highest reported VIF was 3.53 for the variable *Y2018* in the regression (−2, +60). So the levels of multicollinearity were not alarming. The model was also checked for functional form misspecification. This was reviewed by way of a residual plot for event window (−2, +10) in STATA. Prima facie, a linear regression seems to be in

order based on the result. Furthermore, the residuals were checked for normality in STATA. This is relevant in relation to hypothesis testing. A kernel density estimate was used for testing the normality of the residuals. This showed that the residuals are not perfectly normally distributed but do slightly approach a normal distribution.

5 | RESULTS

5.1 | Results of the event study

Table 3 presents the average CARs and some other relevant information in relation to the different event windows. The table shows that the CAARs were negative in each event window. Furthermore, the second panel in Table 3 shows that the CAARs continue to decrease for longer event windows. This might suggest that it indeed takes longer for the market to incorporate and digest the information related to divestment announcements by investors. However, another problem might be due to other factors such as potential relative underperformance of the fossil fuel market as a whole.

Table 4 presents the results of the *t* test in relation to the CAARs. The *t* statistic show that all CAARs, except the CAAR at the (−0, +0) event window, are significant at the 1% level. The CAAR at the (−0, +0) is significant at the 10% level (the corresponding *p* value is 0.062). These *t* values were provided by WRDS's event study tool.

The results from the event window (−2, +10) were also tested using a the sign test. The results of this sign test are presented in Table 5 (on the next page). The sign test shows that for the (−2, +10) event window, the fraction of negative abnormal returns is significantly different from 0.5

TABLE 3 CAARs and descriptive statistics related to the CARs

Event window	CAAR	St. dev.	Min.	Median	Max.	Obs.
(−0,+0)	−0.07%	2.7%	−16.3%	−0.1%	49.2%	4,988
(−2,+2)	−0.35%	5.2%	−27.4%	−0.4%	61.9%	4,988
(−5,+5)	−0.34%	8.1%	−56.4%	−0.5%	65.5%	4,988
(−10,+10)	−0.66%	10.9%	−81.6%	−0.6%	76.1%	4,933
(−2,+10)	−1.01%	8.7%	−64.3%	−1.1%	61.3%	4,882
(−2,+30)	−3.53%	14.2%	−65.4%	−3.3%	91.1%	4,829
(−2,+60)	−5.19%	20.1%	−116.1%	−4.4%	117.3%	4,352
(−2,+90)	−5.47%	24.3%	−153.4%	−5.3%	146.8%	4,193

TABLE 4 Results t-test for CAARs

Event window	CAAR	*t* statistic	Corresponding *p* value
(−0, +0)	−0.06%	−1.87	0.062
(−2, +2)	−0.35%	−4.71	0.000
(−5, +5)	−0.34%	−2.99	0.003
(−10, +10)	−0.66%	−4.23	0.000
(−2, +10)	−0.91%	−7.88	0.000
(−2, +30)	−3.53%	−16.65	0.000
(−2, +60)	−5.19%	−13.21	0.000
(−2, +90)	−5.47%	−12.50	0.000

TABLE 5 AARs and results of sign test for event window (−2, +10)

Event day	AAR	% negative AR	Sign test	Corresponding *p* value
−2	−0.05%	51.39%	1.95	0.053
−1	−0.18%	54.73%	6.65	0.000
0	−0.06%	51.87%	2.63	0.009
+1	0.07%	48.69%	−1.83	0.069
+2	−0.12%	53.67%	5.12	0.000
+3	−0.06%	53.24%	4.52	0.000
+4	−0.02%	51.35%	1.89	0.061
+5	−0.13%	51.86%	2.60	0.010
+6	−0.15%	52.95%	4.12	0.000
+7	−0.08%	52.19%	3.06	0.002
+8	−0.08%	53.24%	4.52	0.000
+9	0.04%	49.51%	−0.69	0.501
+10	−0.10%	54.57%	6.38	0.000

on most of the days (except −2, +1, +4, and +9). Furthermore, the table shows that the abnormal returns are lowest on the day prior to the event. On this day, the average abnormal return is −0.18%. Table 5 demonstrates that the fraction of negative abnormal returns is also highest on this date. These results might suggest that some information regarding the divestment announcement might leak to the market prior to the public announcement of the divestment pledge.

Furthermore, a brief look at the individual CARs revealed large differences between these individuals CARs. The CARs differed depending on the specific announcement and the specific fossil fuel company. A regression analysis was performed to try to explain these differences.

5.2 | Results of the regression analysis

This section presents the results for regressions that were performed for the three event windows that were selected: (−2, +2), (−2, +10), and (−2, +60). For each selected event window, two regressions were run. The first regression for each selected window is a regression on the full model. Table 6 (on the next page) shows the results of the regressions. It also shows the *R*-squared and adjusted *R*-squared for the different models. In STATA, the adjusted *R*-squared was not reported in light of the robust standard errors. So these were calculated manually. The *R*-squared and adjusted *R*-squared show that some portion of the CARs is indeed explained by the regression model. However, this is for a large part because of the control variable *OilPriceChange*. For example, a regression for (−2, +2) that omitted this control variable (but included all other variables of the full model) resulted in a *R*-squared of 0.052 (compared to 0.1397). So *OilPriceChange* is an important determinant for the abnormal returns but the other variables do also explain some of the abnormal returns.

The results from the regression analysis show that some of the coefficients for the selected variables are significant. Especially, many of the coefficients in regressions 3–6 are significant. However, *Y2017* (and to a lesser degree *Y2018* and *LargeInvestor*) is a notable exception. This variable is not significant in any of the regressions. We investigated the data, but we did not find anything that was particular about it. An explanation might be that there were less (notable) divestment announcements in 2017. Another noteworthy observation is that some signs of

TABLE 6 Results from regressions

	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6
	CAR(−2, +2)	CAR(−2, +2)	CAR(−2, +10)	CAR(−2, +10)	CAR(−2, +60)	CAR(−2, +60)
Constant	−0.0043	0.0021*	−0.0107***	−0.0086***	−0.0345***	−0.0327***
O and G	0.0007		−0.0057**	−0.0056**	−0.0312***	−0.0312***
Partial	−0.0076***	−0.0088***	−0.0036		0.0371***	
CoalOnly	−0.0065***	−0.0066***	−0.0068**		0.0000	
MediumInvestor	−0.0017	−0.0049***	0.0054*		−0.0364***	−0.0304***
LargeInvestor	0.0071***	0.0014	0.0181***		−0.0163*	−0.0086
Y2015	−0.0049**		−0.0301***	−0.0300***	−0.0362***	−0.0290***
Y2016	0.0174***		0.0437***	0.0425***	0.1154***	0.1176***
Y2017	−0.0023		−0.0044	−0.0019	0.0044	0.0070
Y2018	0.0032		0.0018	0.0058*	0.0529***	0.0521***
Y2019	−0.0032		−0.0309***	−0.0231***	−0.0795***	0.0788***
OilPriceChange	0.4236***	0.4553***	0.4494***	0.4.482***	0.3466***	0.4.618***
R-squared	0.1397	0.1179	0.1925	0.1884	0.1970	0.1913
Adjusted *R*-sq.	0.1378	0.1170	0.1907	0.1872	0.1952	0.1898

Note: The asterisks show the level of significance of the results. The higher the number of asterisks, the more significant the results.

the coefficients changed depending on the regression. This is probably not because of potential multicollinearity. A plausible explanation for this phenomenon is that it is due to smallness of these coefficients. This explanation is also reasonable in light of the consistency of the signs for larger coefficients (e.g., the sign of the coefficient for *OilPriceChange* is positive in all regressions). In Table 7, we provide a list of companies used in our sample for the study.

6 | DISCUSSION

The paper sought to investigate the impact of fossil fuel divestment announcements on stock prices of 51 U.S. firms. We also examined whether there is a short-term announcement effect from these divestment announcements and given these announcement effects, whether the firms resultant actions when faced with stock price fluctuations have any meaning for society.

Our findings suggest that divestment announcements indeed have a direct (short-term) effect on the stock prices of U.S. fossil fuel companies that is significantly different from zero. Both the t-test and the sign test show that the abnormal returns are significantly different from zero (at either the 1% or 10% level). For that reason, the null hypothesis (the effect from divestment announcements on U.S. fossil fuel stock prices is not significantly different from zero) is rejected. Furthermore, the results suggest that divestment announcements have a negative effect and not a positive effect on fossil fuel stocks. This finding is based on the (consequent) negative signs of the CAARs and the results from the sign test as discussed in Sections 5.1 and 5.2. Moreover, the CAARs keep decreasing for longer event windows. This might suggest that it takes some time for the market to digest the information.

Divestitures have been frequently employed over the past 5 years. The recent global pandemic and the major environmental events of 2021 have resulted in economic slowdown. The pandemic has shown that it is possible to reduce emissions, as they were reduced by 7% in 2020, yet that

TABLE 7 List of oil and gas (O and G) and coal (C) companies in our final sample

Company	O and G/C	Stock exchange
Apache	O and G	NYSE
Antero Resources	O and G	NYSE
Arch Coal	C	NYSE
Alliance Resource Partners	C	Nasdaq
BHP Billiton	C	NYSE
BP	O and G	NYSE
Peabody Energy	O and G	NYSE
CONSOL Energy	C	NYSE
Chesapeake Energy	O and G	NYSE
Continental Resources	O and G	NYSE
Canadian Natural Resources	O and G	NYSE
Cabot Oil and Gas	O and G	NYSE
ConocoPhillips	O and G	NYSE
Crescent Point Energy	O and G	NYSE
California Resources	O and G	NYSE
Cenovus Energy	O and G	NYSE
Chevron	O and G	NYSE
Concho Resources	O and G	NYSE
Devon Energy	O and G	NYSE
ENI	O and G	NYSE
Ecopetrol	O and G	NYSE
EOG Resources	O and G	NYSE
Statoil/Equinor	O and G	NYSE
EQT	O and G	NYSE
Foresight Energy	C	Nasdaq
Hess	O and G	NYSE
Hallador Energy	C	Nasdaq
Marathon Oil	O and G	NYSE
ArcelorMittal	C	NYSE
Mechel	C	NYSE
Murphy Oil	O and G	NYSE
Noble Energy	O and G	NYSE
NACCO Industries	C	NYSE
Occidental Petroleum	O and G	NYSE
Petrobras	O and G	NYSE
PetroChina	O and G	NYSE
Pioneer Natural Resources	O and G	NYSE
QEP Resources	O and G	NYSE
Royal Dutch Shell	O and G	NYSE

TABLE 7 (Continued)

Company	O and G/C	Stock exchange
Rio Tinto	C	NYSE
Range Resources	O and G	NYSE
Sinopec	O and G	NYSE
Sasol	O and G	NYSE
Suncor Energy	O and G	NYSE
Southwestern Energy	O and G	NYSE
Teck Resources	C	NYSE
Total	O and G	NYSE
Vale	C	NYSE
Whiting Petroleum	O and G	NYSE
ExxonMobil	O and G	NYSE
YPF	O and G	NYSE

if society is to reach the SDGs, then many organizations will have to work to avoid the worst outcomes of climate change (Winston, 2021). With the Norwegian Sovereign Wealth Fund and Goldman Sachs as the latest in a growing list of investment firms divesting from fossil fuel firms, the reasoning is clear from these investors that they feel investment in fossil fuels is a great and growing risk. The Goldman Environmental Policy Framework acknowledges the scientific consensus that climate change is a reality and that human activities are responsible for increasing concentrations of greenhouse gasses in the earth's atmosphere. They believe that climate change is one of the most significant environmental challenges of the 21st century and thus delaying action on climate change will be costly for the natural environment, to both humans and the economy (Goldman, 2020). Consequently, Goldman has pledged to decline any financings that directly support the development of new coal fired power generation unless it has carbon capture and storage or equivalent carbon emissions reduction technology. They will also decline any financing transaction that directly supports new upstream Arctic oil exploration or development. Finally, the firm has committed that for transactions directly financing new thermal coal mine development or any mountaintop removal mining, they will decline the opportunity (Goldman, 2020).

A study from 2017 by CDP has shown that investors, such as Goldman, in fossil fuel companies carry influence over one-fifth of the industrial greenhouse gas emissions worldwide (CDP, 2017). The highest GHG emitting publicly traded companies since 1988 are ExxonMobil, Shell, BP, Chevron, Peabody, and BHP Billiton, according to the report. A mere 25 producers from fossil fuels account for just over half of emissions in the past three decades. The top 100 account for 71% of industrial emissions. Because of rapid economic growth and growing demand for power generation, especially among populous developing nations, more than half of the emissions since the Industrial Revolution have occurred since 1988. That was the year that the United Nations founded the Intergovernmental Panel on Climate Change (IPCC) to urgently study mankind's role in climate change (CDP, 2017). The question, thus, becomes what type of influence are investment firms like Goldman and their limited divestments in coal and oil having over the fossil fuel industry?

350.org has stated that divestment, once strictly a moral call to action, is now also seen as the only prudent financial response to climate risk. The fossil fuel industry has been lagging the market for over a decade now, finishing dead last in the S&P rankings in 2018. The sector is underperforming, volatile, and exposed to multiple transition risks, presenting a decidedly poor bet for

TABLE 8 Selected divestment announcements (events)

	Event date	Investor	Type of divestment	Size of investor
1	27/01/2014	Storebrand	Partial	Large
2	06/05/2014	Stanford University	Coal only	Medium
3	14/05/2014	City of Dunedin	Full	Small
4	10/06/2014	Union Theological Seminary in NYC	Full	Small
5	11/07/2014	World Council of Churches	Full	Small
6	22/09/2014	Rockefeller Brothers Fund	Full	Medium
7	07/10/2014	Local Government Super	Coal only	Medium
8	08/10/2014	University of Glasgow	Full	Small
10	30/01/2015	The New School	Partial	Small
11	05/02/2015	Norway sovereign wealth fund	Partial	Large
12	09/02/2015	The New School	Partial	Small
13	02/03/2015	City of Oslo	Coal only	Medium
14	16/03/2015	City of Paris	Full	Small
15	31/03/2015	Syracuse University	Full	Medium
16	01/04/2015	Guardian Media Group	Full	Small
9	27/04/2015	Waterloo Foundation	Full	Small
17	27/04/2015	Yale University	Partial	Medium
18	30/04/2015	Church of England	Coal only	Medium
19	05/05/2015	Nordea Bank	Partial	Large
20	05/05/2015	MP Pension	Full	Medium
21	13/05/2015	The London School of Hygiene and Tropical Medicine	Coal only	Small
22	19/05/2015	University of Oxford	Coal only	Medium
23	06/07/2015	Episcopal Church, USA	Full	Small
24	02/09/2015	CalPERS & CalSTRS	Coal only	Large
25	22/09/2015	Children's Investment Fund Foundation	Full	Medium
26	19/10/2015	UK Environment Agency Pension Fund	Partial	Medium
27	19/10/2015	City of Oslo	Full	Medium
28	09/11/2015	Pensioenfonds Zorg en Welzijn (PFZW)	Partial	Large
29	10/11/2015	Birmingham City University	Coal only	Small
30	23/11/2015	Allianz Group	Coal only	Large
31	27/11/2015	The London School of Economics and Political Science	Coal only	Small
32	30/11/2015	SCOR Re	Coal only	Medium
33	08/12/2015	Presse-Versorgung	Partial	Medium
34	29/01/2016	City of Copenhagen	Full	Small
35	23/03/2016	Rockefeller Family Fund	Full	Small
36	01/04/2016	Australia National University	Partial	Small
37	11/04/2016	Australian Ethical	Full	Medium
38	11/04/2016	Hunter Hall Investment Management	Full	Medium
39	14/04/2016	Norway sovereign wealth fund	Coal only	Large

TABLE 8 (Continued)

	Event date	Investor	Type of divestment	Size of investor
40	15/04/2016	Australian Super	Partial	Large
41	28/04/2016	City of Copenhagen	Full	Small
42	23/05/2016	University of Southampton	Full	Small
43	24/05/2016	Church of Scotland	Coal only	Small
44	24/05/2016	Newcastle University	Full	Small
45	06/06/2016	Washington DC Pension Fund	Full	Medium
47	13/06/2016	Second Swedish National Pension Fund	Partial	Medium
48	16/06/2016	Four Catholic institutions	Full	Small
49	23/06/2016	City of Berlin	Full	Small
50	30/06/2016	Publica	Coal only	Medium
46	06/09/2016	City of Syndey	Full	Small
52	23/09/2016	Waltham Forest Pension Fund	Full	Small
51	28/09/2016	King's College London	Coal only	Small
53	04/10/2016	Seven Catholic institutions	Partial	Small
54	05/10/2016	Ircantec	Coal only	Medium
55	17/10/2016	World Medical Organisation	Full	Small
56	14/12/2016	Southwark council pension fund	Full	Medium
57	15/12/2016	French Pension Reserve Fund	Coal only	Medium
58	17/01/2017	Berliner Ärzteversorgung/Berlin Doctor's Pensionfund	Partial	Medium
59	27/01/2017	Ireland Sovereign Wealth Fund	Full	Medium
60	09/02/2017	HCF	Full	Medium
61	08/03/2017	King's College London	Full	Small
62	13/03/2017	Columbia University in the City of New York	Coal only	Medium
63	17/04/2017	PKA Pension	Partial	Medium
64	10/05/2017	Nine Catholic institutions	Full	Small
65	15/06/2017	AP7	Partial	Medium
66	19/07/2017	City of Cape Town	Full	Small
67	06/09/2017	SCOR Re	Partial	Medium
68	03/10/2017	40 Catholic institutions	Full	Medium
69	13/11/2017	Zurich Insurance Group	Coal only	Large
70	16/11/2017	Lloyds of London	Coal only	Large
71	12/12/2017	AXA	Coal only	Large
72	19/12/2017	Kommunal Landspensjonskasse (KLP)	Coal only	Large
73	10/01/2018	New York City Employees Retirement System	Full	Large
74	21/02/2018	Generali	Coal only	Large
75	15/03/2018	MP Pension	Full	Medium
76	12/04/2018	PKA Pension	Partial	Medium
77	23/04/2018	35 Catholic institutions	Full	Medium

(Continues)

TABLE 8 (Continued)

	Event date	Investor	Type of divestment	Size of investor
78	04/05/2018	Allianz Group	Partial	Large
79	22/05/2018	Pensioenfonds Van De Metalektro	Coal only	Medium
80	07/06/2018	Georgetown University	Coal only	Medium
81	13/06/2018	American Medical Association	Full	Small
82	20/06/2018	Hannover Re	Coal only	Medium
83	02/07/2018	Swiss Re	Coal only	Large
84	03/07/2018	CPEG - Caisse de prévoyance de l'État de Genève	Coal only	Medium
85	09/07/2018	Church of England	Full	Medium
86	11/07/2018	Ireland sovereign wealth fund	Full	Medium
87	11/07/2018	Queens College, Cambridge	Full	Small
88	27/07/2018	Royal College of General Practitioners	Full	Small
89	06/08/2018	Munich Re	Coal only	Large
90	17/08/2018	AP7	Partial	Medium
91	10/09/2018	London Pension Fund Authority	Partial	Medium
92	10/09/2018	New York City Employees Retirement System	Full	Large
93	08/10/2018	Amundi Asset Management	Coal only	Large
94	28/11/2018	Caisse des Dépôts	Coal only	Large
95	30/11/2018	Storebrand	Full	Large
96	01/02/2019	Aegon	Coal only	Large
97	08/03/2019	Norway Sovereign Wealth Fund	Partial	Large
98	08/03/2019	Mapfre	Coal only	Large
99	14/03/2019	BNP Paribas Asset Management	Coal only	Large
100	14/03/2019	Uniqa Insurance Group	Coal only	Medium
101	12/04/2019	The American Psychiatric Association (APA)	Full	Small
102	29/05/2019	NN Group	Coal only	Large
103	11/06/2019	Norway sovereign wealth fund	Partial	Large
104	17/06/2019	Calouste Gulbenkian Foundation	Full	Medium
105	21/06/2019	Legal & General Investment Management	Partial	Large
106	24/06/2019	ASR	Coal only	Large
107	28/06/2019	Natixis Investment Managers	Coal only	Large
108	01/07/2019	Chubb	Coal only	Large
109	01/07/2019	KfW Group	Coal only	Large
110	05/07/2019	National Trust	Full	Medium
111	10/07/2019	London Pensions Fund Authority	Partial	Medium
112	16/09/2019	PFA Pension	Partial	Large
113	17/09/2019	University of California	Full	Large
114	01/10/2019	Norway sovereign wealth fund	Partial	Large
115	16/10/2019	University College London	Full	Small
116	14/11/2019	European Investment Bank	Full	Large

investors (350.org, 2019). While this may be the case, the general fossil fuel industry analyzed here has seen only limited impacts from divestitures since 2014. However, since divestitures began in 2011, investors have been increasingly advocating for firms to incorporate climate change and emissions reduction into their business strategy. A Goldman Sachs Equity Report states that the number of climate-related shareholder proposals to public fossil fuel firms has almost doubled since 2011 and the percentage of investors voting in favor has tripled over the same time period. This is creating a severe tightening of financing conditions across the hydrocarbon industry, leading to a new age of capital constraint (Vigna et al., 2019). Also, capital availability for new oil developments has tightened significantly over the past 5 years, with the market increasingly focused on the low-carbon transition. The reserve-based lending (long-term lending collateralized with the oil and gas reserves underground) to exploration and production (E&P) firms for new oil and gas developments is down 90% from the peak, with financial institutions redirecting financing toward renewable developments. Reserve-based lending was the financing of choice for E&Ps. The banks that were most active in reserve-based lending have substantially reduced their exposure to oil and gas and are mostly looking to discontinue hydrocarbon financing over the long term. High yield credit to the U.S. E&Ps, the financing of choice of smaller U.S. shale producers, has also dried up since the beginning of 2019, leading to a 25% fall in U.S. shale activity (Vigna et al., 2019).

In addition, given that Goldman sees the demand for both oil and gas as likely to remain robust under most decarbonization scenarios in the medium term to 2030 for oil and to 2040 for gas, the firm believes that capital market focus on de-carbonization is changing the supply dynamics of the industry much faster than its demand dynamics. This will result in a tight oil and gas market in the 2020s and is likely to lead to a de-carbonization process through higher not lower energy prices (Vigna et al., 2019). The raised energy prices, in concert with the ongoing divestitures analyzed in this paper, may finally influence fossil fuel firms to alter strategies accordingly and result in the UN SDGs discussed having a greater chance to be met once the next decade is behind us.

7 | CONCLUSION AND FUTURE RESEARCH AGENDA

Fossil fuel divestment is an important area that needs to be investigated further. For instance, future studies could replicate the findings from our study in other Western countries' contexts over time using the same methodological frameworks so that a more generalizable conclusion could be drawn given more data as the expectation is that the SDGs and tightening of financial and global conditions will push more firms to divest from fossil fuel firms. Also, future studies could explore the impact of fossil fuel divestments on climate change mitigation in both developed and developing countries. A look at divestments ongoing in Europe and Australia could specifically provide vital information to impacts on fossil fuel firms. Further studies need to be explored to examine the role of non-state actors in combating climate change using fossil divestment campaigns and whether such actions are having the intended consequences for society. In addition, the confounding effects, realized from local events such as wildfires, flooding, and hurricanes that are increasing in number and severity in society will almost certainly have an impact on this area of research. Investigating how these events impact fossil fuel firms' decisions will be key to understanding the true impacts of divestitures over time.

Our study is not without potential limitations. We admit that our study concentrates on one model to measure and capture the effect of these divestments. Thus, applying a separate second model to validate our results would have provided certainty on the results captured or otherwise. We are also concerned about our sample distribution geographically. These firms operate largely in the United States and not across the world. It is possible that the concentration of investors in the US could skew

our results given the fossil fuel divestments and the discourse on climate change may have taken a global tone. Finally, our study may lack generalizability since we did not consider all divestments across the world or at least by comparison to firms that did not announce any divestments.

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