KELLEY SCHOOL OF BUSINESS

OSTROM WORKSHOP

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Climate Risk and Investors

Indiana University - ECGI Online Series
March 2, 2023

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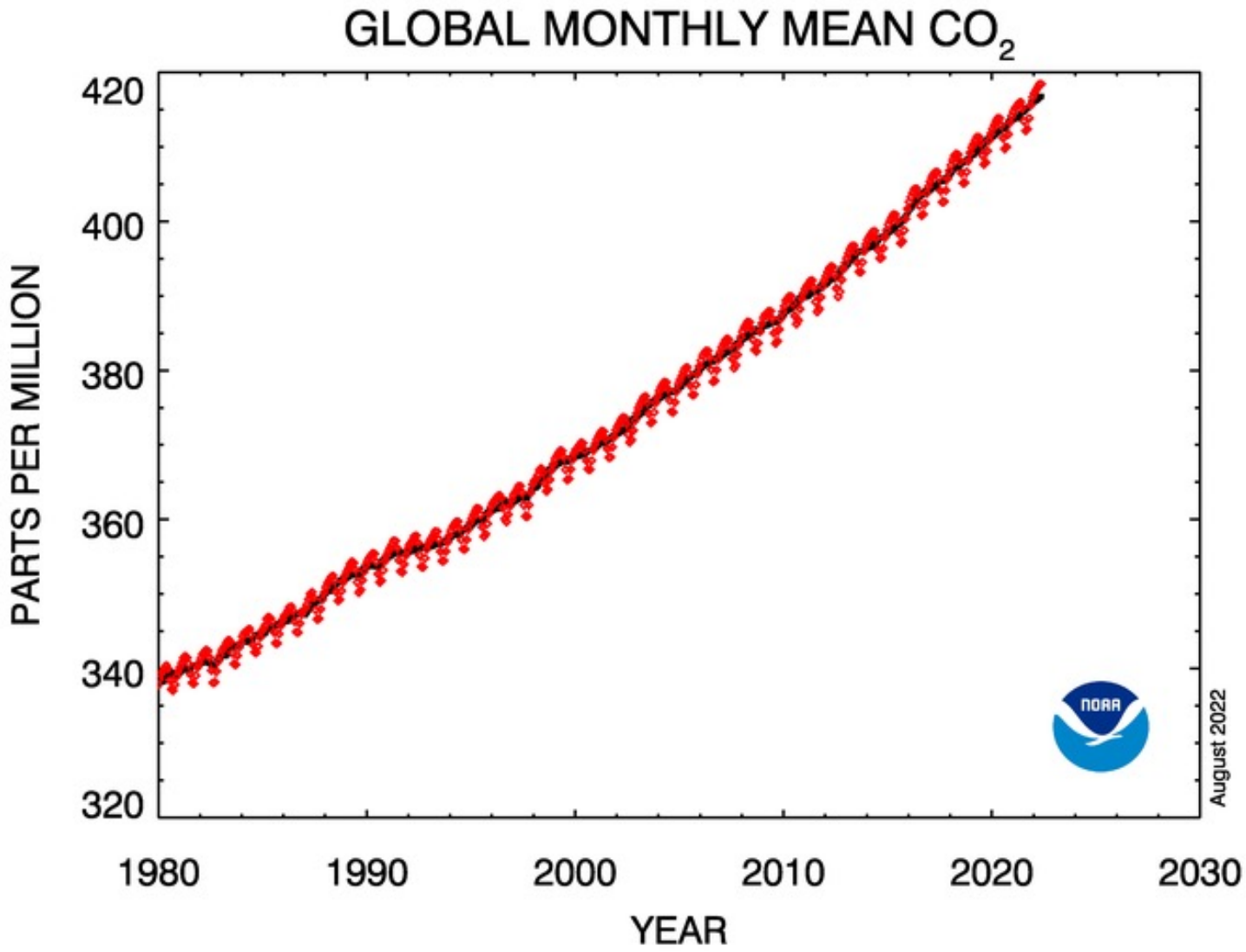
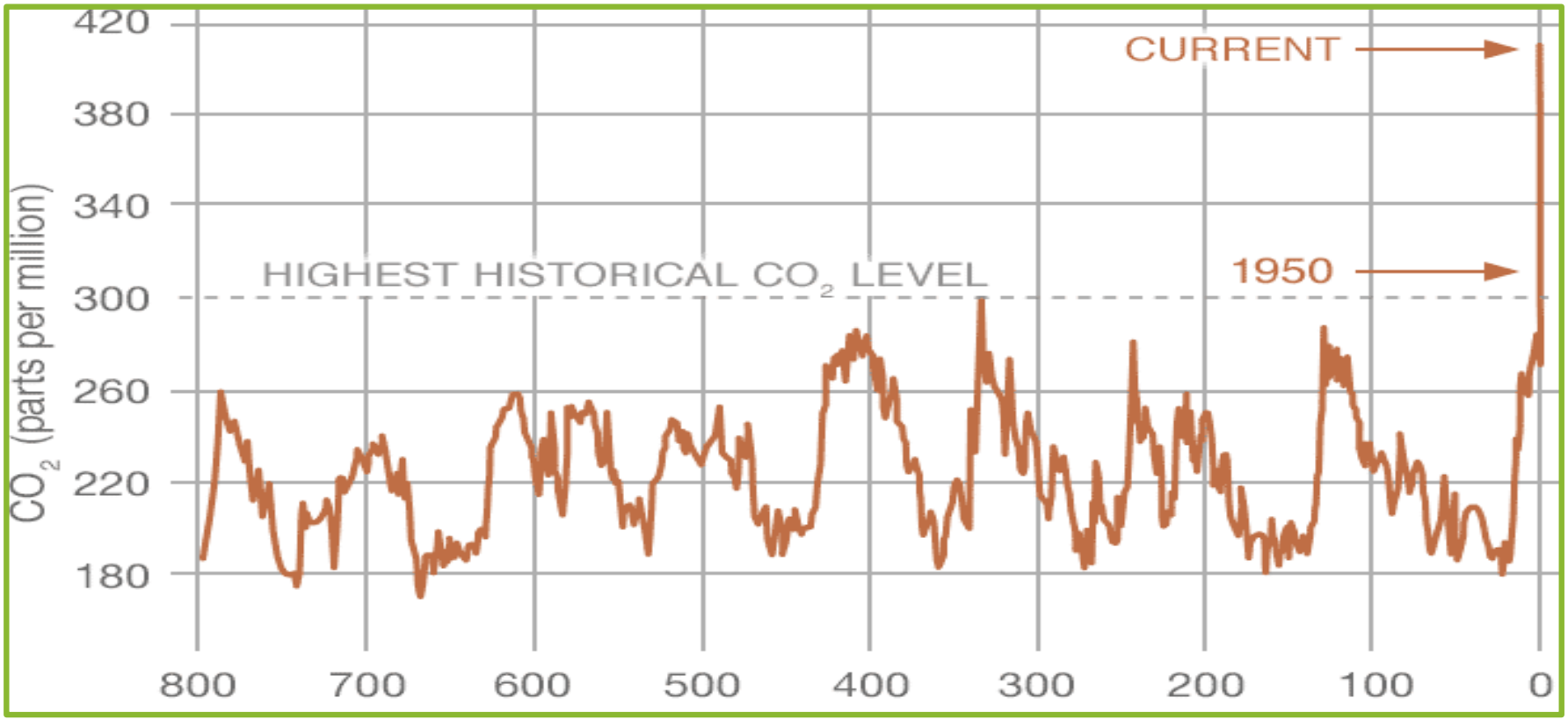
As we all know, there exists increasing carbon in the atmosphere



And the problem is relatively recent

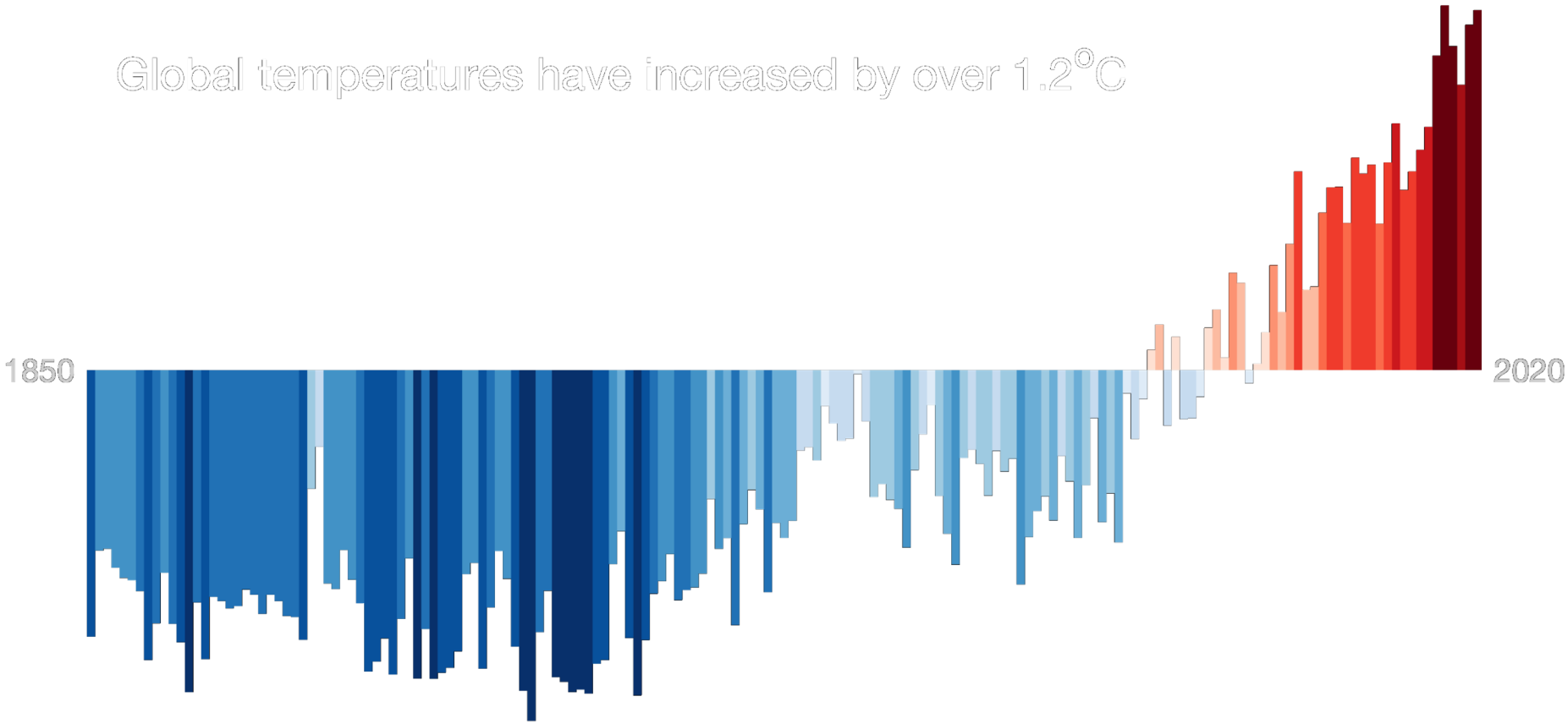


Thousands of years before today

NOAA atmospheric carbon

Leading to increasing temperatures

From Professor Ed Hawkins (University of Reading) https://showyourstripes.info/



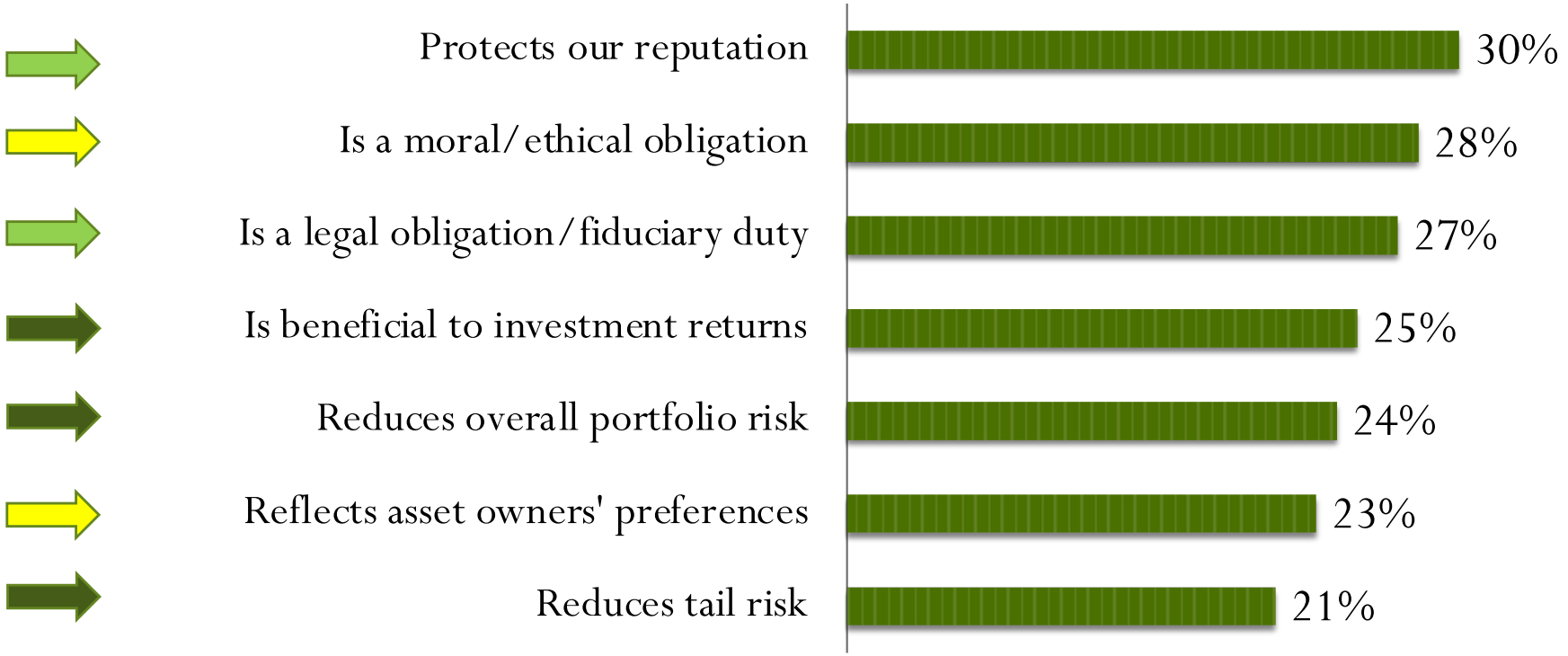
And climate risks for companies and investors

What are the challenges and issues with climate risk for investors?

- Climate risk is an E, S and G risk for investors.
  - Still need to understand for given investors
    - how much is due to financial concerns, from a *Value* perspective
    - how much is nonpecuniary (i.e., based on the investors' tastes and preferences), from a *Values* perspective
  - We asked 439 large institutional investors across the world about their motivations for incorporating climate risk into their investment decisions.

Climate risk incorporation motivations

Top motivations for incorporating climate risk into investment decisions



These are not mutually exclusive.

Value
Values
Blend

Krueger, Sautner, and Starks (RFS, March 2020)

What are the challenges and issues with climate risk for investors?

- Climate risk is an E, S and G risk for investors.
  - Still need to understand for given investors
    - how much is due to financial concerns, from a *Value* perspective
    - how much is nonpecuniary (i.e., based on the investors' tastes and preferences), from a *Values* perspective

- Climate risk is difficult to price and hedge due to
  - its systematic nature
  - a lack of sufficient disclosure by portfolio firms
  - difficulty in finding suitable hedging instruments

- Climate risk has become a first order topic for policy makers, thus, increasing the regulatory risk component and requiring consideration of its time-varying nature.

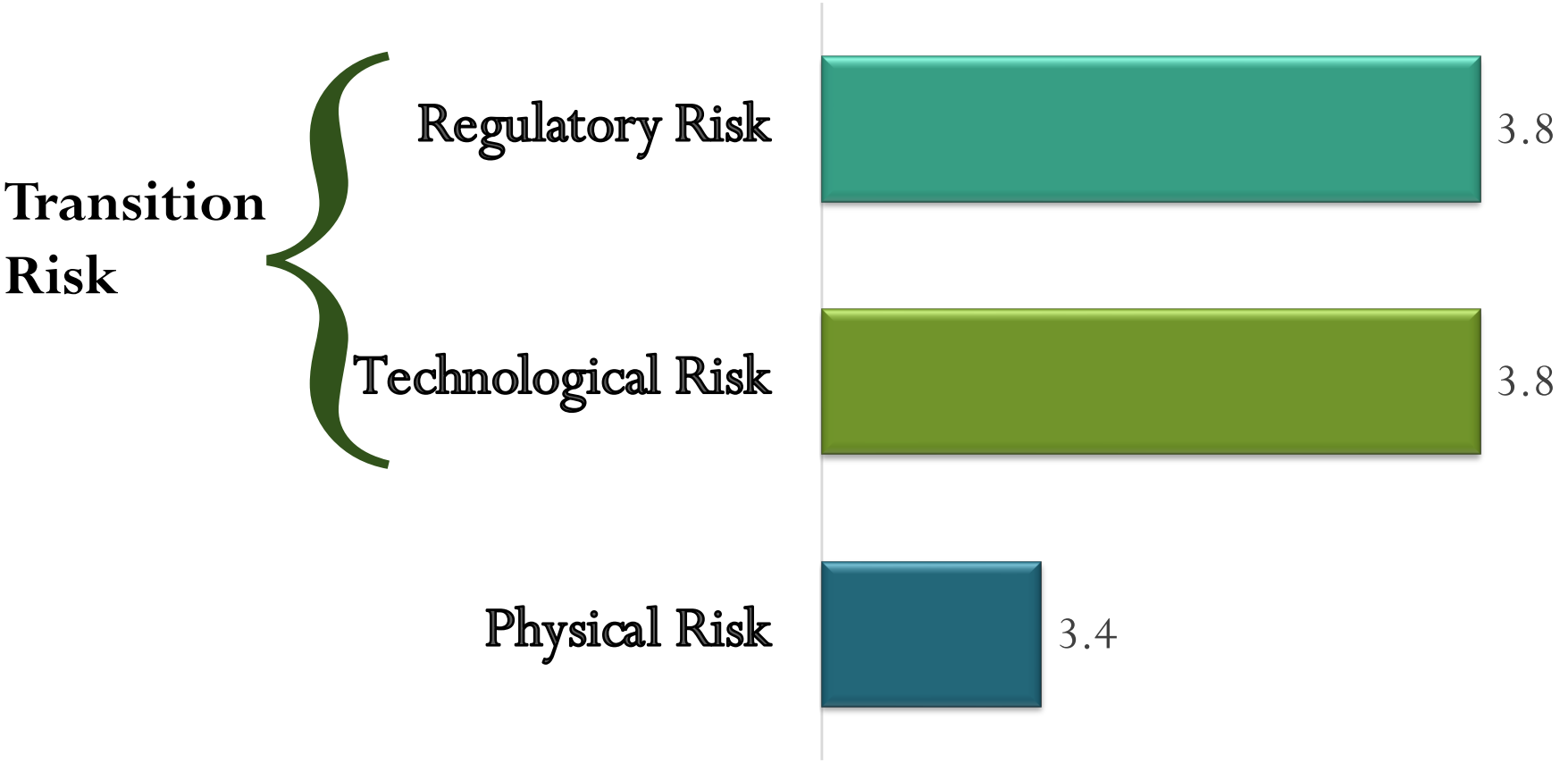
- Climate risk is usually considered in light of its negative effects on asset values, but it can also provide return opportunities.

Further issues with climate risk for investors

- Different types of risk:
  - Physical
    - Chronic
    - Acute
  - Transitional
    - Policy
    - Regulatory
    - Liability
    - Technological
  - Reputational
- Systematic versus company-specific risk
- Time horizon
- Risk versus uncertainty

Importance of climate risks to institutional investors

Rating the importance of climate risk from 1 to 5:



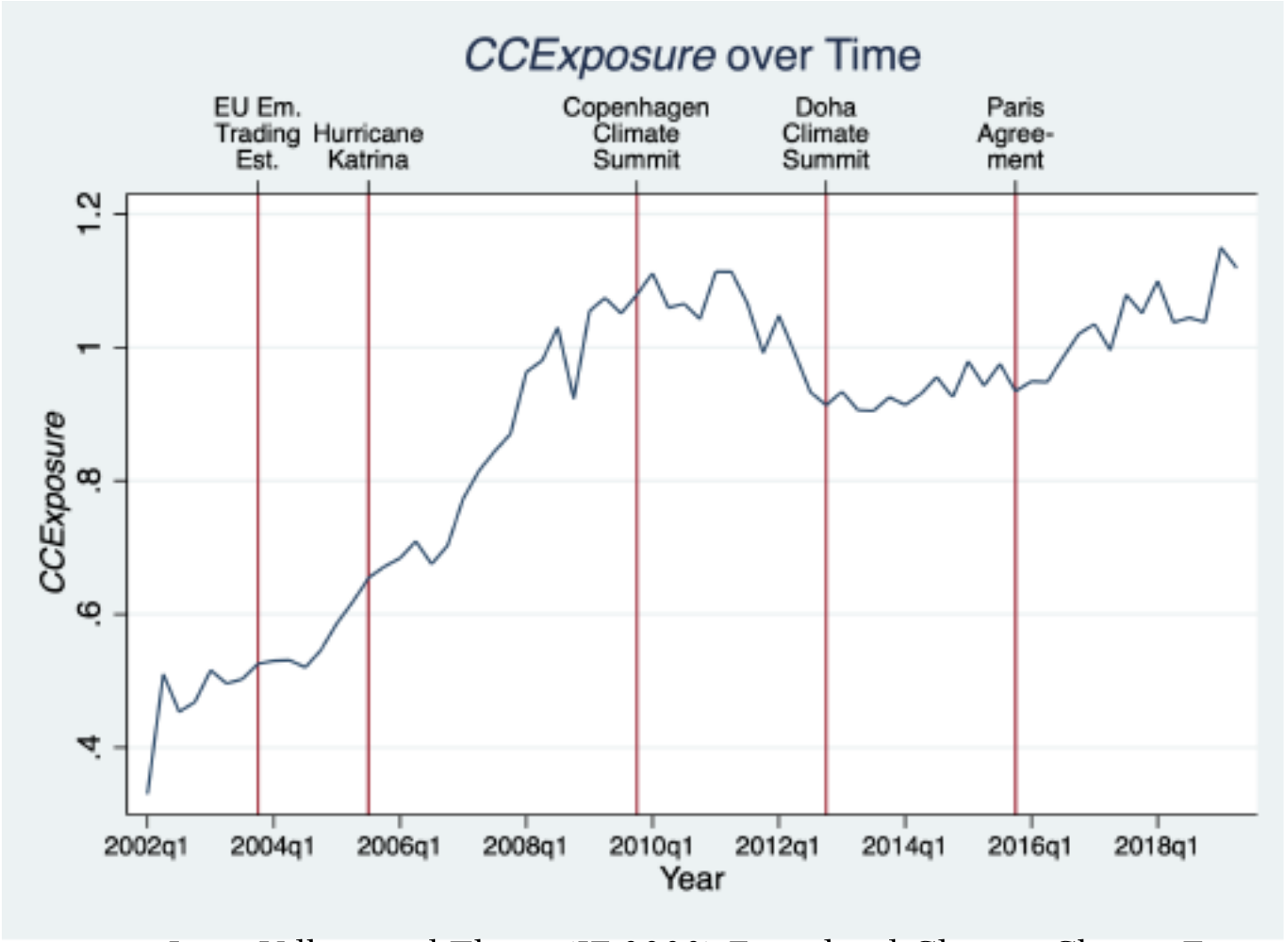
Krueger, Sautner and Starks, RFS 2020

Further evidence shows analysts and investors are increasingly concerned

Increasing questions regarding climate change risks during firms' earnings conference calls

80,000 annual observations originating from more than 10,000 unique firms in 34 countries between 2002 and 2019

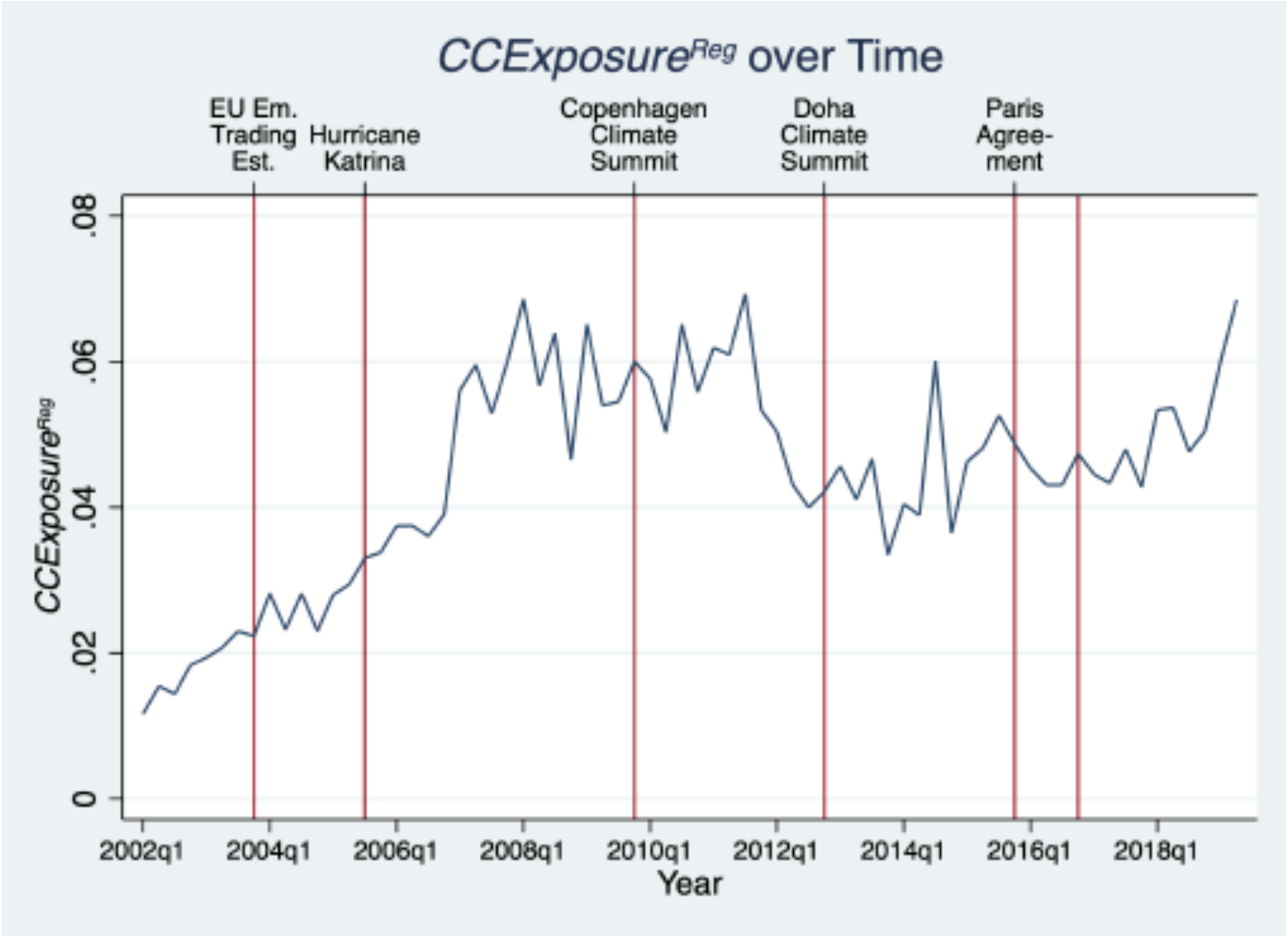
References to Climate Risk



Sautner, van Lent, Vilkov, and Zhang (JF 2022) Firm-level Climate Change Exposure

Increasing questions regarding climate change risks during firms' conference calls

References to Regulatory Climate Risk



Sautner, van Lent, Vilkov, and Zhang (JF 2022) Firm-level Climate Change Exposure

Investors are pricing climate policy uncertainty

- Regulatory climate risk likely most severe for firms with large carbon emissions.
- The regulatory changes have jump-like effects on asset prices, such as around the Paris Agreement.
- Using the estimated effects of carbon emissions on corporate left-tail risk (estimated from OTM put options), there exists strong evidence that carbon emissions are positively associated with tail risk.

Ilhan, Sautner and Vilkov (RFS, 2020)

Bond investor and credit analyst concerns about climate regulatory risk

- Does climate regulatory risk affect corporate bond risk and pricing?
- Hypothesis: climate risks would be borne by corporate bond issuers and investors and particularly through the risk of regulatory enforcement
- Examine Paris Agreement as natural experiment

Seltzer, Starks, and Zhu (2022)

Why corporate bonds?

- For corporations raising funds in financial markets, the bond market, rather than the equity market, is the '*marginal source of finance*.'

  Gourio 2013

- For most firms, climate and environmental risks are fundamentally downside risks

  Hoepner, Oikonomou, Sautner, Starks and Zhou 2022

  Ilhan, Sautner, Vilkov 2020

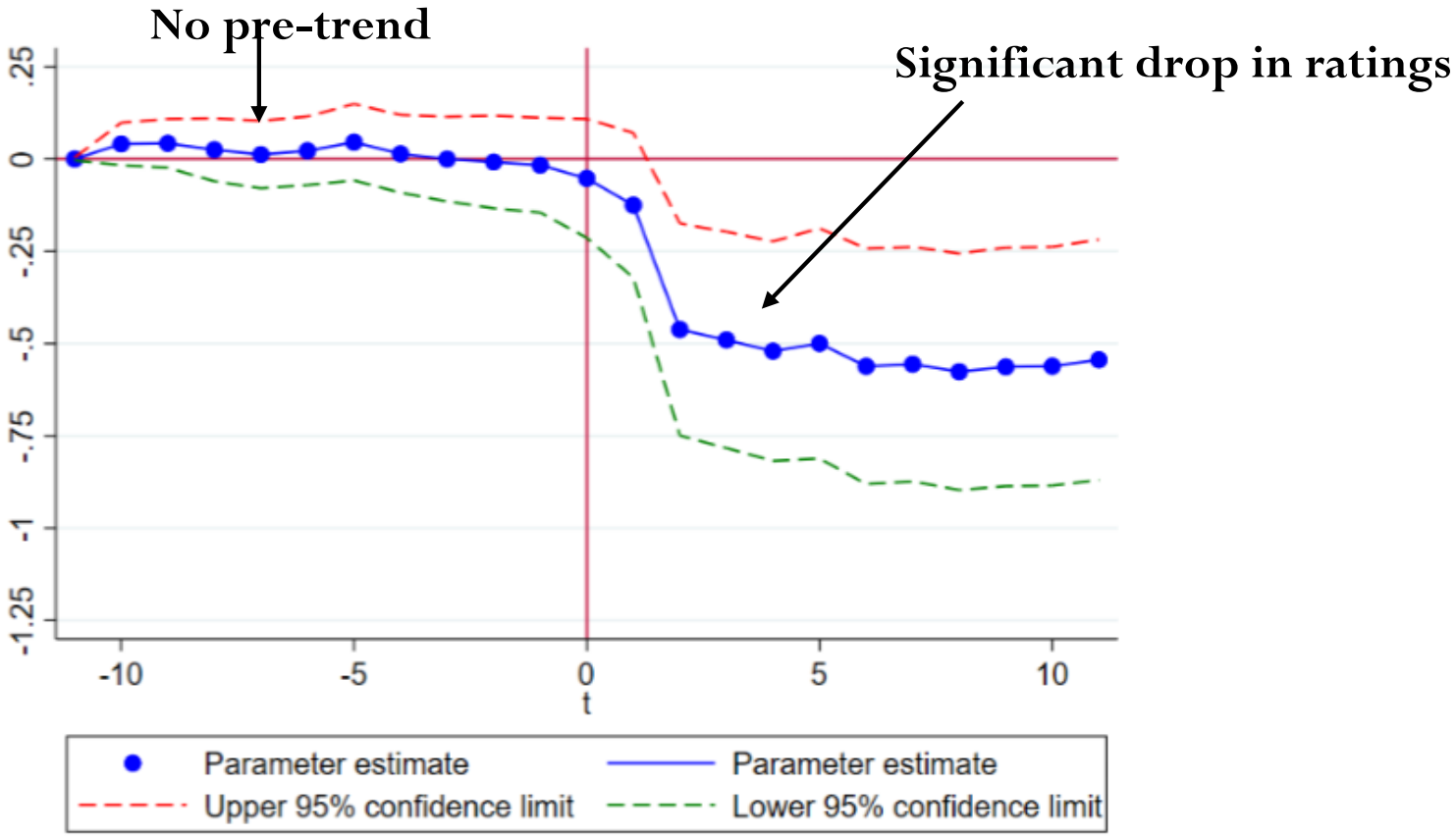
- Further, in the cross-section, downside risk has been shown to be the strongest predictor of future bond returns.

  Bai, Bali and Wen (2019)

Changes in regulatory risk? Credit ratings around Paris Agreement

Difference-in-differences tests

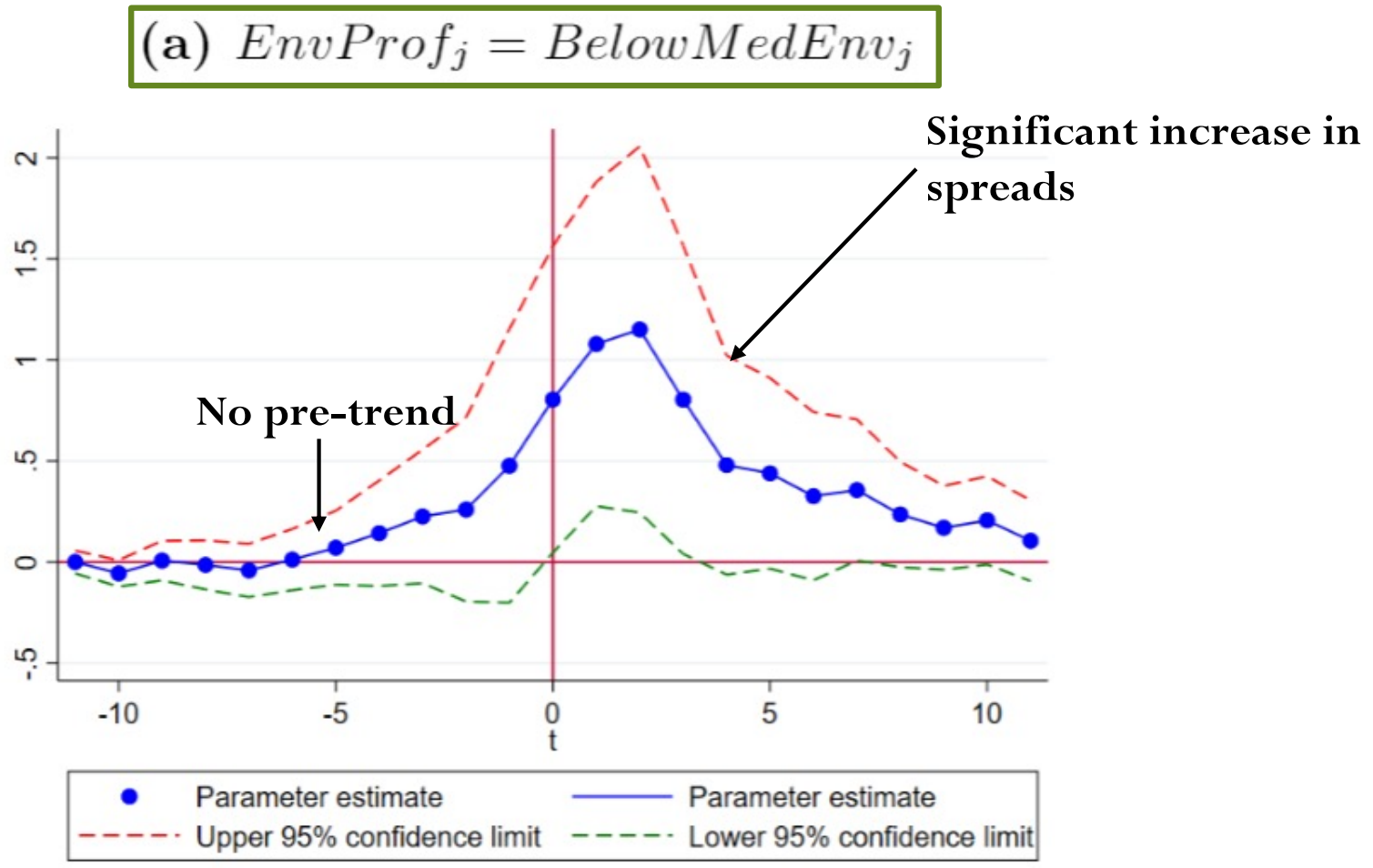
Treatment = Top high emissions industries



From Seltzer, Starks, Zhu (2022)

Yield spreads around Paris Agreement

Difference-in-differences test



From Seltzer, Starks, Zhu (2022)

Changes in institutional bond ownership around Paris Agreement

Treated bond defined by:	High emission industries			Below-median firm environmental score		
Ownership (%) by	All institutions	Mutual funds	Insurance firms	All institutions	Mutual funds	Insurance firms
	(1)	(2)	(3)	(4)	(5)	(6)
Treated bonds * Post Paris Agreement	-1.237***	-0.0333	-1.209***	-0.426*	0.265***	-0.675**
	(0.173)	(0.0512)	(0.215)	(0.221)	(0.0231)	(0.218)
Treated bonds	0.297	0.780	-0.516	4.759***	2.921**	1.802
	(1.083)	(0.826)	(1.376)	(1.338)	(1.001)	(1.672)
Ln(Issue amount)	-7.633***	1.148	-8.812***	-3.633**	2.965**	-6.747***
	(1.007)	(0.687)	(1.241)	(1.210)	(0.983)	(1.475)
Years to maturity	-0.00141	-0.214***	0.222**	-0.107	-0.258***	0.160
	(0.0710)	(0.0288)	(0.0789)	(0.0886)	(0.0510)	(0.103)
Credit rating (numerical)	-0.554***	-1.110***	0.563**	0.195	-1.458***	1.667***
	(0.153)	(0.183)	(0.190)	(0.182)	(0.270)	(0.328)

Decrease in institutional bond ownership after Paris Agreement driven by insurance firms selling while mutual funds buy.

From Seltzer, Starks, Zhu (2022)

Implications

- Results show that corporate bond investors and ratings agencies respond to climate regulatory risk.

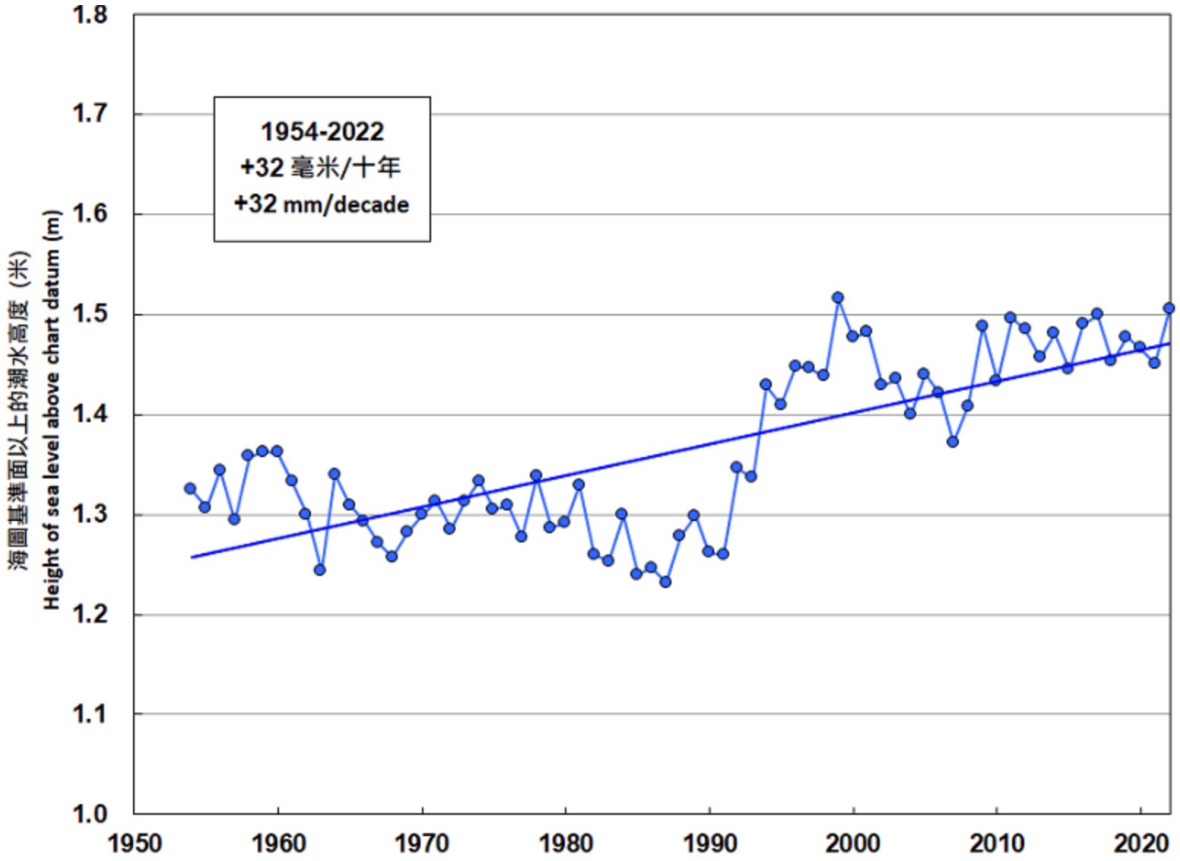
- Consistent with the survey views of institutional investors, regulatory risk is an important channel through which climate risk impacts investors.

What about physical risk? Climate risk and sea level rise: Potential consequences

Rising sea levels set to displace 45 million people in Hong Kong, Shanghai and Tianjin if earth warms 4 degrees from climate change

South China Morning Post November 2015

Annual Mean Sea Level Rise Victoria Harbor



https://www.hko.gov.hk/en/climate_change/obs_hk_sea_level.htm

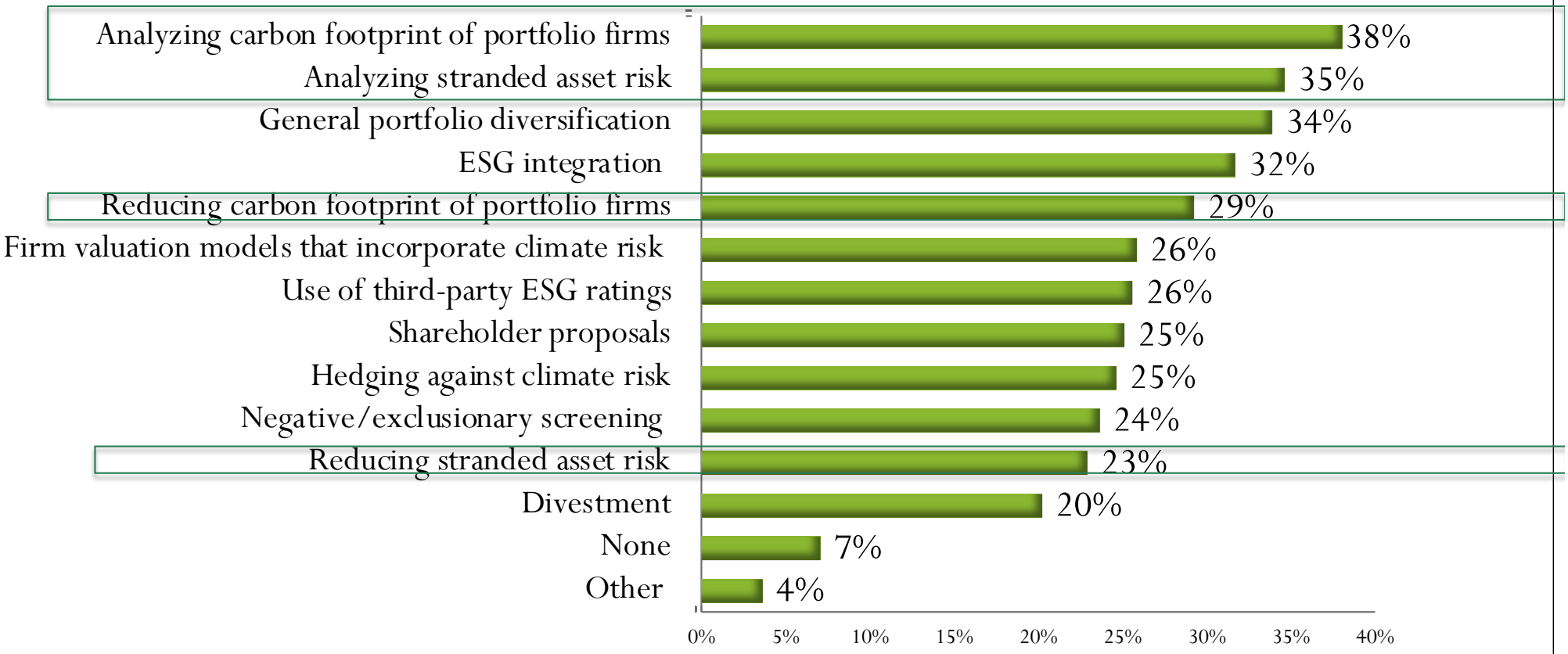
Substantial academic evidence that sea level rise is affecting markets

- Sea level rise is affecting real estate prices, sales volume and descriptions in listings
  - Bernstein, Gustafson, and Lewis (JFE, 2019)
  - Baldauf, Garlappi, and Yannelis (RFS, 2020)
  - Keys and Mulder (NBER, 2022)
  - Giglio, Maggiori, Rao, Stroebel and Weber (2021)
- But some evidence disputes that sea level rise is affecting real estate prices
  - Murfin and Spiegel (RFS, 2020)
- Sea level rise is affecting municipal bond markets
  - Painter, 2020
  - Goldsmith-Pinkham, Gustafson, Lewis and Schwert, 2021
- And other evidence that physical risk is affecting muni markets
  - Archarya, Johnson, Sundaresan, and Tomunen, 2022

Substantial academic evidence on the pricing of climate risk in equity markets

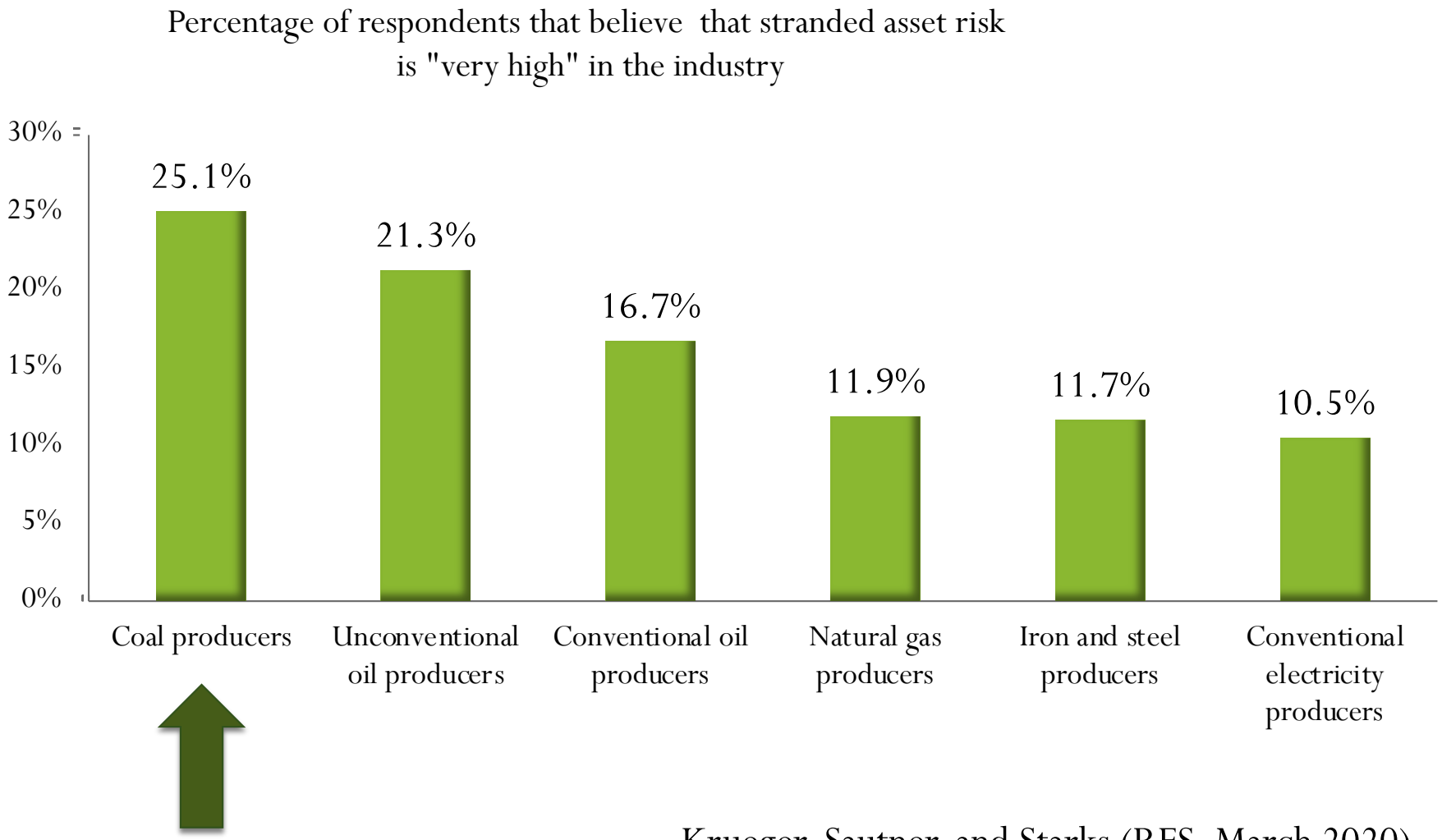
- **Climate risks can impact equity markets**
  - Litterman, 2011
  - Bansal, Ochoa and Kiku, 2017
  - Daniel, Litterman, and Wagner 2017
  - Painter 2019
  - Bolton and Kacperczyk 2020, 2021, 2022
  - Ilhan, Sautner and Vilkov 2020;
  - Ramelli, Wagner, Zeckhauser, and Ziegler 2021
  - And many more
- **But markets may be unable to correctly value them**
  - Andersen, Bolton, and Samama, 2016
  - Hong, Li, and Xu 2017
  - Krueger, Sautner and Starks 2020

Approaches taken to incorporate climate risk management in the investment process



Krueger, Sautner, and Starks (RFS, March 2020)

Perceptions of stranded asset risks



Krueger, Sautner, and Starks (RFS, March 2020)

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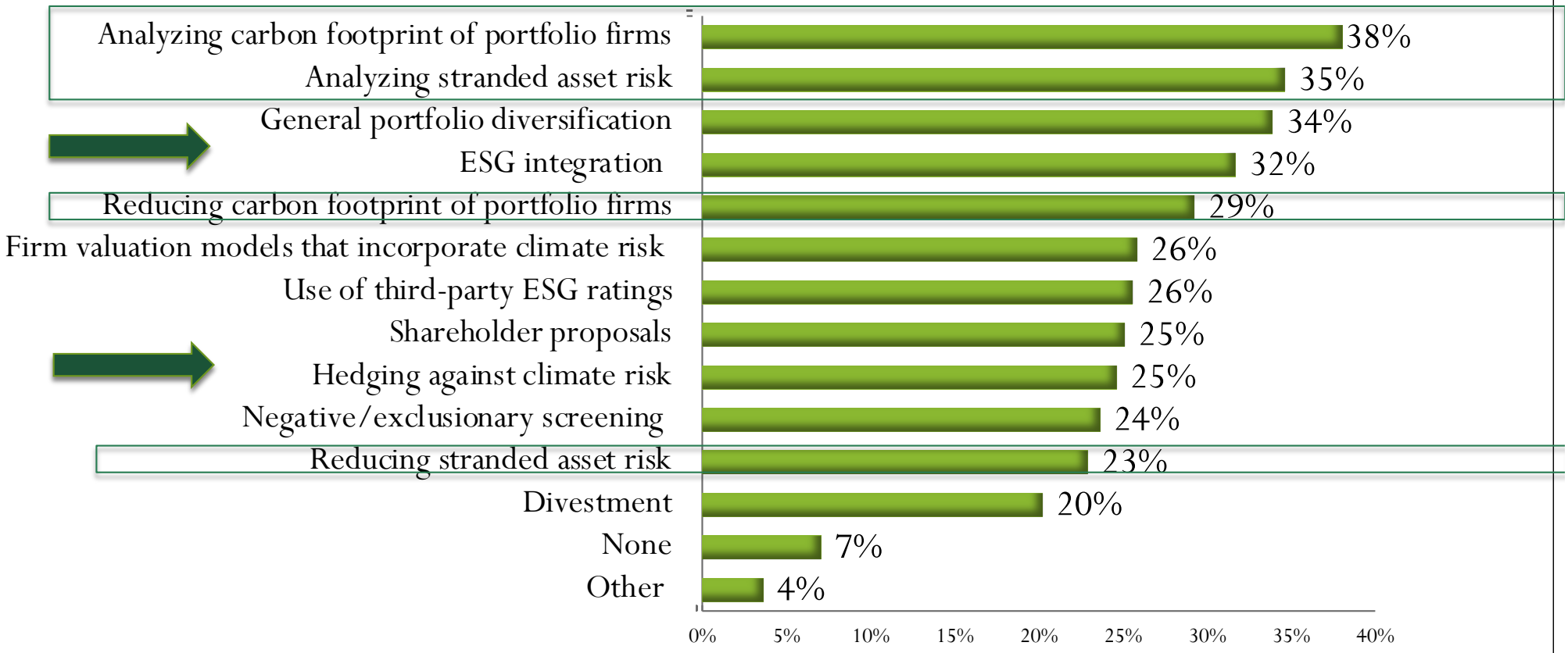
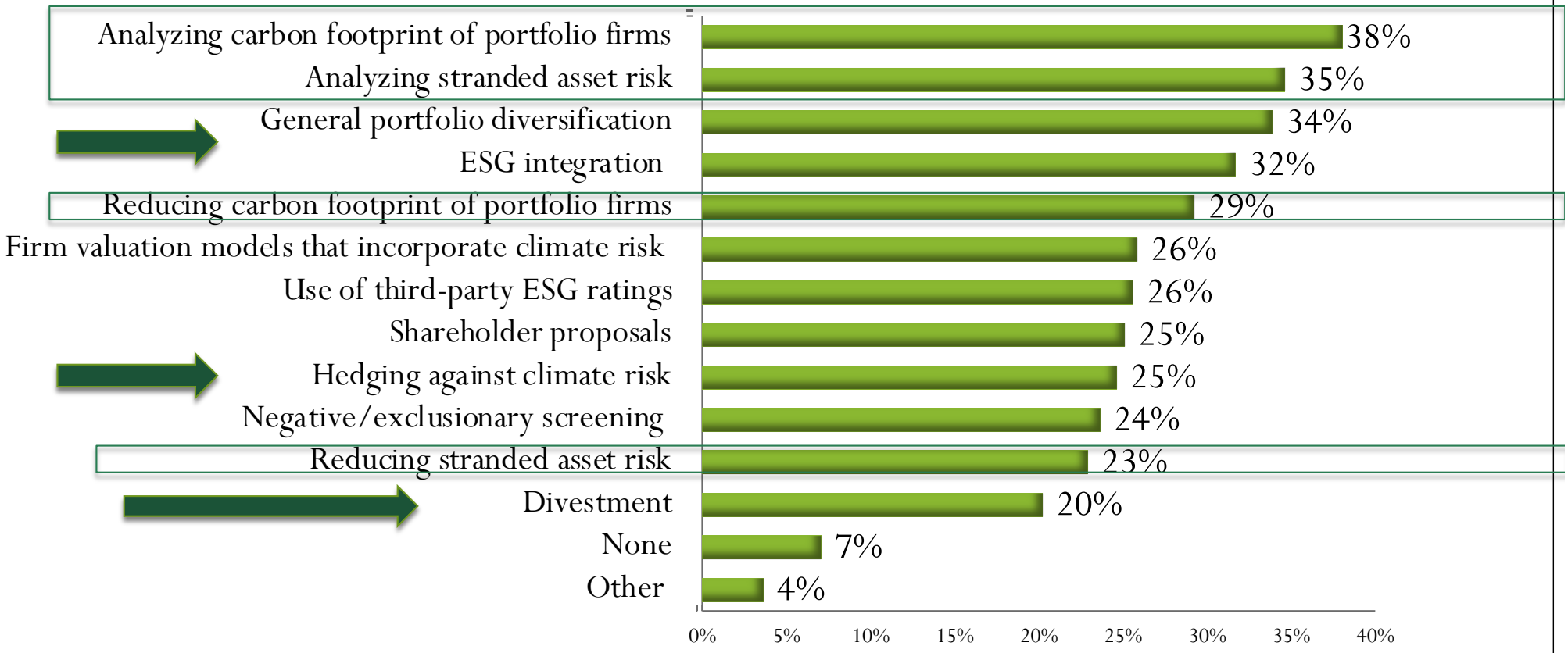


Krueger, Sautner, and Starks (RFS, March 2020)

Hedging of climate risk

- Through financial instruments
  - Cat bonds: Tomunen (2022)
- Through synthetic approaches
  - Andersson, Bolton and Samama (2016)
  - Engle, Giglio, Kelly, Lee and Stroebel (2020)
  - Alekseev, Giglio, Maingi, Selgrad and Stroebel (2022)

Approaches taken to incorporate climate risk management in the investment process



Krueger, Sautner, and Starks (RFS, March 2020)

Theoretical/conceptual evidence on effectiveness of exclusion/divestment

- Theoretical/conceptual arguments
  - Divestment should be ineffective given most managerial compensation conttracts
  - Divestment's effect on cost of capital will be too low to make a difference
  - Divestment's effectiveness depends on motivations of a majority of the shareholders
  - If shareholders want to change a company's actions, tilting with engagement is better than divestment.
  - Divestment movements provide social pressure for change
    - Davies and van Wesep (2018)
    - Berk and van Bingsbergen (2022)
    - Broccado, Hart and Zingales (2022)
    - Edmans, Levit, and Schneemeier, (2022)
    - Becht, Pajuste, Toniolo (2022)

Empirical evidence on exclusion/divestment

Empirical evidence

- Little discernible effect on firm values from South African divestments
- Exclusion can be costly to pension plans and endowments
- Exclusion can be effective under certain conditions including having E&S-conscious institutional investors
- Institutional portfolios are being decarbonized because of portfolio reweighting rather than through shareholder engagement
  - Teoh, Welch and Wazzan (1996)
  - Bessembinder (2016)
  - Gantchev, Giannetti, and Li (2022)
  - Atta-Darkua, Glossner, Krueger, and Matos (2022)

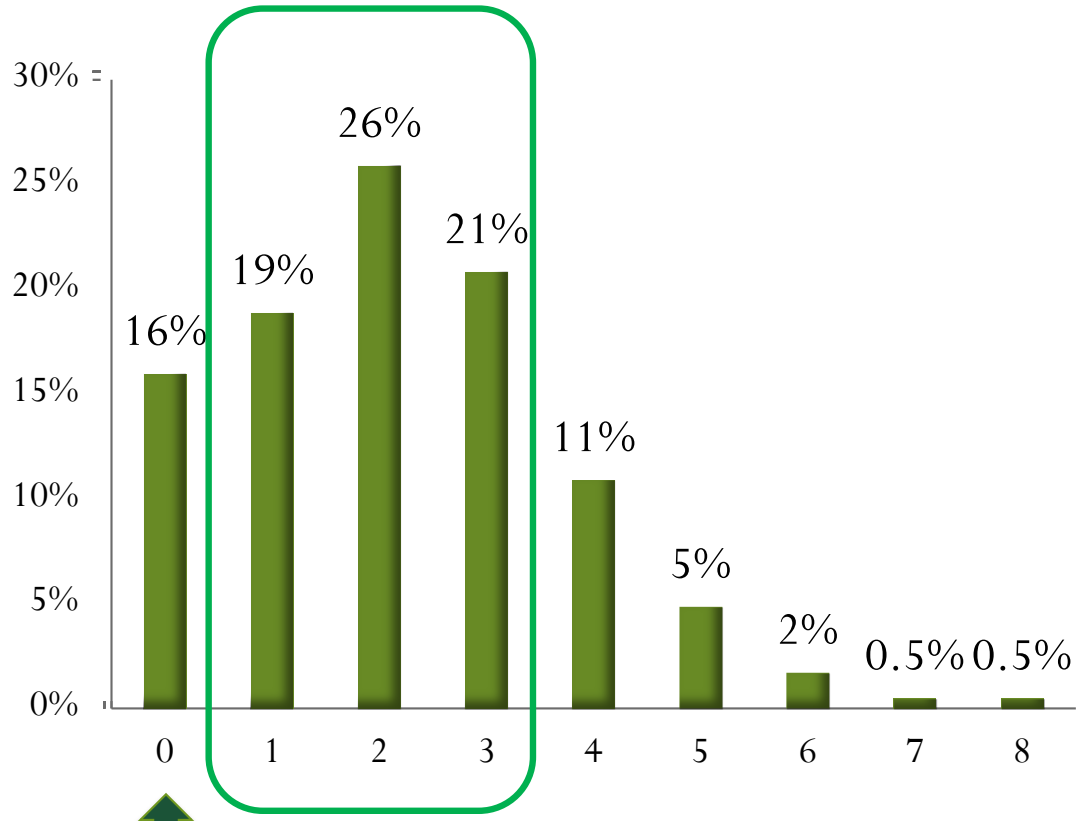
Investor engagement on climate risk

Krueger, Sautner, and Starks (RFS, March 2020)

Evidence on engagement on climate risk

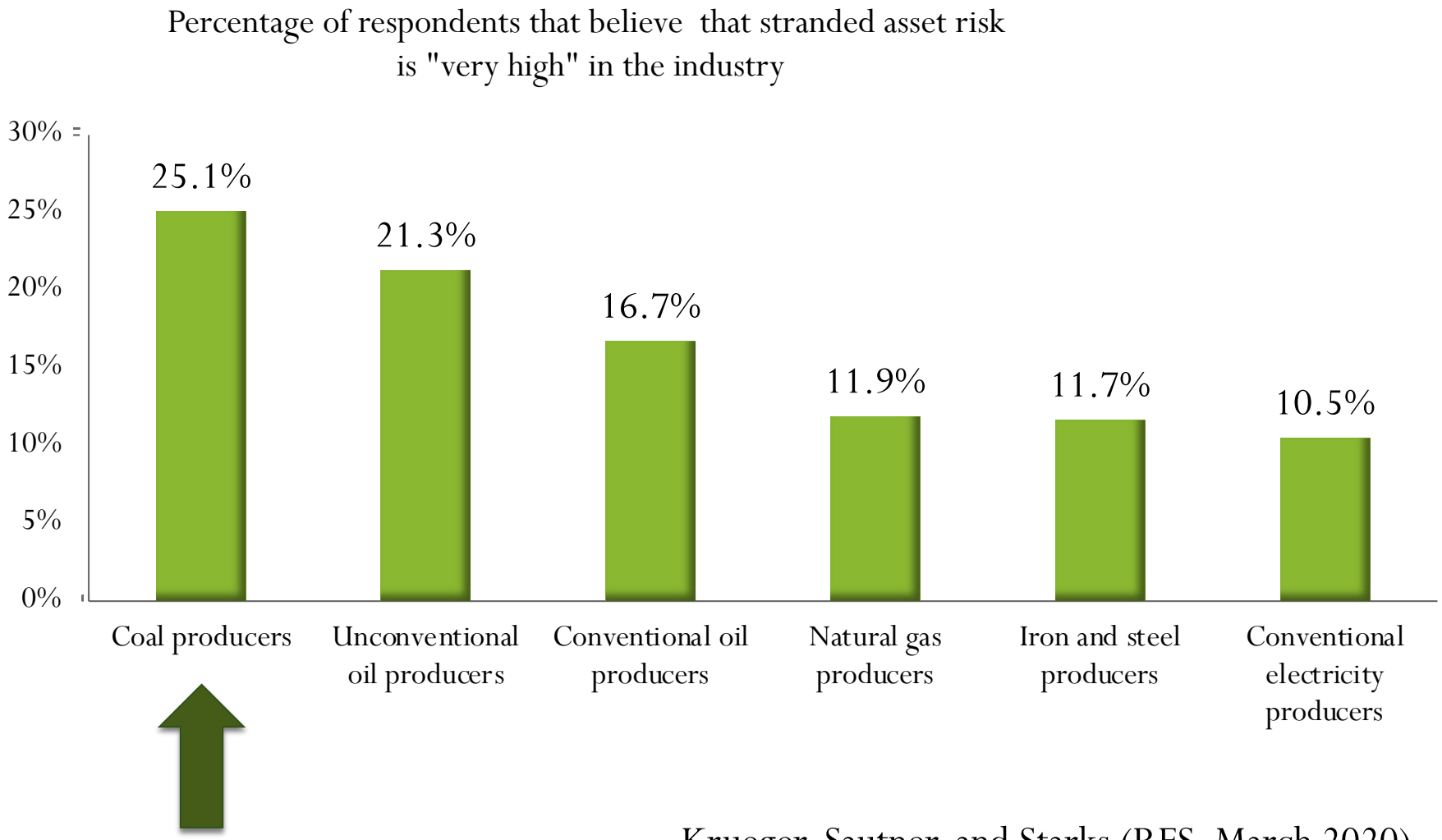
- Institutional investor engagement increases voluntary climate risk disclosure
  - Flammer, Toffel, Viswanathan (2019)
- Institutional investor engagement reduces downside risk from climate change
  - Hoepner, Oikonomou, Sautner, Starks, Zhou (2022)
- Consistent with previous evidence that institutional investor engagement has results:
  - Dimson, Karakas and Li (2015, 2021)
  - Becht, Franks, Mayer and Rossi (2009)
  - Becht, Franks, Grant, and Wagner (2017)

Number of engagement channels taken by investors



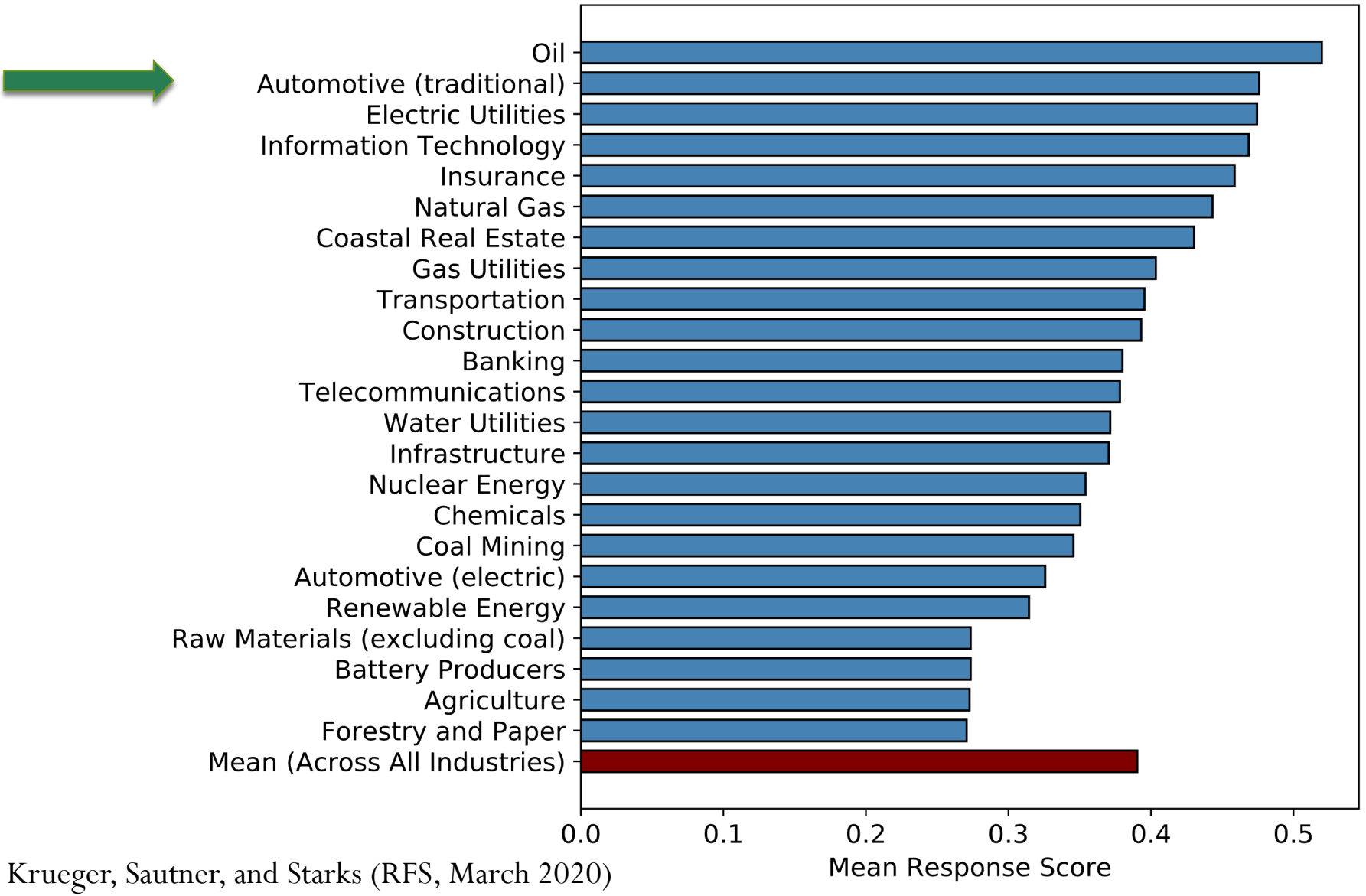
Similar to finding on governance engagement in McCahery, Sautner and Starks, JF 2016

Perceptions of stranded asset risks



Krueger, Sautner, and Starks (RFS, March 2020)

Which sectors are mispriced due to climate risk?



Krueger, Sautner, and Starks (RFS, March 2020)

But also perceptions of investment opportunities

Top 15 responses to open question; larger font = more frequently named

Krueger, Sautner, and Starks (RFS, March 2020)

What about disclosure? Importance of climate-related information

- Financial market efficiency relies on timely and accurate information regarding firms' risk exposures
- Given the increasingly important risk exposure related to climate change, high-quality information on firms' climate risk exposures is necessary for informed investment decisions and the correct market pricing of climate-related risks and opportunities
- Sound disclosure on climate risks is also essential for regulatory efforts to protect financial stability

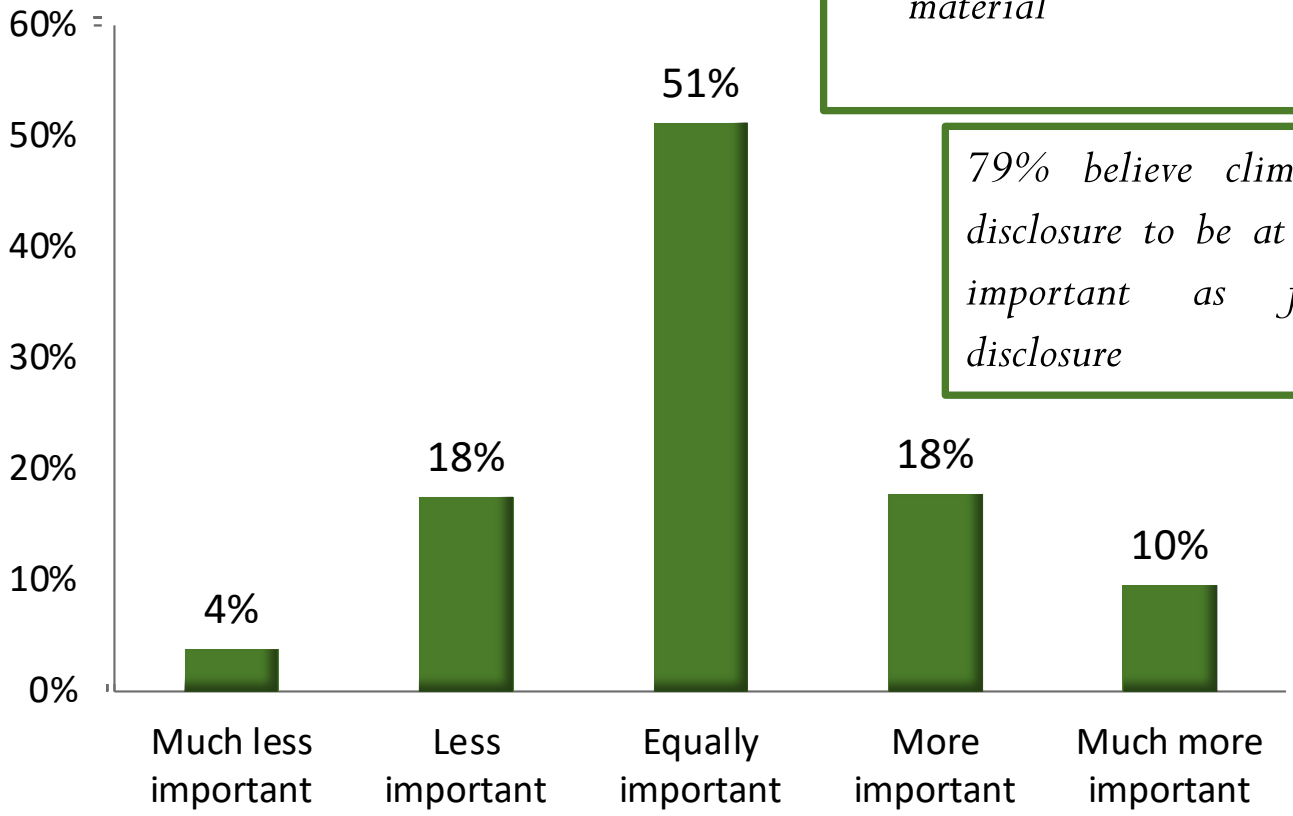
How important do investors consider climate risk disclosure?

Compared to reporting on financial information

Investors who thought it was more important:

- *Larger AUM*
- *Higher ESG share of portfolio*
- *Believe climate risk to be more financially material*

79% believe climate risk disclosure to be at least as important as financial disclosure



From Ilhan, Krüger, Sautner, and Starks, 2022

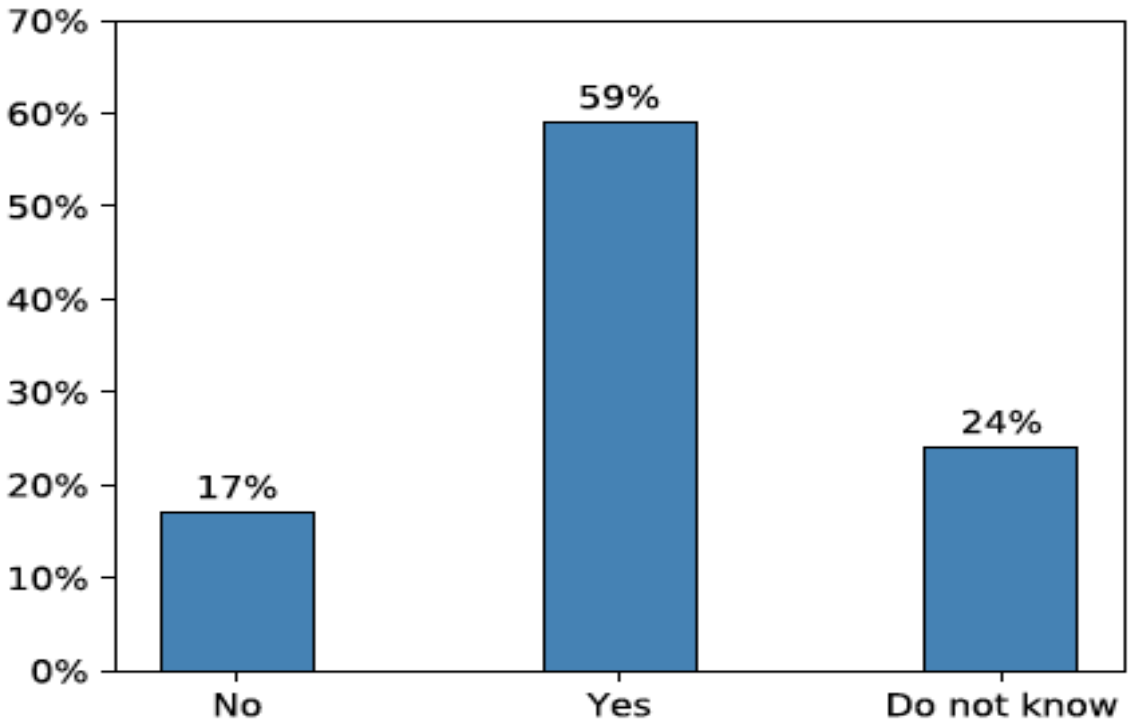
Two possible goals of mandatory climate risk disclosure

According to Christensen, Hail and Leuz (2021) regarding CSR:

- Goal 1: Give the investors the information they want on firms' climate effects
  - Basically single materiality – how does climate change affect the firm?
- Goal 2: Drive change in the firms' climate finance behavior through the disclosure regime
  - Basically, double materiality – how does climate change affect the firm and how do the firm's actions affect society and the environment?

Engagement of portfolio firms on TCFD recommendations

Do you engage (or plan to engage) portfolio companies to report according to the recommendations of the Task Force on Climate related Financial Disclosures (TCFD)?



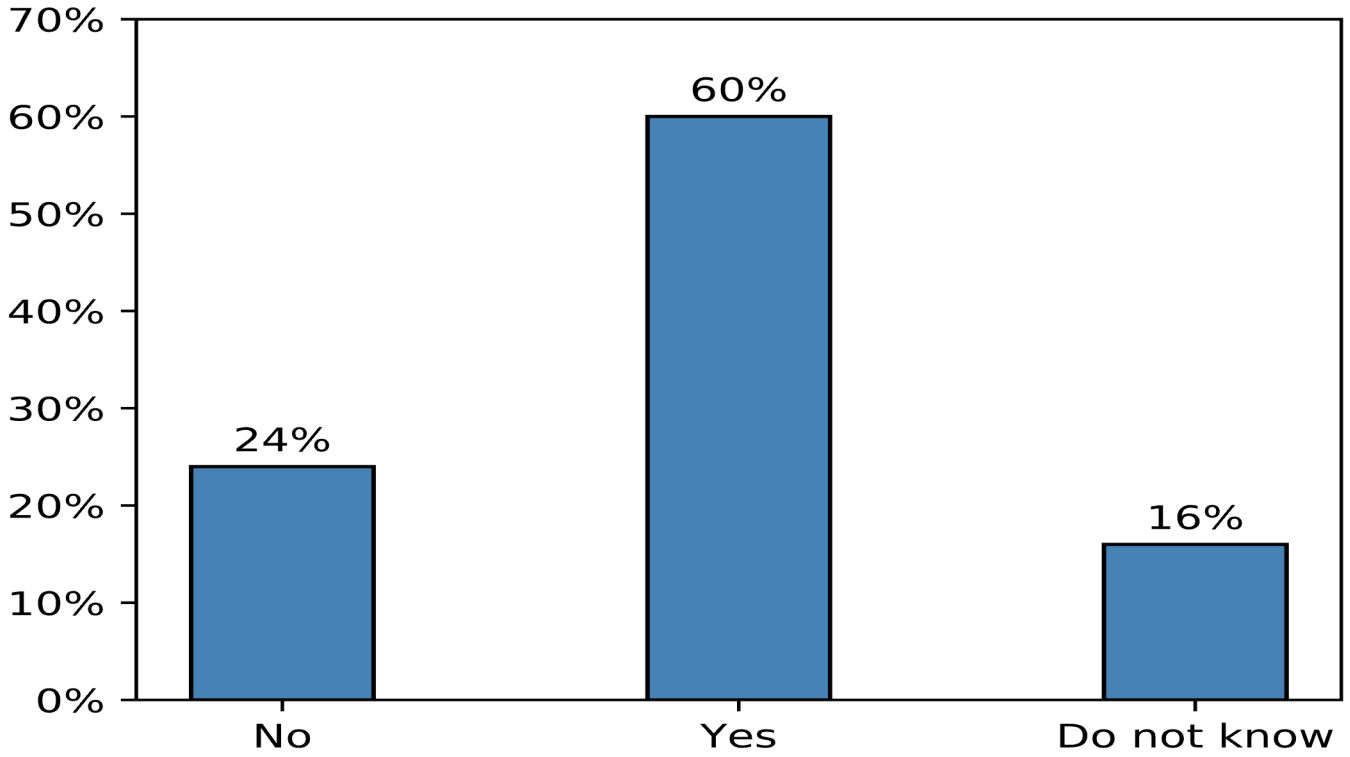
The investors who engage:

- *Higher ESG share of portfolio*
- *Believe climate risk to be more financially material*
- *Located in countries with higher social norms about the environment.*

From Ilhan, Krüger, Sautner, and Starks, 2022

Investors' views on their own disclosures

Do you plan to report the carbon footprint of your portfolios?



The investors who report:

- *Larger AUM*
- *Higher ESG share of portfolio*
- *Believe climate risk to be more financially material.*

From Ilhan, Krüger, Sautner, and Starks, 2022

Climate risk disclosure and mispricing

- Theory predicts a link between climate mispricing and disclosure (Daniel, Litterman, and Wagner 2017).
- Investors' opinions on the quality of current climate reporting are related to the perceived underpricing of climate risks.
  - Respondents who believe that reporting is lacking see more mispricing in current equity valuations.
  - Consistent with Michael R. Bloomberg, Chair of the TCFD

    "Increasing transparency makes markets more efficient, and economies more stable and resilient."

Hypotheses on how institutional investors are reacting to disclosures

- Baseline relations
  - Climate-conscious institutional ownership is positively related to climate risk disclosure
- Costs and benefits of climate-related disclosure
  - Effect weakened if the proprietary costs of the disclosure are higher
    - Consider role of competition
  - Effect strengthened if the information production costs of the disclosure are relatively lower
    - Consider role of firm size
  - Effect strengthened if the externality benefits from the disclosure are higher
    - Consider role of carbon emissions

Baseline estimation: Who owns the firms with better disclosure?

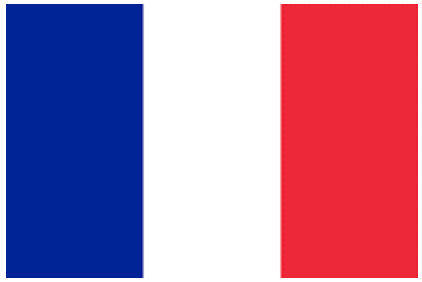
	Scope 1 disclosure			Climate risk disclosure			Log(1+ Climate disclosure score)		
	0.17**			0.64**			1.17**		
	(0.08)			(0.28)			(0.51)		
		0.30**			0.63**			1.00**	
		(0.13)			(0.29)			(0.45)	
			0.41***			0.67***			1.28***
			(0.08)			(0.20)			(0.26)
Non-stewardship code IO				-0.21			-0.38		
				(0.30)			(0.44)		
		0.01			-0.10			-0.18	
		(0.11)			(0.35)			(0.51)	
Sample									
Years	2010-2019			2011-2016			2010-2015		
Firm characteristic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x year fixed effects	Yes	Yes			Yes			Yes	
Country fixed effects	Yes	Yes			Yes			Yes	
N	35350	35350			21312			21168	20584
Adj. R^2									

Costs and benefits of climate-related disclosure

- Demand for climate risk reporting depends on the costs and benefits of the disclosures
  - Goldstein and Yang (2017); Christensen, Hail, and Leuz (2019)
- Strong evidence that disclosure demand is affected by climate-specific disclosure costs and benefits
- Effect of climate-conscious ownership on climate-related disclosure is
  - Moderated among firms with high proprietary disclosure costs
  - Magnified among large firms with lower information production costs
  - Magnified among firms in highly carbon-polluting industries

Influence versus selection effects

- Estimated relations may exist for two *nonmutually* exclusive reasons.
- Influence Effect
  - Climate-conscious institutions may actively engage firms to demand that they voluntarily produce such information
- Selection Effect
  - Climate-conscious institutions could have a propensity to invest in firms that provide such disclosures
- We examine the imposition of French Article 173 to better understand the influence effect.



French Article 173 in 2016

	Scope 1 disclosure					Climate risk disclosure
	(1)	(2)	(3)	(4)		(5)
Post Article 173 x High French IO	0.020**	0.021**	0.032**			0.078**
	(0.009)	(0.010)	(0.014)			(0.037)
Post Article 173 x French IO				1.379**		
				(0.540)		
High French IO	0.059***	0.059***	-0.007			0.074
	(0.012)	(0.012)	(0.012)			(0.052)
French IO				0.621		
				(0.445)		
Forecast occurrence	0.07***	0.07***	0.02	-0.06*		0.15**
	(0.02)	(0.02)	(0.02)	(0.03)		
Sample	All Firms	Non-French Firms	Balanced Panel			
Years	2013-2017	2013-2017	2013-2017			
Industry x Year Fixed Effects	Yes	Yes	No			
Country Fixed Effects	Yes	Yes	No			
Year Fixed Effects	No	No	Yes			
Firm Fixed Effects	No	No	Yes			
N						

Conclusions

- According to the institutional investors, climate risks
  - Are important investment risks
  - Have important financial implications for portfolio firms
  - Have started to materialize and are being priced, especially those related to regulation and sea level rise
- Institutional investors value and demand climate-related disclosures
  - Their disclosure demand is affected by climate-specific disclosure costs and benefits
  - Influence effects can help explain the equilibrium relations between institutional investor ownership and disclosure