



**Shareholder Activism for Stranded Asset Risk: An Analysis of Investor
Reactions for Fossil Fuel Companies**

John Byrd¹ and Elizabeth S. Cooperman²

1, 2: University of Colorado Denver Business School, Denver, CO., USA

A B S T R A C T

Meinshausen, et al. (2009) in a seminal study estimated a carbon budget for 2000 to 2050, whereby no more than 1,000 gigatons of carbon emissions (CO₂e) can be emitted for a 75% probability of less than 2°C of warming to avoid catastrophic climate change. This was followed by a research report by the Carbon Tracker Initiative (CTI, 2011) demonstrating that to achieve this target about two-thirds of fossil fuel reserves are unburnable, i.e., stranded assets, suggesting a potential carbon bubble. In response, shareholder activists have engaged in divestment and shareholder resolution campaigns to persuade major fossil fuel companies to recognize and act on their climate change risks. In this study we examine investor reactions to these events for a sample of coal and oil and gas stocks during 2011 to 2015. We find significant negative cumulative abnormal returns (CARs) for both types of fossil fuel companies associated with two major CTI reports. However, we find significant negative CARs only for coal companies in response to divestment events. For shareholder resolutions targeting oil and gas companies, we find significant negative CARs for both coal and oil and gas companies to a special resolution requesting a return of capital to investors for stranded asset risk, and positive significant CARs for two manager-supported resolutions for reporting climate change risks.

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1. Introduction

Environmental shareholder activists engage in corporate governance activities including divestment campaigns and shareholder resolutions to get companies to change harmful practices. Information campaign initiatives have also been undertaken by non-profit research organizations on harmful practices by businesses that affect shareholder value. According to the Proxy Monitor database (ProxyMonitor.org), environment-related shareholder proposals have risen dramatically in recent years (Copland and O’Keefe, 2016, 2017). In a survey commissioned by HSBC, of 497 institutional investors surveyed, more than half responded that they were receiving “highly inadequate” information from companies about their risk of disruption from climate change, and more than two-thirds suggested that *green finance* was moving from the margin to becoming mainstream for global markets (Ward, 2017).

Many institutional investors have been concerned from both a fiscal and a financial perspective about huge potential losses in the valuations of fossil fuel companies with tougher regulations globally on carbon emissions under the United Nations (UN) Paris Climate Accord that came in force in November 2016. This Accord was signed by 195 member countries to hold global warming to no more than 2°C above pre-industrial levels, to avoid irreversible, catastrophic climate change. Although the U.S. withdrew from the accord, to be effective in 2020, the U.S. Climate Alliance, and Climate Mayors, a coalition of 377 cities, 13 states and Puerto Rico, and about 1,650 businesses and investors signed on, agreeing to quantify their climate commitments and share their plans with the UN to achieve the U.S. goal to reduce greenhouse (GHG) gas economy-wide emissions by 26 to 28% from 2005 levels by 2025 (Tabuchi and Friedman, 2017; U.S. Climate Alliance, 2017; U.S. Climate Mayors, 2017). Globally the investment community has taken action to meet a UN sustainable investment goal of doubling clean energy investments by 2020 with these investments reaching a record high of \$239 billion in 2015 (UN, 2014, 2016).

In 2011, the Carbon Tracker Initiative (CTI 2011), a non-profit financial think tank with the aim of aligning capital market actions with climate reality, warned investors of fossil fuel stranded asset risk with its significant report titled, *Unburnable Carbon—Are the world’s financial markets carrying a carbon bubble*. The report analyzed the risk of a carbon bubble for 200 major publicly-traded fossil fuel companies globally, where expected future government regulations to restrict GHG emissions to avoid a greater than 2°C rise in global temperatures, would make their fossil fuel reserves *unburnable in the future*. The study, estimated total carbon reserves of equivalent carbon dioxide (GtCO_{2e}) of 389.12 GtCO_{2e} for the coal companies and 356.47 GtCO_{2e} for oil and gas companies.

Since reserves feed directly into the valuation of a company, a second Carbon Tracker Initiative report (CTI 2013) estimated a valuation reduction by 40 to 60% for these major fossil fuel companies. Climate scientists, Meinshausen et al. (2009) estimated that 30 percent of fossil fuel reserves would be unburnable to avoid a rise in global temperatures greater than 2°C. A later study by McGlade and Elkins (2015), based on a current budget of 1,000 billion tons of CO₂, found that approximately 80 percent of coal, 50 percent of gas, and 33 percent of oil reserves cannot be extracted and burned (based on a current budget of 1,000 billion tons of CO₂ emissions allowable), with only about 565 GtCO₂ of this budget remaining (NOAA, 2015)

In reaction to this threat, in 2012 Bill McKibben wrote an article in *Rolling Stone Magazine*, *Global Warming’s Terrifying New Math*, and the 350.org campaign was started with a *Do the Math Tour* across the U.S. This movement later transformed into a global fossil fuel divestment movement, GoFossilFree.org. The campaign uses online campaigns, grassroots

organization, and mass public actions to oppose new coal, oil and gas projects and divest funds from companies that are large GHG emitters (350.org, 2017). The fossil fuel divestment movement has grown dramatically, with many other organizations emerging including Divest-Invest Philanthropy, the Wallace Global Fund, the UN Divest-Invest Catalyst plan, among others, to encourage fossil fuel divestments and reinvestment in alternative energy sources globally. By mid-2017, 749 institutions and local governments and 58,800+ individuals managing an estimated \$5.53 trillion in assets pledged to divest from fossil fuels including divestments (UN 2014; Arabella Advisors, 2015; Rose-Smith 2014; Fossil Free, 2014, 2017; Flood, 2015).

Accompanying the divestment movement in 2013, major institutional investors with the assistance of As You Sow, a non-profit promoting corporate accountability through shareholder action (www.asyousow.org), sent letters to the largest fossil fuel company carbon emitters requesting that they address their carbon asset risk. With responses from major fossil fuel companies failing to fully address this issue, major institutional investors facilitated by As You Sow and Ceres, a sustainability non-profit working with influential investors and companies (www.ceres.org), issued the first *carbon bubble*” *shareholder resolutions* mandating that climate change issues and particularly carbon asset risk be addressed.

With several resolution for the reporting of carbon asset risk by major fossil fuel companies, including one for Exxon Mobil negotiated and withdrawn in return for a promised report on climate change, failing to recognize stranded asset risk, new shareholder resolutions were issued. In particular, concerns arose over fossil fuel companies allocating an estimated \$674 billion in 2013 to find, develop and extract new reserves (CTI 2013). In late 2014 and 2015, for the first time shareholder resolutions were issued asking major fossil fuel companies to return capital to investors for their failure to address their climate change risk and for continuing to make major expenditures to find and extract new fossil fuel reserves. The SEC in Spring 2015 reviewed this unique type of resolution and ruled to exempt the resolution targeting Exxon Mobil, but allowed the same resolution to be voted on for Chevron. However, a stunning victory occurred in April 2015 for investor advocates, with two manager-supported carbon risk resolutions at Shell and BP receiving majority shareholder votes, including a 98 percent vote by BP shareholders (Arjuna Capital and As You Sow, 2015; CTI 2014; Cardwell, 2014; CSR Wire, 2014; Ceres 2014; Fahey 2014; Douglas 2015; PR Newswire, 2014; Cheeseman, 2015).

According to social activism theory, social activists can be effective by: (1) providing information to shareholders and the public to put economic pressure on firms to change their behavior, such as the U.S. anti-apartheid divestment campaign in the 1960s and 1970s, (Kaempfer, Lehman and Lowenberg, 1987); (2) offering a *voice* creating a dialog with managers and traditional shareholders to gain legitimacy for initiating new policies, such as the anti-apartheid shareholder resolutions in the 1970s, and environmental/health resolutions in more recent years (Gamson, 1990; Broyles, 1998; Goodman, et al., 2013; Byrd and Cooperman, 2014); and (3) creating public pressure on governments to sanction bad actors, such as eventual mandates for U.S. companies to divest operations in South Africa in the mid-1980’s (Domonell, 2013; Rose-Smith, 2014; Kaempfer, et al., 1987; Ansar, et al. 2013).

Similarly, Lee and Lounsbury (2011, p. 156) theorize that social movements act to disrupt routines, reframe issues, and mobilize relevant change, so over time ideals that seemed improbable become possible and even inevitable. Van Buren (2005) observes that by providing evidence of bad practices, social activists move companies and industries towards greater transparency and corporate social responsibility (CSR) that makes them better companies. In a

similar vein, Ingle, Mueller and Cocks (2011) point out strategic benefits for firms engaging with non-traditional stakeholders, and King and Gish (2015) observe that the large rise in socially responsible investing (SRI) has increased the acceptance of new movement ideas and practices that have a positive effect on firm value.

Reid and Toffel (2009) theorize and find evidence that social activist shareholder resolutions prime firms to adopt practices consistent with the broader movement's social aims, especially if new regulations are likely. Perrault and Clark (2016) suggest that the status or reputation of a social activist group affects a company's response to environmental stakeholder concerns. This suggests that resolutions initiated by institutional investors may be able to convey stronger informational signals to shareholders.

Whether social activists are effective in this capacity as a corporate control mechanism by conveying valuable information on bad practices of companies to investors remains an unanswered question. New information to shareholders of firms involved in risky practices could lead to a reassessment of a firm's valuation by shareholders. Few studies have examined the impact of new information provided through social activist campaigns, particularly in relationship to activities by institutional investors targeting stranded asset risk. With growing concerns over climate change risk, institutional investors as more reputable shareholder have become more engaged in shareholder resolutions, and shareholders appear to have become more responsive to these resolutions. This is reflected in the recent case for ExxonMobil's shareholder meeting in May of 2017, where a shareholder resolution requested a report on the impact on Exxon's operations with new global regulations limiting carbon emissions under the UN Paris Accord. This resolution received a majority, 62.3 percent shareholder vote, with institutional investors including BlackRock, casting their votes against management in favor of the proxy resolution (Mufson 2017).

This study sheds light on the effectiveness of climate change social activist campaigns in signaling information to investors by examining the response of investors in 25 of the largest publicly-traded U.S. coal and gas and oil companies to major carbon asset risk reports, divestment and shareholder resolution events during 2011 to 2015. We use a standard event-study methodology, and examine reactions to informational research reports, major divestments, and shareholder carbon-risk resolution events. In efficient markets information should be impounded into asset prices quickly. For early reports about unburnable fossil fuels reserves, it may be that investors to adjust share prices early on in response to informational campaigns through research reports before either divestment or shareholder resolution announcements are made. If so, the full shareholder wealth effect of stranded assets will be underestimated if only the divestment and shareholder resolution announcements are examined.

Consistent with the premise of social activist campaigns providing new information to shareholders, the empirical results show significant negative abnormal returns in response to the initial report by CTI on stranded carbon assets, with significant CARs of -1.90% for the coal company sample and -1.63% for the oil and gas companies, and an overall significant negative mean CAR of -3.07% overall for the all CTI report event dates for the coal company sample, as the largest CO₂ emitter.

For divestment events, significant negative CARs occur for the coal company sample for six major divestment events, with a significant mean CAR over all divestment event dates of -1.27%. For shareholder resolutions targeting oil and gas companies, significant negative CARs appear for oil and gas companies and coal companies in response to the shareholder resolution to Exxon requesting a return of capital to shareholders for stranded asset risk. However,

positive significant abnormal returns occur for two event dates for manager-supported resolutions for reporting their climate change risks for Shell and BP.

The paper is organized as follows. Section 2 presents a brief overview of previous literature on the effects of divestment and shareholder resolution events and the events examined in this study. Section 3 provides the data and empirical procedures, followed by the empirical results in Section 5, and Section 6, a summary and conclusion.

2. Brief Overview Previous Studies

Studies examining the effect of social activist campaigns on a firm's stockholder valuation or financial performance have shown mixed results. Rehbein, Waddock, and Graves (2004) examining shareholder resolutions during 1988 to 1998, find that social activist shareholders often targeted companies that were larger and publicly visible and focused on issues of particular social interest that would prefer to avoid negative publicity and public scrutiny. The authors point out that previous studies in the corporate social responsibility (CSR) literature by Hillman and Keim (2001), Margolis and Walsh (2001), Pava and Krausz (1996), and Waddock and Graves (1997) found a positive relationship between engagement by managers with key stakeholders and financial performance. Strickland, Wiles, and Zenner (1996) also note that financially weaker firms are often targeted with shareholder resolutions.

Reid and Toffel (2009) explore corporate responses on shareholder activism including direct appeals to management and examine companies listed in the S&P Index that were asked to support the climate change movement in both February 2006 and 2007 by the CDP (formerly the Carbon Disclosure Project), a non-profit organization which helps companies measure, report and reduce their carbon emissions providing greater transparency on progress for institutional investors. Focusing on corporation decisions to adopt the public disclosure CDP practice they evaluate the effect of shareholder resolutions and potential regulations on emissions in the state where the company is headquartered on this decision. Using a logistic model for the likelihood that a company would adopt CDP disclosure or not, they find that shareholder resolutions more than doubled the odds of this happening with spillover effects for other firms in the industry. Similarly, companies operating in states with a regulatory threat and in sectors that were likely to be targeted were 24 percent more likely than other firms in the same industry to publicly disclose.

Studies examining the effect of divestment activities on firm performance have focused on anti-apartheid social activists targeting U.S. companies operating in South Africa in the 1960s and 1970s. Kaempfer, et al. (1985) examines the stock performance effect of divestment actions at this time by comparing the performance of targeted firms relative to the overall stock performance of the overall S&P 500. The empirical results show no significant difference in performance. However, the authors note that the threat of large billion dollar pension funds of selling shares, even if not carried through could have had a significant economic effect on the policies of these companies, eventually leading to political pressure and positive changes in the long-run. Similarly, Broyles (1998) point out a positive effect of shareholder resolutions in the early 1970s targeting companies operating in South Africa that led to greater public debate and public discourse, such as the appointment of the first African American Director to GM's board.

Renneboog and Szilagyi (2009) studying proxy proposals over 1996 to 2005 for different CSR issues discover a positive stock market reaction associated with CSR proxy proposal announcements, suggesting that information relayed is being evaluated and valued by stockholders. However, Parthiban, Bloom, and Hillman (2007) find counter evidence that

proposal activism may take away resources from a firm's other activities having a negative effect on their financial performance.

Byrd and Cooperman (2014) examining social and environmental shareholder activist proxy resolutions during 2006 to 2011, find negative stock price reactions by investors to news announcements about environmental health resolutions for consumer/retail companies surrounding annual meeting dates when these resolutions are taken for a vote. This suggests that there likely is information related through shareholder resolutions to stockholders that shareholders act upon. In a later study, Byrd and Cooperman (2015) find on average negative stock returns corresponding to news announcements about carbon bubbles related topics for fossil fuel companies, with differing types of reactions for specific announcements by respectively coal companies and oil and gas companies. This suggests that shareholders may react to specific information revealed in news articles about carbon asset risk as well.

Griffin, et al. (2015) examined for stock market reactions of oil and gas company shareholders to carbon asset risk announcements, and found a 1.5% to 2% drop in share prices of U.S. oil and gas companies on the publication date of the Meinshausen, et al. (2009) study in the science journal *Nature* that showed that 30% of fossil fuel company reserves could not be burned. However, the authors found no stock reaction for U.S. coal producing companies, nor any stock price reactions to follow-up stories through 2013.

In this study we expand upon the previous literature by examining stock market reactions to the three different types of activities for a social activist campaign including research reports on stranded asset risk, major divestment events, and carbon asset risk shareholder resolutions during 2011 to 2015. We examine valuation effects surrounding event dates for major fossil fuel companies with large reserve years, subject to stranded asset risk. We also examine different reactions for major coal companies versus oil and gas corporations.

3. Events, Data, and Methodology

3.1 Events

We collected news announcements for research announcements, divestment, and shareholder resolution activities concerning stranded fossil fuel assets and carbon asset risk events by searching for items with the key words, 'carbon-asset risk', 'stranded assets', 'unburnable carbon' and 'fossil fuel divestment' and 'carbon-asset risk shareholder resolutions.' We began with 38 events but deleted five of these because on the announcement date oil prices fell by more than 2%. The 2% fall in oil prices was an arbitrary cut-off, but we felt that it would be impossible to distinguish the effect for the news announcement from the effect of a drop in oil prices, so these observations were better eliminated.

The remaining sample includes five Carbon Tracker Initiative Report events, 11 shareholder carbon-asset risk shareholder resolution events, and 17 divestment events. Announcement dates include the earliest publication date by major news sources including *Bloomberg*, *S&P*, *the Wall Street Journal*, *New York Times*, and other major news sources. Table 1 also gives a brief description of each news announcement and the categorization for each event as Carbon Tracker Initiative Research Report (R), Divestment (D) or Shareholder Resolution (SR) related.

Table 1. News announcements used in the study categorized as a Carbon Tracker Initiative Research Report, Shareholder Resolution, or Divestment Event.

The announcement period includes three trading days with the event date at the center of the period. Events with an oil price decrease of more than 2% were deleted from the sample. Type identifies events for research (R),

shareholder resolution (SR) or divestment (D).

Event Date	Type	Description
7/01/11	R	Carbon Tracker Initiative Initial Report on Unburnable Carbon published
11/06/12	D	Bill McKibben & 350.org Kick-Off Nationwide “Do the Math” Tour
3/07/13	SR	“Shareholders File 1 st Ever Carbon Bubble Resolutions” Article
4/19/13	R	LSE & Carbon Tracker Updated Report on Financial Risk of Stranded Assets
5/16/13	SR	Results for the 1st “carbon bubble” shareholder resolutions
8/02/13	D	Article “Is it Time to Divest from Fossil Fuels?”
10/24/13	SR	Carbon Risk Initiative Letters on Unburnable Carbon to 45 Fossil Fuel Companies
1/28/14	D	Norwegian Sovereign Fund Halves Fossil Fuel Investments
1/29/14	D	17 of World’s Largest Philanthropic Foundations Pull Out of Fossil Fuels
2/12/14	SR	Resolutions Filed with 10 Fossil Fuel Companies for Carbon Asset Risks
3/20/14	SR	Negotiated Withdrawal by Exxon Mobil to Report on Carbon Asset Risks
3/31/14	SR	Exxon Mobil Reports on Climate Change Risks as Business as Usual
5/04/14	D	Australian Divestment Day Campaign from Coal Companies
5/06/14	D	Stanford University Divests from 100 Coal Companies
5/08/14	R	Carbon Tracker Identifies Oil Projects Not Making Economic Sense
5/13/14	D	Dunedin, New Zealand Fossil Fuel Divestment
5/22/14	SR	30% Shareholder Vote for Carbon Risk Resolution at Anadarko Petroleum
6/17/14	D	Oakland California City Council Votes to Divest Fossil Fuels
6/23/14	D	University of Dayton Divests \$670 mil. in Fossil Fuel Stocks
7/08/14	R	Carbon Tracker Initiative Responds to Shell on Stranded Assets
7/14/14	D	Oxford, UK City Council votes to Divest from Fossil Fuels
7/16/14	D	Eugene, Oregon votes to Divest from Fossil Fuels
9/18/14	R	Carbon Tracker Issues Report Criticizing Exxon for Business as Usual Report
9/21/14	D	Rockefellers & Others Divestment of \$50 billion from Fossil Fuels
10/18/14	D	University of Glasgow, UK Divests from Fossil Fuels
11/25/14	SR	New Proxy Resolutions asking Exxon Mobil & others to Return Capital to Shareholders given great Carbon Asset Risks
1/30/15	SR	Shell Endorses Shareholder Resolution on Climate Change Risks
3/18/15	SR	SEC Rules in favor of Resolutions for Return of Capital for Stranded Asset Risks
3/31/15	D	Syracuse University formalizes policy of no investments in Fossil Fuels
4/14/15	D	Sit-In Week Begins for Divestment from Fossil Fuels: Harvard Students & Alums
4/16/15	SR	98% vote by shareholders for Climate Change Resolution at BP’s Annual Meeting
4/24/15	D	University of London, UK Votes to Divest Fossil Fuels
4/25/15	D	Boulder, Seattle & San Francisco: 10 City Fossil Free City Divestment Campaign

3.2 Data

Table 2 shows the companies in the sample, categorized by coal or oil and gas, and their total assets and market capitalization in millions at the end of 2013. For BHP Billiton that has some oil exploration as well as coal activities, we characterized the firm as in the coal industry, since it has greater coal exploration activities. The sample includes major fossil fuel companies that are publicly traded in the U.S. with available data on CRSP-Daily returns tapes for AMEX, NYSE, and NASDAQ securities during 2011 to 2015. Since non-U.S. corporations did not have available data for the years we examine, we focus on U.S. Fossil Fuel Companies. We also had to eliminate coal companies that did not have continuous data over this period due to financial difficulties. The sample firms include 25 major fossil fuel corporations with an average market value of \$75.4 billion and mean total assets of 93.2 billion. These include 18 major oil and 7 major coal companies that are publicly traded in the U.S. that have large reserve to annual production ratios. The 7 major coal companies include the four largest coal producers in the U.S. including Peabody Energy, Arch Coal, Cloud Peak Energy, and Alpha Natural Resources, that had production that was over 50 percent of total U.S. coal production in 2015 (EIA 2015). Because other smaller coal companies were privately held, they could not be included in the sample. Also included in Table 2 is each company's years of reserves computed as total reserves, as reported at the end of 2013 in 10-K reports, divided by a corporation's average yearly production for 2011 to 2013. The coal companies in the sample have the largest years of reserve ratios, averaging 39.70 years compared to 13.50 years of reserves for the oil companies, with greater reserves relative to annual average production.

3.3 Methodology

To investigate the reaction of the oil and gas and coal companies in our sample we use a standard event study methodology. We calculate abnormal stock returns for each firm for each event date by comparing the actual returns over the three trading days from 1 day before the news announcement to one day after. We designate these as days -1, 0, and 1. We compute the expected stock return using the Capital Asset Pricing Model with betas being computed using daily stock returns from July 1, 2009 through June 30. The expected stock return is a company's beta times the market returns over the event period. Abnormal stock returns are calculated by subtracting the expected return from the actual return. Any excess return (actual less expected) is considered due to the news announced during that period.

The significance of the cumulative average abnormal returns (CARs) for each 3-day event date window are tested using t-tests, and mean CARs are calculated for all events for the entire sample as well as for announcements that specifically related to divestments or carbon-asset risk shareholder resolutions. In addition, average abnormal returns are calculated separately for oil and gas versus coal companies. We tested the robustness of these results by removing the most extreme CARs and then re-computing the results. There is little qualitative difference between those results and the results we report (not shown for the sake of brevity).

Table 2. The sample of coal and oil companies with years of fossil fuel reserves shown.

“Years of reserves” are computed as total reserves divided by production based on values reported for 2013. For

CNOOC the data was from 2012. Financial data for total assets and market value (MV) are in millions and are as of the end of the 2013 fiscal year.

Company Name	Industry	Ticker	Years of reserves	Total Assets	MV Common Stock
Arch Coal	Coal	ACI	39.55	8,990.19	944.65
Alpha Natural Resources	Coal	ANR	49.48	11,799.26	1,578.03
Apache Corporation	Oil	APA	9.52	61,637.00	34,012.73
Anadarko Petroleum	Oil	APC	9.80	55,781.00	39,953.48
Alliance Resource Partners	Coal	ARLP	22.53	2,121.90	2,846.15
BHP Billiton	Coal/Oil	BHP	10.87	138,109.00	153,448.42
BP	Oil	BP	2.55	305,690.00	150,784.09
Peabody Energy	Coal	BTU	37.16	14,133.40	5,275.05
CNOOC	Oil	CEO	9.80	102,660.03	83,785.50
Chesapeake Energy Corp.	Oil	CHK	10.98	41,782.00	18,026.12
Cloud Peak Energy Inc.	Coal	CLD	13.32	2,357.43	1,096.13
Canadian Natural Resources	Oil	CNQ	32.62	51,754.00	39,078.35
CONSOL Energy	Coal	CNX	105.26	11,393.67	8,716.71
Conoco Phillips	Oil	COP	16.49	118,057.00	86,612.59
Chevron	Oil	CVX	34.62	253,753.00	239,028.15
Devon Energy Corporation	Oil	DVN	11.90	42,877.00	25,119.22
Eni S.p.A.	Oil	E	10.87	190,620.06	87,834.74
EOG Resources Inc.	Oil	EOG	11.39	30,574.24	45,834.75
Hess Corporation	Oil	HES	11.88	42,754.00	27,001.06
Occidental Petroleum	Oil	OXY	12.53	69,443.00	75,698.74
Sinopec Corp.	Oil	SHI	9.52	6,051.97	3,082.32
Statoil	Oil	STO	8.96	146,001.29	76,707.15
Suncor	Oil	SU	24.74	78,315.00	55,052.45
Total	Oil	TOT	5.01	239,053.25	138,988.79
Exxon Mobil	Oil	XOM	12.53	346,808.00	438,702.00

4. Empirical Results

4.1 Cumulative Abnormal Returns for Carbon Tracker Initiative Report Events

Table 3 shows the average 3-day cumulative abnormal return (CAR) for each of the Carbon Tracker Initiative report event dates. For the date of Carbon Tracker's first report (7/11/11) on *Unburnable Carbon* and *Stranded Asset Risk*, the mean CAR for the entire sample was significant and negative, -1.72%, with a -1.90% mean CAR for the coal company subsample, and a -1.63% CAR for the oil and gas sample, each significant at a .01 level. A small significant negative CAR of -0.78% for the entire appeared on the date of a second major CTI report (4/19/13) reporting on the financial risk of stranded assets, with only the coal subsample having a significant negative CAR of -1.99%. Similarly for a follow-up response report by CTI (7/18/14) on stranded assets, there was a significant -1.70% for the entire sample, with the coal company sample having a large negative, significant CAR of -5.59%. In response to a Carbon Tracker report (9/18/14) criticizing Exxon for its report ignoring stranded

asset risk and continuing business as usual, there was a significant negative CAR of -2.97% for the entire sample, with a large significant -6.67% CAR for the coal company subsample, and -1.33% CAR for the oil and gas subsample.

Overall for all events, the mean CAR was a significant negative CAR of -1.35%, with a -3.07% mean CAR for the coal company sample and insignificant mean CAR over all events of -0.59% for the oil and gas subsample. The results are consistent with the premise of social activist informational campaigns including research reports conveying new information to shareholders, resulting in a reassessment of the value of companies, in this case for stranded asset risk.

In contrast to Griffin, et al. (2015) that also examined stranded asset news reports, our results suggest a larger negative reaction to stranded asset research reports for coal companies versus oil and gas companies. The larger response for coal company stocks likely reflects that coal is the highest emitter of CO₂ emissions, so coal companies would likely be targeted first by future government regulations, so would have greater stranded asset risk.

Table 3. The average 3-day abnormal returns (Days -1, 0 and +1) for announcements of general information about stranded asset risk from Carbon Tracker.

Stock betas were computed using data from January 1, 2013 through June 30, 2014. Statistically significant results are shown in boldface.

Date	All		Coal		Oil		Shareholder Resolution Events
	Average 3-day Abnormal Return	t-statistic	Average 3-day Abnormal Return	t-statistic	Average 3-day Abnormal Return	t-statistic	
7/11/11	-1.72%	-4.918	-1.90%	-3.162	-1.63%	-3.698	Carbon Tracker Report "Unburnable Carbon" Issued
4/19/13	0.42%	0.772	0.81%	0.545	0.23%	0.574	Carbon Tracker: Update \$674 billion annually Spent to find new stranded assets despite carbon asset risk
5/8/14	-0.78%	-1.801	-1.99%	-2.749	-0.24%	-0.488	Carbon Tracker Identification of Oil Projects Not Making Economic or Climate Sense
7/8/14	-1.70%	-2.355	-5.59%	-3.524	0.02%	0.076	Carbon Tracker Responds to Shell on Stranded Assets
9/18/14	-2.97%	-3.402	-6.67%	-2.886	-1.33%	-3.749	Carbon Tracker Issues Report Criticizing Exxon: Business as Normal
Column Average	-1.35%		-3.07%		-0.59%		
t-statistic	-2.40		-2.26		-1.58		

4.2 Cumulative Abnormal Returns in Response to Divestment Events

Table 4 shows the average CARs for major divestment events including the 350.org tour kick-off date and major divestments announced over 2012 to April 2015, with the t-statistics highlighted for significant negative cumulative abnormal returns (CARs) for each 3-day event window.

Table 4. The average 3-day abnormal returns (Days -1, 0 and +1) for various divestment event dates for a sample of coal and oil companies listed on US stock exchanges.

Stock betas were computed using data from January 1, 2013 through June 30, 2014.

Statistically significant results shown in boldface.

Date	All		Coal		Oil		Divestment Events
	Average 3-day Abnormal Return	t-statistic	Average 3-day Abnormal Return	t-statistic	Average 3-day Abnormal Return	t-statistic	
11/6/12	-2.21%	-2.224	-5.97%	-2.437	-0.34%	-0.686	350.org Kick-Off
8/2/13	-0.74%	-1.072	-3.40%	-2.591	0.59%	0.957	Time to Divest from Fossil Fuels?
1/28/14	1.01%	2.644	2.28%	2.491	0.38%	1.449	Norwegian Sovereign Fund Divests
1/29/14	0.27%	0.816	1.16%	1.507	-0.18%	-0.642	17 of World's Largest Philanthropic Foundations Divests
5/4/14	0.77%	1.561	-0.91%	-1.100	1.52%	2.827	Australia Divestment Day
5/6/14	0.13%	0.164	-3.67%	-2.685	1.81%	2.926	Stanford Divests from Coal
5/13/14	0.56%	1.601	0.71%	0.962	0.50%	1.235	Dunedin New Zealand Fossil Fuel Divestment
6/17/14	-0.37%	-1.189	-0.53%	-0.612	-0.30%	-1.132	Oakland California City Council Votes to Divest Fossil Fuels
6/23/14	-0.86%	-2.115	-1.98%	-1.980	-0.37%	-1.043	University of Dayton Divests \$670 in Fossil Fuel Stocks: Over Carbon Bubble
7/14/14	-0.89%	-2.521	-0.49%	-0.888	-1.06%	-2.370	Oxford city Council in UK votes to divest from fossil fuels
7/16/14	0.03%	0.076	-0.08%	-0.073	0.08%	0.192	Eugene Oregon vote to Divest & Urges Statewide funds to follow
9/21/14	-1.23%	-2.554	-3.21%	-2.654	-0.35%	-1.257	Rockefellers & Others Announce \$50 bil. Divestment from Fossil Fuels
10/18/14	-2.08%	-2.100	-7.33%	-3.289	0.25%	0.685	University of Glasgow Divests its Fossil Fuels-1st European University to Do So
3/31/15	1.28%	1.697	-0.58%	-0.292	1.80%	2.295	Syracuse University formalizes policy for no investments in Coal or Fossil Fuels
4/14/15	3.39%	4.599	3.23%	1.709	3.43%	4.214	Harvard Students & Alums Start Week-long Sit in for Divestment from Fossil Fuels
4/24/15	1.42%	1.190	-0.73%	-0.246	2.02%	1.555	University of London Votes to Divest 1.5 million pounds from fossil fuels for its endowment
4/25/15	1.14%	1.089	-0.11%	-0.075	1.49%	1.157	Boulder, Seattle, and San Francisco launch Fossil Free City Divestment Campaign for 10 cities
Column Average	0.10%		-1.27%		0.66%		
t-statistic	0.28		-1.90		2.34		

With the majority of the divestments associated with divestments from coal, as the largest carbon emitter, the coal company sample had significant negative CARs in response to six major divestment events including the kick-off of the 350.org tour (11/06/12) of -5.97%, and an article on the divestment movement, "Is it Time to Divest from Fossil Fuels" (8/02/13) of -3.40%. Other events with negative, significant CARs included Stanford University's divestment from coal (5/6/14) of -3.67%, Dayton University's divestment from coal (6/23/14) of -1.98%; the Rockefeller and other foundation divestments of \$50 billion (9/21/14) of -3.21%, and the University of Glasgow divestment from fossil fuels (10/18/14) of -7.33% (all with the

exception of the University of Dayton divestment event) significant at a .01 level. For the mean for all divestment events, the mean CAR for the coal subsample was a significant mean of -1.27% at a .10 significance level.

With most major divestments from coal companies, the oil and gas subsample only had one significant CAR (7/14/14) of -1.06% for one divestment the U.K. by the city of Oxford. For four other divestment events, oil and gas companies had significant positive CARs, (1.52% for the Australia coal divestment day on 5/4/14; 1.81% for the Stanford coal divestment on 5/6/14, 1.80% for Syracuse University's divestment from coal on 3/31/15, and 3.43% for the Harvard Student protest on 4/24/15). Since these events focused on divestment from coal, the positive significant CARs may reflect benefits for natural gas as a substitute for coal.

4.3 Cumulative Abnormal Returns in Response to Shareholder Resolution Events

Table 5 shows the empirical results for the investor response to carbon-asset risk shareholder-resolution events. On 3/17/13, the announcement of the first carbon bubble shareholder resolution targeting primarily major oil and gas companies, the coal company subsample had a significant positive CAR of 5.53%. However, on 5/16/13 when shareholder resolutions had higher than expected support for reports on climate change risk, the oil and gas company subsample experienced a negative significant CAR of -1.27%. The oil and gas company subsample also had a significant negative CAR of -1.22% on 3/13/14 in response to Exxon Mobil's report stating that it had little stranded asset risk, expecting business as usual versus considerations of a transition to a less carbon intensive world.

On 5/22/14, the date of a 30% shareholder vote at Anadarko in response to a shareholder resolution for reporting the company's carbon asset risks, there was a significant -4.71% negative significant CAR for the coal company subsample. On 11/25/14, when a new shareholder resolution was issued requesting a return of capital to shareholders for carbon-asset risk, significant negative CARs of -5.51% for the coal subsample and -3.81% for the oil and gas subsample appeared. These negative CARs suggest perhaps apprehension on the part of investors for management strategic plans that avoided reporting or acting on their climate change risks.

In contrast, significant positive CARs appeared for the oil and gas subsample on 1/30/15 and 4/16/15 on dates of respectively Shell endorsing a shareholder resolution on reporting on its climate change risk, and the report of a 98% vote in favor of a resolution supported by BP's management for similarly reporting on its climate change risk.

The significant negative CARs for the oil and gas subsample in response to carbon-risk resolutions suggest that resolutions initiated by major institutional investors conveyed information of bad practices by managers in not recognizing carbon asset risks that could affect future cash flows and stock valuations. The positive investors reactions to management-supported resolutions suggests support for greater transparency in reporting and hence managing these risks. From this perspective, information gained from social activist activities appears to have conveyed significant information to investors, The results are interesting compared to previous literature finding little reaction of shareholders to divestment events associated with early anti-apartheid campaigns for corporations doing business in South Africa. One reason for a stronger reaction from fossil fuel company investors to social activist campaigns concerning stranded asset risk may be that social activists included large institutional investors with strong reputational capital.

Table 5. The average 3-day abnormal returns (Days -1, 0 and +1) for various climate shareholder resolution event dates for a sample of coal and oil companies listed on US stock exchanges.

Stock betas were computed using data from January 1, 2013 through June 30, 2014. Statistically significant results shown in boldface.

Date	All Average		Coal		Oil		Shareholder Resolution Events
	3-day Abnormal Return	t-statistic	Average 3-day Abnormal Return	t-statistic	Average 3-day Abnormal Return	t-statistic	
3/7/13	2.50%	2.910	5.53%	2.716	0.98%	1.765	Shareholder file 1 st ever Carbon Bubble Shareholder Resolution
5/16/13	-0.70%	-1.275	0.44%	0.289	-1.27%	-3.916	The results of the first 'carbon Asset risk resolutions are in!'
10/24/13	0.45%	0.798	1.61%	1.164	-0.14%	-0.302	Carbon Risk Initiative: Letters to 45 Large Fossil Fuel Companies
2/12/14	-0.03%	-0.080	-0.51%	-0.738	0.21%	0.487	on Carbon Asset Risks Shareholder Resolutions Files with 10 Large Fossil Fuel Companies
3/20/14	0.62%	0.661	1.20%	0.429	0.33%	0.820	Exxon Mobil to Report on its Carbon Asset Risks with negotiated withdrawal of Shareholder Proposal
3/31/14	-1.55%	-2.300	-2.22%	-1.405	-1.22%	-1.840	Exxon Mobil Releases Reports to Shareholders Business as Usual
5/22/14	-1.45%	-2.605	-4.71%	-4.853	-0.01%	-0.028	30% Shareholder Vote at Anadarko to report on Carbon Asset Risks
11/25/14	-4.33%	-7.554	-5.51%	-3.663	-3.81%	-7.911	New Proxy Resolution asking Exxon Mobil to Return Shareholders Capital Given Carbon Asset Risk
1/30/15	3.59%	5.309	1.15%	0.532	4.26%	7.465	Shell Endorses Shareholder Resolution on Climate Risk
3/18/15	1.02%	1.836	2.98%	2.837	0.47%	0.791	SEC rules in favor of Return of Capital for Stranded Asset Risks
4/16/15	2.85%	5.857	5.12%	3.394	2.21%	6.049	98% Vote for Climate Change Resolution at BP's Annual Stockholder Meeting for BP
Column Average	0.23%		0.46%		0.18%		
t-statistic	0.13		0.21		0.46		

5. Summary and Conclusion

In this study we examine investor reactions to the social activist campaign during 2011 to 2015 that focuses on unburnable fossil fuel reserves, i.e. stranded asset risk to avoid significant, irreversible global warming greater than 2°C relative to pre-industrial times that climate scientists warn will result in catastrophic climate change. We examine three different types of information related in the carbon-asset risk campaign including: (1) research publications by the Carbon Tracker Initiative on stranded asset risk; (2) major fossil fuel divestment campaign events focusing on divestments from coal; and (3) carbon-asset risk shareholder resolutions

focusing on major oil and gas companies requesting greater transparency on their stranded asset risks and strategies for moving away from fossil fuels as the world becomes less carbon intensive in the future.

In the theoretical literature of social activist campaigns one aspect is to provide a *voice* from non-traditional stockholders in the best interests for society versus traditional stockholder interests in more economic goals. The stranded asset risk campaign is particularly interesting, since social activist goals combine with economic goals with shareholder resolutions initiated by major institutional investors as well as non-traditional stockholders attempting to protect investments from stranded asset risk.

Our empirical results show significant negative cumulative abnormal returns (CARs) associated with all three types of activities, with larger negative CARs for coal company shares in response to research reports on stranded asset risk and divestment events that focused on coal company investments. In response to carbon-risk shareholder resolutions that focused more on major oil and gas companies, significant negative CARs appeared for oil and gas companies in response to the first carbon asset risk resolutions and to the first proxy resolution asking for a return of capital to shareholders for carbon asset risk. However, on two dates, positive significant CARs appeared in response to two management supported shareholder resolutions for greater reporting on stranded asset risks.

As a caveat, additional research is needed to examine the larger number of stranded-asset risk campaign events that have occurred now that the UN Climate Accord is in force, as data becomes available, as well as including a sample of non-fossil fuel companies in the sample to examine differences in market reactions for these companies. Also, as a caveat, our sample of major U.S. coal companies is small, since many smaller coal companies are privately traded.

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