

# Heterogeneous Investor Response to New Risks in Financial Markets: Evidence from Environmental Litigation Risk

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# Climate Bubbles and Financial Stability

## Are investors aware of climate risk and managing it?

Literature Review

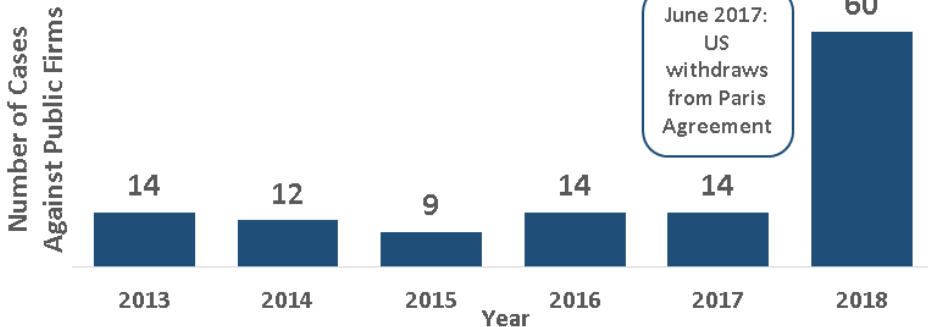
### Research Question

- How are investors reacting to environmental litigation risk? Which investors?

### Scenarios: [More Details](#)

- ① **No Response (NR)** - no market reaction
- ② **Screening (S)** - asymmetric information among investors
- ③ **Preferences (P)** - eco-conscious investors sell shares
- ④ **Engagement (E)** - different comparative advantage of engagement

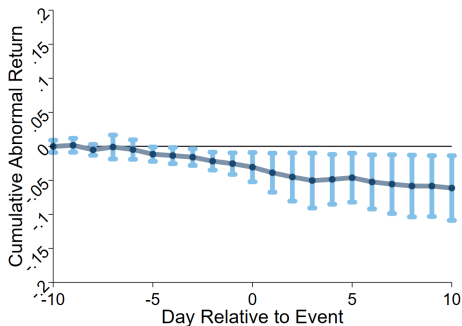
# Setting: Environmental Litigation

[Data Sources](#)[Litigation Background](#)[Lawsuits by Industry](#)[Lawsuits by Company](#)[Stats: Defendant vs. Competitor](#)[Stats: Competitor vs. Others](#)

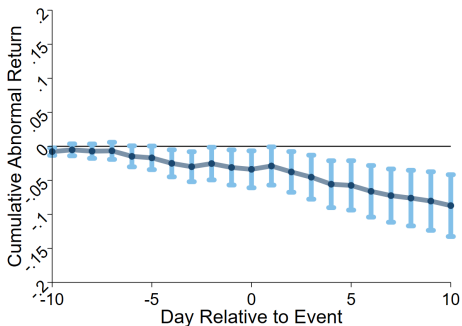
# CARs - Negative for Defendants and Competitors

Baseline Model: 3-Factor Fama French

## Defendants



## Competitors



No Response → Unlikely

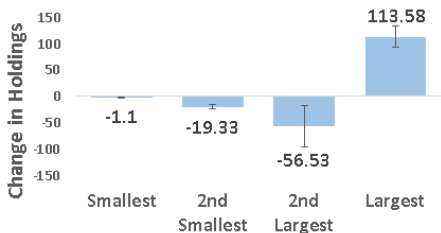
CAR Model

CAR Table Results

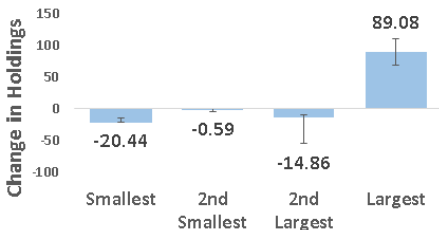
# Large Investors Increase Holdings; Small Investors Sell

Change in Holdings During Quarter of Lawsuit (1,000 shares)

## Defendants



## Competitors



Screening → Unlikely

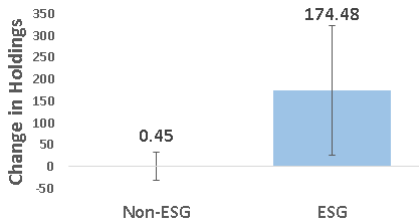
Holdings by Size Model

Holdings by Size Table Results

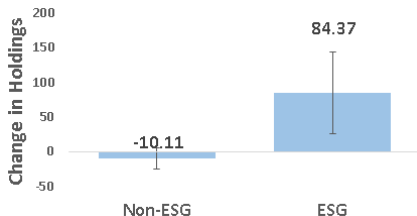
# ESG Investors Increase Holdings

Change in Holdings During Quarter of Lawsuit (1,000 shares)

## Defendants



## Competitors



Preferences → Unlikely

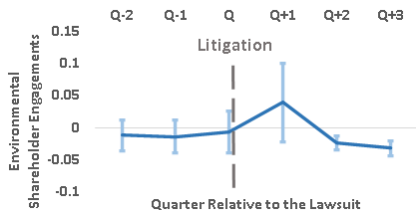
Holdings by ESG Model

Holdings by ESG Table Results

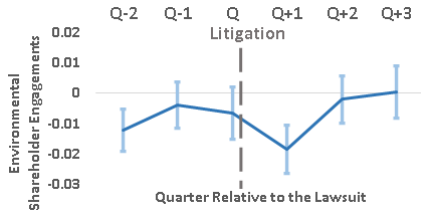
# Fewer Shareholder Proposals After Litigation

## Environmental Shareholder Proposals After a Lawsuit

### Defendants



### Competitors



## Substitution from Public to Private Engagement?

Shareholder Proposals Model

Shareholder Proposals Table Results

# Conclusion

## Scenarios: [More Details](#)

- 1 **No Response (NR)** - no market reaction to risk
- 2 **Screening (S)** - asymmetric information among investors
- 3 **Preferences (P)** - eco-conscious investors sell shares
- 4 **Engagement (E)** - different comparative advantage of engagement

Variable	Expected Sign				Actual Sign
	NR	S	P	E	Results
Price	0	(-)	(-)	(-)	(-)
Large Investors	0	(-)	(?)	(+)	(+)
ESG Investors	0	(-)	(-)	(+)	(+)
Activism	0	(-)	(-)	(+)	Proposals: (-) Private: unobservable

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# Literature Review

Climate risk matters to investors; possible mispricing (Krueger et al., 2020)

- **No Response** - drought and food company stocks (Hong et al., 2019); sea level rise and house prices (Murfin and Spiegel, 2019); temperature and stock returns (Kumar et al., 2019)
- **Screening** - temperature and stock prices (Choi et al., 2019); mortgage securitization (Ouazad and Kahn, 2019)
- **Preferences** - sea level rise and house prices (Baldauf et al., 2019; Bernstein et al., 2018, Bakkensen and Barrage, 2018); policy and investor holdings (Ramelli et al., 2019)

## Environmental Litigation Risk

- Event study with data from 1980-2000 (Karpoff et al., 2005)
- Firm-specific and time-varying

**This Paper:** Institutional investor response to environmental litigation risk

# Data Sources

Scope: U.S. public companies; 2013-2018

- **Environmental Litigation:** Audit Analytics; NOS 893 federal lawsuits including violations of Clean Air Act, Clean Water Act, National Environmental Policy Act, etc.
- **Price:** CRSP
- **Institutional Investors:** Thomson Reuters 13F Filings
  - Includes investors > \$100M required to file
  - Excludes holdings < 10,000 or < \$200,000
- **ESG Investors:**
  - Principles for Responsible Investment (PRI) ESG investor database
- **Engagement:**
  - ISS Shareholder Proposal: voting analytics for shareholder proposals
- **Controls:** Company fundamentals (Compustat) Back

# Environmental Litigation Risk

## Citizens must "flood the courts" in fight for climate justice: economist

### Environmental Litigation on the Rise in Corporate Canada and Around the World

- U.S. federal environmental litigation
  - Evolving Regulation: EPA can regulate GHG emissions as of 2011
  - Evolving Impact: Negative stock price reaction for poor environmental performance is increasing (Flammer, 2013)

#### Research Question

- How do investors respond to environmental litigation shocks?
- Is this risk redistributed or managed? If so, how?



# Lawsuits by Company

	Frequency	Percent
3M CO	7	5.69
EXXON MOBIL CORP	4	3.25
CHEMOURS CO	3	2.44
MARATHON OIL CORP	3	2.44
UNITED STATES STEEL CORP	3	2.44
APACHE CORP	2	1.63
BRISTOL MYERS SQUIBB CO	2	1.63
CASELLA WASTE SYSTEMS INC	2	1.63
CHEVRON CORP NEW	2	1.63
CONOCOPHILLIPS	2	1.63
EASTMAN CHEMICAL CO	2	1.63
F M C CORP	2	1.63
HESS CORP	2	1.63
MARATHON PETROLEUM CORP	2	1.63
N L INDUSTRIES INC	2	1.63
NAVISTAR INTERNATIONAL CORP	2	1.63
PHILLIPS 66	2	1.63
PLAINS ALL AMERN PIPELINE L P	2	1.63
PLAINS G P HOLDINGS LP	2	1.63
PORTLAND GENERAL ELECTRIC CO	2	1.63
REPUBLIC SERVICES INC	2	1.63
TEXTRON INC	2	1.63
UNION PACIFIC CORP	2	1.63
OTHER (< 2)	67	54.47
TOTAL	123	100.00

# Selection Effect of Litigation

## Are defendant firms comparable to other firms?

	Ever Sued		Never Sued		Difference in Means	
	Mean	S.D.	Mean	S.D.	t-stat	
Assets	28,092	36,310	5,346	16,099	-30.60	***
Book Leverage	0.63	0.20	0.52	0.29	-8.43	***
Log(Sale)	8.86	1.62	6.11	2.43	-26.12	***
Market-to-Book Ratio	1.04	0.89	2.05	2.68	8.34	***
Profitability	0.11	0.09	0.00	0.30	-8.14	***
Tangibility	0.41	0.27	0.25	0.25	-15.15	***
Cash Flow Volatility	0.04	0.05	0.09	0.16	7.45	***
Intangible Assets	0.17	0.17	0.19	0.21	1.82	*
Firm-Year Observations	536		19,126			

- Defendant firms are larger and more profitable Back

# Summary Statistics - Competitors vs. Others

## Are competitor firms comparable to other firms?

	Ever Sued		Never Sued		Difference in Means	
	Mean	S.D.	Mean	S.D.	t-stat	
Assets	8,171	20,475	4,552	14,538	-12.90	***
Book Leverage	0.51	0.30	0.52	0.29	1.53	
Log(Sale)	6.26	2.55	6.06	2.39	-4.59	***
Market-to-Book Ratio	1.87	2.50	2.11	2.73	5.01	***
Profitability	-0.02	0.33	0.01	0.30	4.30	***
Tangibility	0.34	0.29	0.22	0.23	-28.88	***
Cash Flow Volatility	0.12	0.18	0.09	0.15	-10.77	***
Intangible Assets	0.13	0.18	0.20	0.22	20.54	***
<i>N</i>	4,199		14,927			

- Competitor firms are more comparable but still significantly larger

Back

# Price Response: Empirical Strategy

## Event Study:

- Three-Factor Fama French
  - Controls for: market return; size of firm; and book-to-market value
- Significance: Normalize t-statistics with historical stock price standard deviation (Boehmer et al., 1991)

## Also look at competitors

- **Advantage:** Get around selection effect of litigation and increase sample size (Gande and Lewis, 2009; Arena and Julio, 2015)
- **Plausible:** Volkswagen emission scandal: decrease in competitor sales (Bachmann et al., 2019) and market values (Barth et al., 2019)



## Negative Reaction For Defendant and Peer Firms

Window (Days Relative to Event)	Defendant CARs		Competitor CARs	
Before [-10, -2]	-1.90% (-2.97)	***	-2.22% (-2.18)	**
During [-1, +1]	-1.67% (-1.50)		0.36% (0.76)	
After [+2, +10]	-1.67% (-1.84)	*	-5.80% (-4.84)	***
N	123		2,145	

- Test statistics normalized with firm-level standard errors (Boehmer et al., 1991)

# Institutional Investors by Size: Empirical Strategy

$$\Delta Holdings_{i,m,q} = \sum_{l=1}^4 \beta^{d,l} Def_{i,q} \times \mathbb{1}\{s_m = l\} + \sum_{l=1}^4 \beta^{c,l} Comp_{i,q} \times \mathbb{1}\{s_m = l\} + \beta^{\bar{X}} \bar{X} + \alpha_j + \alpha_q + \eta_{i,m,q} \quad (1)$$

$\Delta Holdings_{i,m,q}$  - Change in holdings of firm, i, by manager, m, in quarter, q

$Def_{i,q}$  - Dummy for whether firm, i, is a defendant in quarter, q

$Comp_{i,q}$  - Dummy for whether a competitor of firm, i, is a defendant in quarter, q

$\mathbb{1}\{s_m = l\}$  - Dummy for whether manager, m, is in quartile, l, for investor size

$\bar{X}$  - Vector of controls: Assets, leverage, log(sales), market-to-book ratio, profitability, tangibility, cash flow volatility and intangible assets; and investor type

$\alpha_j, \alpha_q$  - Industry and Quarterly FEs [Back](#)

# Large Investors Increase Holdings; Small Investors Sell

Defendant × Smallest	-11.03** (-2.32)	-15.33 (-1.56)	-3.51 (-0.30)	-1.10 (-0.08)
Defendant × 2ndSmallest	-11.26*** (-4.26)	-16.20*** (-2.79)	-19.14*** (-3.22)	-19.33*** (-3.26)
Defendant × 2ndLargest	-47.31*** (-4.22)	-54.35*** (-4.46)	-56.36*** (-4.40)	-56.53*** (-4.36)
Defendant × Largest	63.70 (1.08)	116.48 (1.42)	114.38 (1.40)	113.58 (1.38)
Competitor × Smallest	-13.69*** (-2.69)	-26.38*** (-2.89)	-19.35** (-2.38)	-20.44*** (-2.62)
Competitor × 2ndSmallest	-1.47 (-0.91)	-0.77 (-0.19)	-1.09 (-0.29)	-0.59 (-0.16)
Competitor × 2ndLargest	-13.73*** (-3.18)	-16.29* (-1.66)	-15.98* (-1.76)	-14.86 (-1.61)
Competitor × Largest	54.02*** (2.64)	88.36** (2.44)	87.32** (2.50)	89.08** (2.53)
Controls	No	Yes	Yes	Yes
Industry FEs	No	No	Yes	Yes
Quarterly FEs	No	No	No	Yes
N	1,931,096	1,080,277	1,080,277	1,080,277

- Dependent variable: Change in holdings (1,000 shares)

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# Institutional Investors by ESG: Empirical Strategy

$$\Delta Holdings_{i,m,q} = \beta^1 Def_{i,q} + \beta^2 Def_{i,q} \times ESG_m + \beta^3 Comp_{i,q} + \beta^4 Comp_{i,q} \times ESG_m + \beta^{\bar{X}} \bar{X} + \alpha_j + \alpha_q + \eta_{i,m,q} \quad (2)$$

$\Delta Holdings_{i,m,q}$  - Change in holdings of firm, i, by manager, m, in quarter, q

$Def_{i,q}$  - Dummy for whether firm, i, is a defendant in quarter, q

$Comp_{i,q}$  - Dummy for whether a competitor of firm, i, is a defendant in quarter, q

$ESG_m$  - Dummy for if manager, m, is an ESG investor

$\bar{X}$  - Vector of controls: Assets, leverage, log(sales), market-to-book ratio, profitability, tangibility, cash flow volatility and intangible assets; and investor type

$\alpha_j, \alpha_q$  - Industry and Quarterly FEs [Back](#)

# ESG Investors Increase Holding

Defendant	-17.74 (-1.17)	-7.12 (-0.47)	1.43 (0.10)	0.45 (0.03)
DefendantXESG	197.62*** (2.82)	170.96** (2.24)	172.93** (2.27)	174.48** (2.30)
Competitor	-21.24** (-2.19)	-21.02*** (-2.63)	-13.15** (-2.12)	-10.11 (-1.25)
CompetitorXESG	76.27*** (2.81)	83.62*** (2.75)	83.54*** (2.76)	84.37*** (2.78)
Controls	No	Yes	Yes	Yes
Industry FEs	No	No	Yes	Yes
Quarterly FEs	No	No	No	Yes
N	1,335,616	1,133,317	1,133,317	1,133,317

- Dependent variable: Change in holdings (1,000 shares) Back

# Shareholder Engagement: Empirical Strategy

$$Engage_{i,q} = \sum_{s=-2}^3 \beta^{d,s} Def_{i,q-s} + \sum_{s=-2}^3 \beta^{c,s} Comp_{i,q-s} + \beta^{\bar{X}} \bar{X} + \alpha_j + \alpha_q + \epsilon_{i,q} \quad (3)$$

*Engage<sub>i,q</sub>* - Dummy for environmental shareholder proposal

*Def<sub>i,q</sub>* - Dummy for whether firm, i, is a defendant in quarter, q

*Comp<sub>i,q</sub>* - Dummy for whether a competitor of firm, i, is sued in quarter, q

$\bar{X}$  - Vector of controls: Assets, leverage, log(sales), market-to-book ratio, profitability, tangibility, cash flow volatility and intangible assets

$\alpha_j, \alpha_q$  - Industry and Quarterly FEs [Back](#)

# Fewer Shareholder Proposals Afterwards

Defendant	Q-2	0.01 (0.43)	-0.02 (-1.24)	-0.02 (-1.26)	-0.01 (-0.98)
	Q-1	-0.00 (-0.43)	-0.02 (-1.24)	-0.02 (-1.23)	-0.01 (-1.10)
	Q	0.01 (0.41)	-0.00 (-0.25)	-0.00 (-0.27)	-0.01 (-0.38)
	Q+1	0.08** (2.25)	0.05 (1.59)	0.05 (1.53)	0.04 (1.25)
	Q+2	0.01 (0.34)	-0.02*** (-5.55)	-0.03*** (-4.61)	-0.02*** (-4.24)
	Q+3	-0.01*** (-4.77)	-0.02*** (-5.78)	-0.03*** (-5.20)	-0.03*** (-5.48)
	Competitor	Q-2	-0.01*** (-2.61)	-0.01*** (-3.80)	-0.01*** (-4.18)
Q-1		0.01** (1.97)	0.00 (0.11)	-0.00 (-1.30)	-0.00 (-0.99)
Q		0.01* (1.69)	0.00 (0.93)	-0.00 (-0.55)	-0.01 (-1.48)
Q+1		0.00 (0.44)	-0.01* (-1.65)	-0.01*** (-3.56)	-0.02*** (-4.55)
Q+2		0.01*** (3.09)	0.01* (1.77)	-0.00 (-0.69)	-0.00 (-0.47)
Q+3		0.02*** (3.51)	0.01** (2.35)	0.00 (0.53)	0.00 (0.10)
Controls		No	Yes	Yes	Yes
Industry FEs	No	No	Yes	Yes	
Quarterly FEs	No	No	No	Yes	
N	53,866	48,670	48,670	48,670	

- Dependent variable: Environmental shareholder proposal [0,1]

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# Market Response Scenarios

- 1 **No Response (NR)** - No market reaction to risk
- 2 **Screening (S)** - Informed investors offloading risky assets to uninformed investors
- 3 **Preferences (P)** - Environmentally-conscious investors hold environmentally-conscious firm stocks and vice versa
- 4 **Engagement (E)** - Comparative advantage to engagement - high-skilled investors buy assets from low-skilled investors
  - Financial motivation to engagement: Dyck et al. (2019); Flammer (2015); Krueger et al. (2020)