Decarbonizing Institutional Investor Portfolios

Helping to Green the Planet or Just Greening Your Portfolio?

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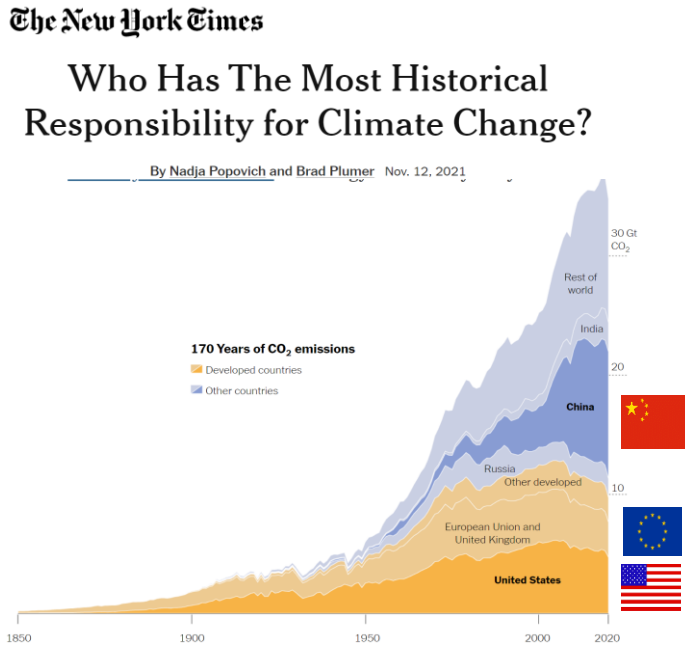
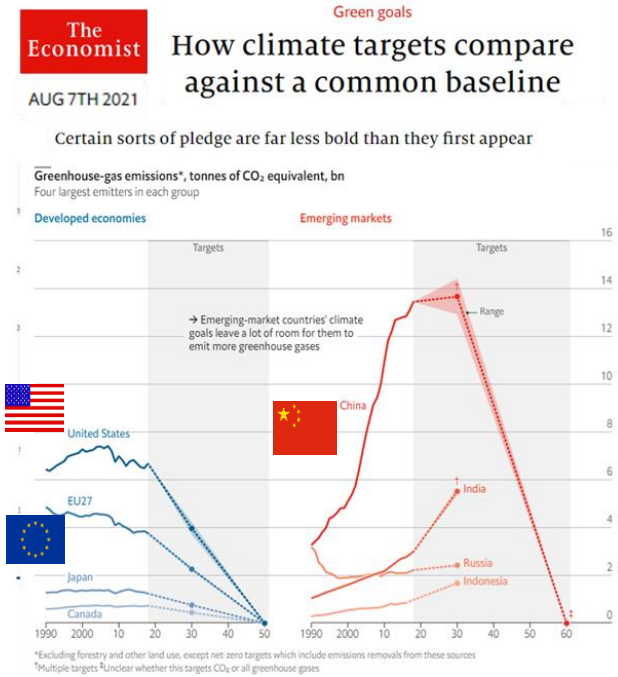
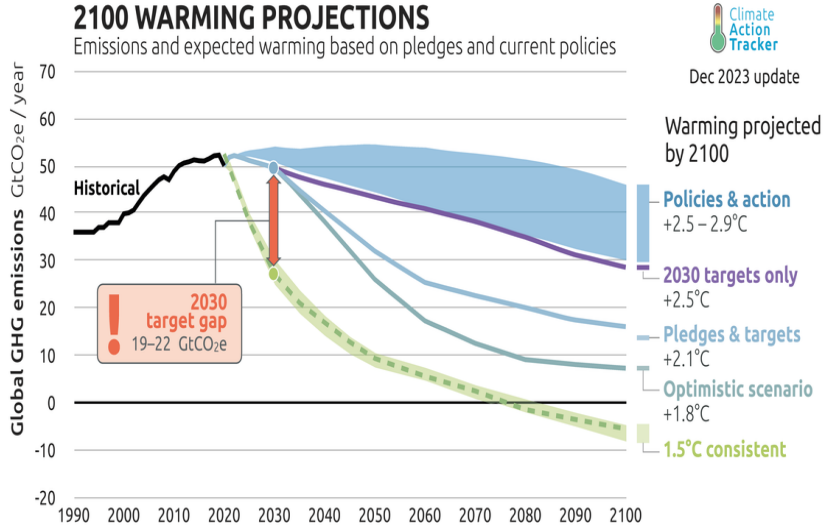
*: The analysis and conclusions contained in this paper are those of the authors and do not reflect the views of the Board of Governors of the Federal Reserve System, its members, or its staff.

Motivation

- To limit global warming below 1.5°C, decarbonization is required but first-best global carbon tax is politically hard (Tirole, 2012)

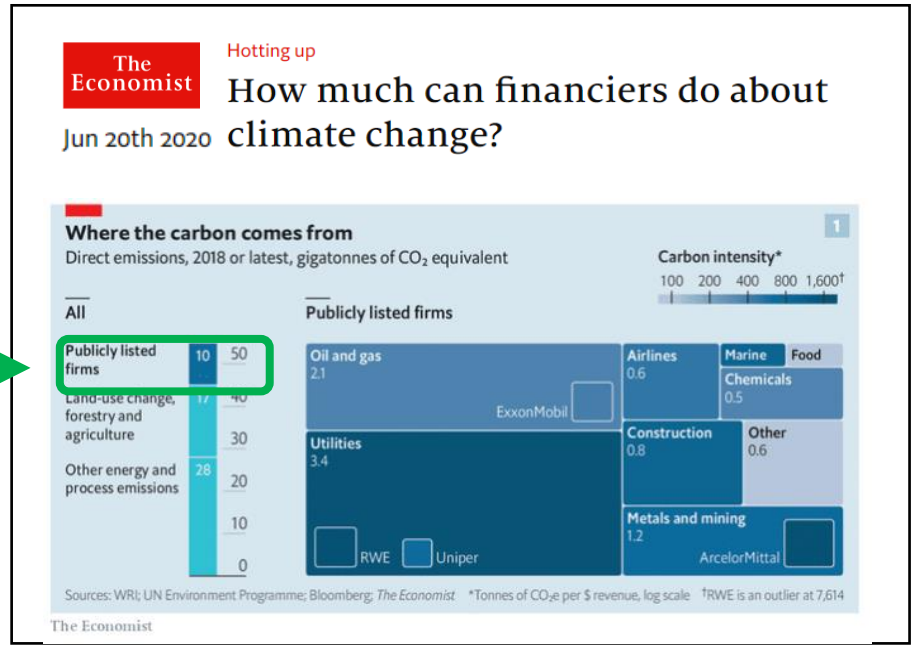






Motivation

- Public companies: can investor-led coalitions contribute to solving the climate crisis (Krueger, Sautner & Starks 2020, Oehmke & Opp 2022)?



This paper: Decarbonization efforts of institutional investors

- Are institutional investors decarbonizing their public equity portfolios?
- What is the role of "climate conscious investors"?

CDP Climate Action 100+

- How do investor-led climate initiatives interact with carbon emissions pricing schemes?

Results preview

Global data on institutional investors equity holdings and firm-level GHG emissions (2005-2019)

1. Are institutional investors **decarbonizing** their public equity portfolios?

   → Yes!

2. Do institutions that are part of investor-led climate initiatives **(CDP) decarbonize faster**?

   → Yes!

3. How do investor-led initiatives **interact with carbon emission pricing schemes**?

   → Decarbonization concentrated in those CDP institutions based in countries with carbon emissions pricing schemes

4. How are institutional investors achieving decarbonization?...

   a) … ***re-weighting* (*tilting)*** their holdings towards lower emitting firms? **[Exit]**
   b) … pushing for ***corporate changes*** through shareholder engagement? **[Voice]**

   → re-weighting/tilting appears to be the predominant approach!

   → some evidence of corporate changes: longer term, top 100 emitting firms, post 2015 (CA100+)

5. Some evidence institutions reweighting towards firms providing **"greener" products**.

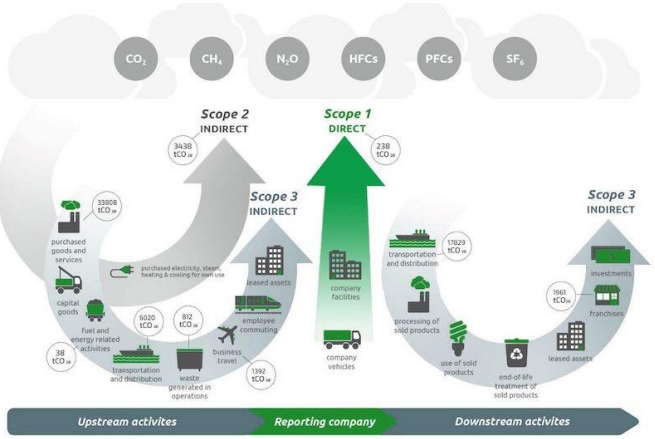
Literature

- **ESG investing**
  - Pastor, Stambaugh & Taylor (2021,2022), Giglio, Kelly & Stroebel (2021), Pedersen, Fitzgibbons & Pomorski (2021), Gantchev et al. (2022, 2023), Dyck et al (2019), Oehmke & Opp (2022), Biais & Landier (2022)
- **Climate finance**
  - Hong, Karolyi & Scheinkmann, (2020), Bolton & Kacperczyk (2021, 2021b, 2022, 2022b), Stroebel & Wurgler (2021), Hsu, Li & Tsou (2022), Duchin, Gao & Xu (2022), Pedersen (2023)
- **How institutional investors approach climate risk**
  - Flammer, Toffel & Viswanathan (2021), Krueger, Sautner & Starks (2020), Azar et al. (2021), Cohen, Kadach & Ormazabal (2022), Ilhan et al. (2023)
- **Institutional investor divestment**
  - Heinkel, Krauss & Zechner (2001) , Hong & Kacpercyck (2009), Bessembinder, (2016), Davies & van Wesep (2018), Atta-Darkua (2020), Choi et al (2022), Berk & van Binsbergen (2022), Bolton, Kacpercyck & Samama (2022)**, Becht, Pajuste & Toniolo (2023)**
- **Institutional investor engagement**
  - Dimson et al. (2015, 2022), Naaraayanan, Sachdeva & Sharma (2021), Edmans, Levit & Schneemeier (2022)

Data

Global sample: 2005-2019

- **Factset:** institutional equity holdings
- **S&P Trucost:** firm-level GHG emissions data (CDP, company disclosures, model to provide firm GHG emissions data) for 15,000 publicly-listed firms; > 95% of global market cap (2019)



Scope 1: GHG emissions from operations owned or controlled by the company.
Scope 2: indirect GHG emissions from consumption of purchased electricity, heat or steam by the company.
Scope 3: other indirect GHG emissions from upstream supply chain and purchased materials as well as those inherent in the use of its products and services.

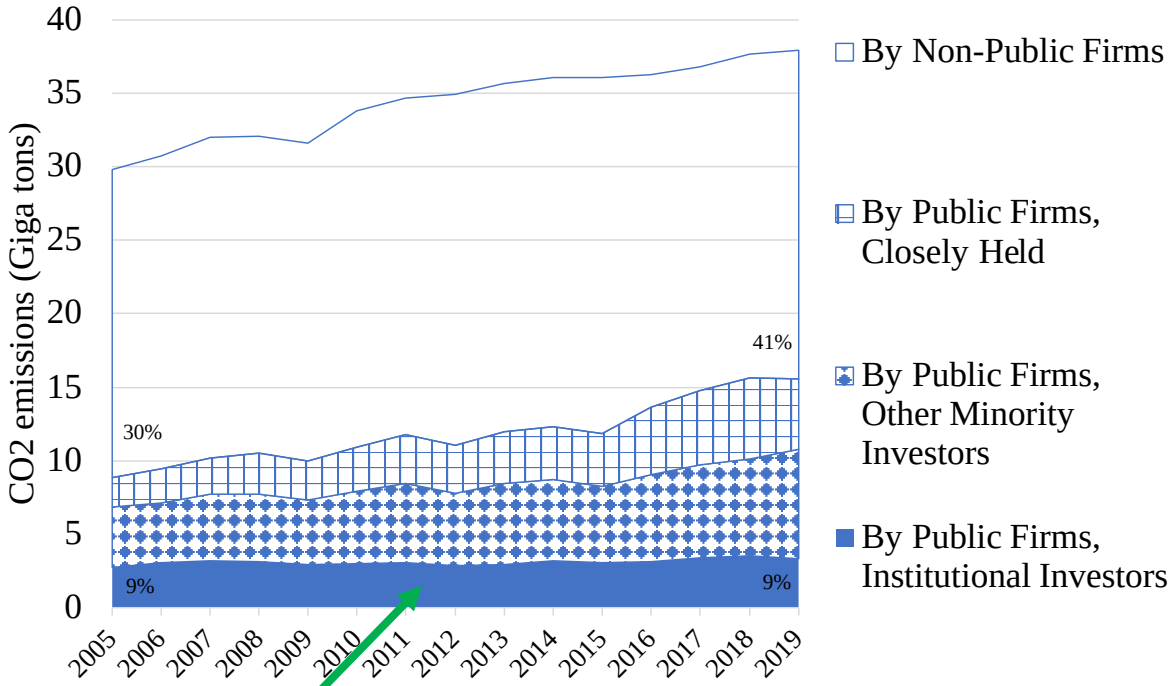
We focus primarily on Scope 1 GHG emissions!

Outline

1. **Are institutional investors decarbonizing their public equity portfolios?**
2. What is the role of investor-led climate initiatives such as CDP or Climate Action 100+ ?
3. How do carbon emission pricing schemes and investor initiatives interact?
4. How are institutional investors decarbonizing?
5. Are institutional investors going beyond portfolio decarbonization?

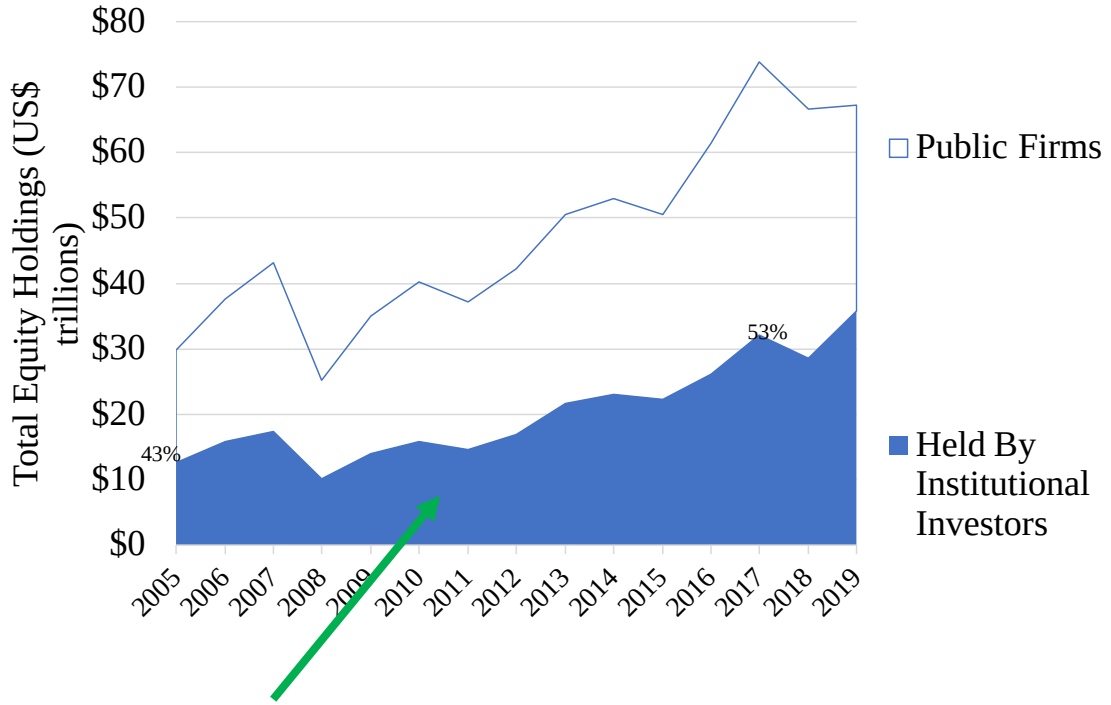
1. Are institutional investors decarbonizing ? A first pass using aggregate data

Figure 1, Panel A
Total Carbon (GHG) Emissions



Aggregate GHG emissions apportioned to institutional investor public equity portfolios are essentially flat at 9%

Figure 1, Panel B
Total Equity Market Values



This occurs despite the fraction of total public equities held by institutional investors growing from 43% to 53%

Data sources: EDGAR (Emissions Database for Global Atmospheric Research), Factset, and S&P Trucost

1. Are institutional investors decarbonizing ? A first pass using aggregate data

Figure 1, Panel A
Total Carbon (GHG) Emissions

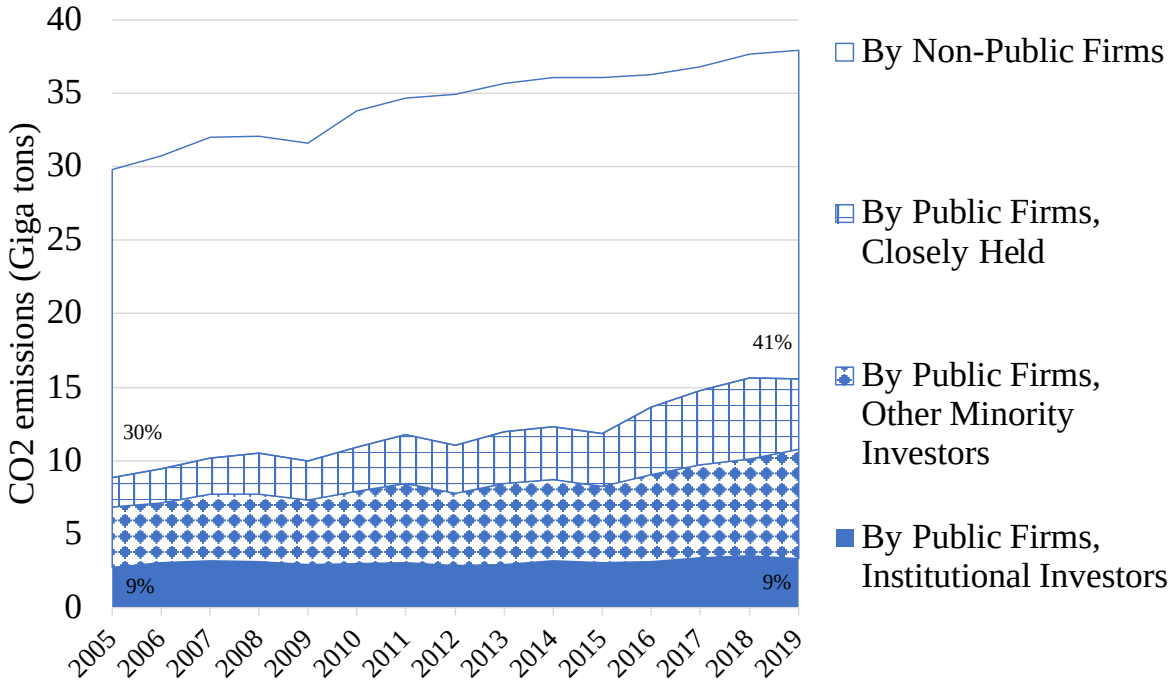
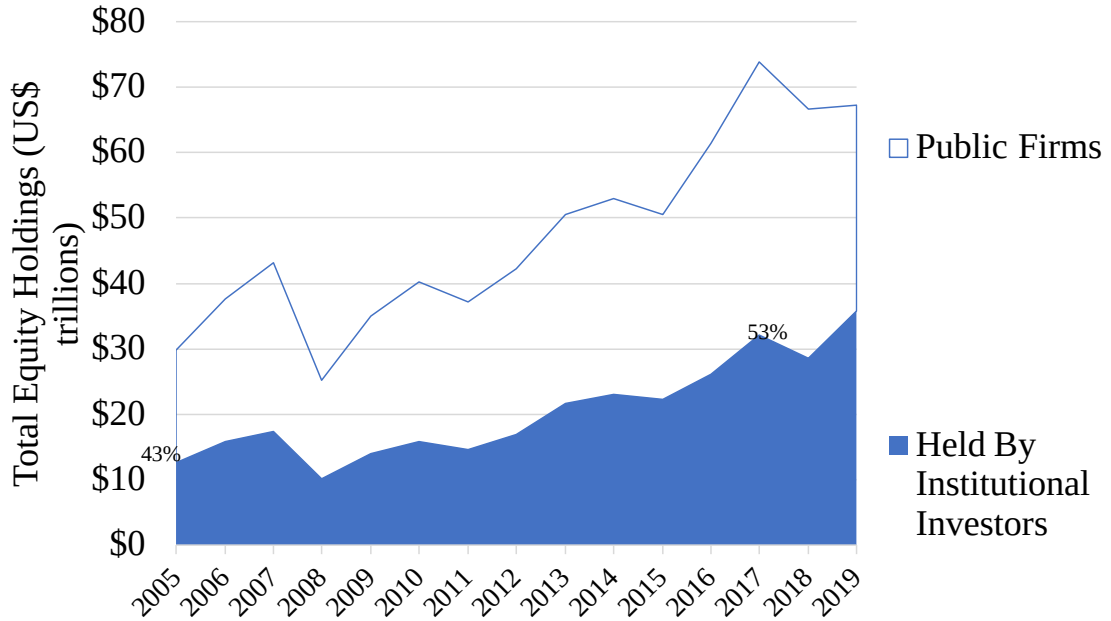


Figure 1, Panel B
Total Equity Market Values



Crude approximation: institutional investors' portion of aggregate GHG emissions should have grown proportionately from 9% to 15% -> CONCLUSION: institutions actively decarbonizing!

[NOTE: decarbonization more pronounced for **MSCI ACWI stocks** ... 33% -> 29% of MSCI ACWI total emissions instead of growing from 33% -> 44%]

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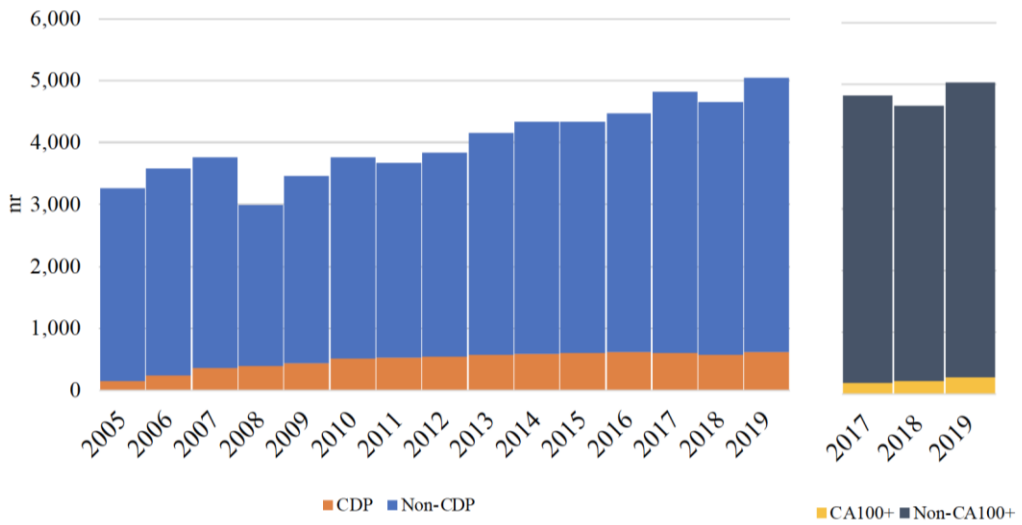
2. Climate-conscious institutional investors

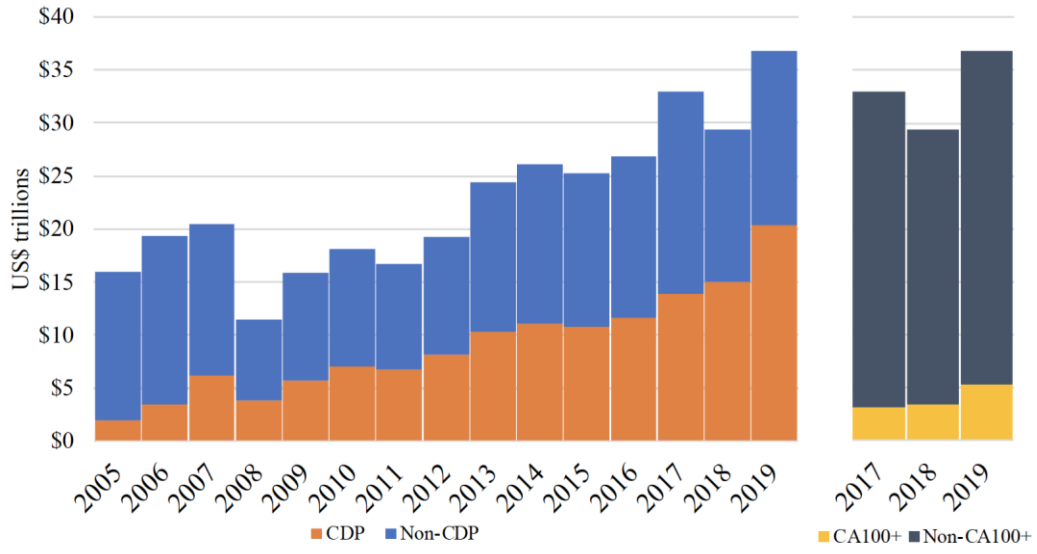
- 2005+: CDP initiative *-> DISCLOSURE?*
  - founded in 2000 as the Carbon Disclosure Project
  - Disclosure-focused: firm questionnaire (GHG emissions and targets) sent to over 13,000 companies in 2021
  - List of investor signatories (623 with $20tn Equity AuM in 2019)
- 2017+: Climate Action 100+ (CA100+) *-> ENGAGEMENT?*
  - Post-2015 Paris Agreement
  - Engagement-focused to accelerate the net-zero emissions transition, work with the top 100 largest emitters (now top 167)
  - List of investor signatories (268 with $5tn Equity AuM in 2019)

2. Climate-conscious institutional investors (contd.)

Number of Institutional Investors



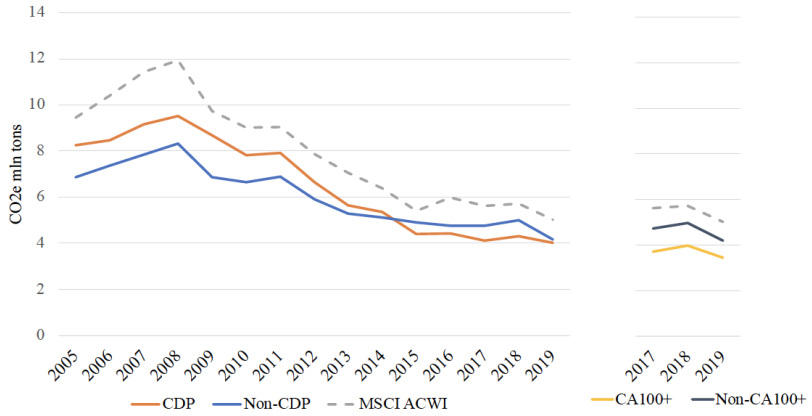
US$ Institutional Investor Equity Holdings



Calculate two *absolute* portfolio-level carbon emissions measures

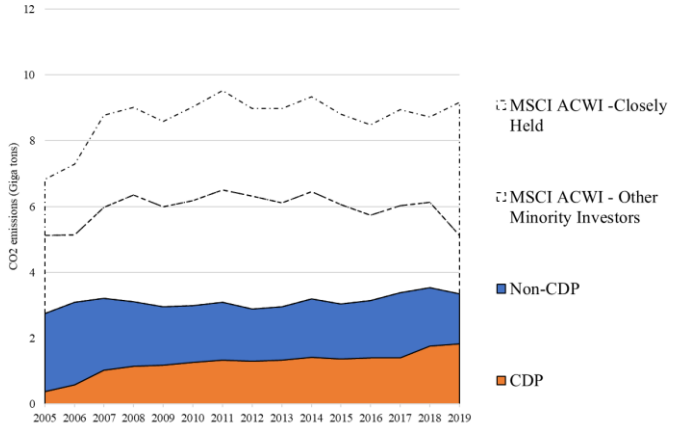
$$Scope\ 1_{it} = \sum_{j=1}^{N_{jt}} \left(\frac{\$\ Shares\ Held_{ijt}}{\$\ Portfolio\ Size_{it}} \right) * Scope\ 1\ GHG\ Emissions_{jt}$$

Internal measure: Scope 1 GHG emissions of the average portfolio firm. How exposed is the investor to carbon risk (e.g. regulation of carbon emissions)?



$$Scope\ 1\ Footprint_{it} = \sum_{j=1}^{N_{jt}} \left(\frac{\$\ Shares\ Held_{ijt}}{\$\ Market\ Cap_{jt}} \right) * Scope\ 1\ GHG\ Emissions_{jt}$$

External measure: Total quantity of Scope 1 GHG emissions *"owned"* by the investor. What's the impact of the investor's equity portfolio on climate change?



[NOTE: we repeat our analysis with relative (carbon intensity) metrics and find similar results]

2. Do climate-conscious investors decarbonize their portfolios faster?

- Use log-differenced portfolio measure as dependent variable

- Estimate panel regressions of the following type

$$\Delta\, log(Carbon\ metric)_{it+1} = a + \boldsymbol{b * CDP_{it}} + c * Controls_{it} + FEffects + \varepsilon_{it},$$

where $Carbon\ metric$ is either institutional investor (i)'s portfolio *Scope1* or *Scope1 footprint*

2. Do climate-conscious investors decarbonize their portfolios faster?

- Some evidence that CDP investors decarbonized faster
  - *Scope 1 Footprint*: 2.7-3pps faster
  - *Scope 1*: 1.8pps faster Scope 1 [not robust to portfolio controls - col (2)]
- Overall, average decarbonization effort by does not appear overly strong

Table 3: Portfolio Decarbonization by Institutional Investors

	All			
	Δ Total log Scope 1 (t+1)		Δ Total log Scope 1 Footprint (t+1)	
	(1)	(2)	(3)	(4)
CDP	-0.018*	-0.012	-0.027*	-0.030**
	[0.010]	[0.010]	[0.014]	[0.011]
Portfolio Size	0.003	0.006	-0.002	-0.007*
	[0.003]	[0.004]	[0.004]	[0.004]
Europe	-0.022	-0.018	-0.025	-0.022
	[0.025]	[0.018]	[0.038]	[0.024]
North America	-0.006	-0.005	-0.021	-0.027
	[0.029]	[0.025]	[0.037]	[0.028]
Asset Owner	-0.023**	-0.019*	-0.051**	-0.042*
	[0.009]	[0.010]	[0.022]	[0.021]
# Companies		0.004		0.061***
		[0.016]		[0.017]
# Industries		-0.001		-0.004***
		[0.001]		[0.001]
Average Market Cap		-0.012		-0.018
		[0.014]		[0.020]
Average Market-to-Book		0.012		0.033
		[0.017]		[0.021]
Own Region %		-0.000		0.000
		[0.000]		[0.000]
Developed Markets %		0.000		0.000
		[0.000]		[0.000]
Investor Controls	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	50997	50983	50997	50983
Adjusted R^2	0.012	0.012	0.009	0.010

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4. How are institutional investors decarbonizing?
5. Are institutional investors going beyond portfolio decarbonization?

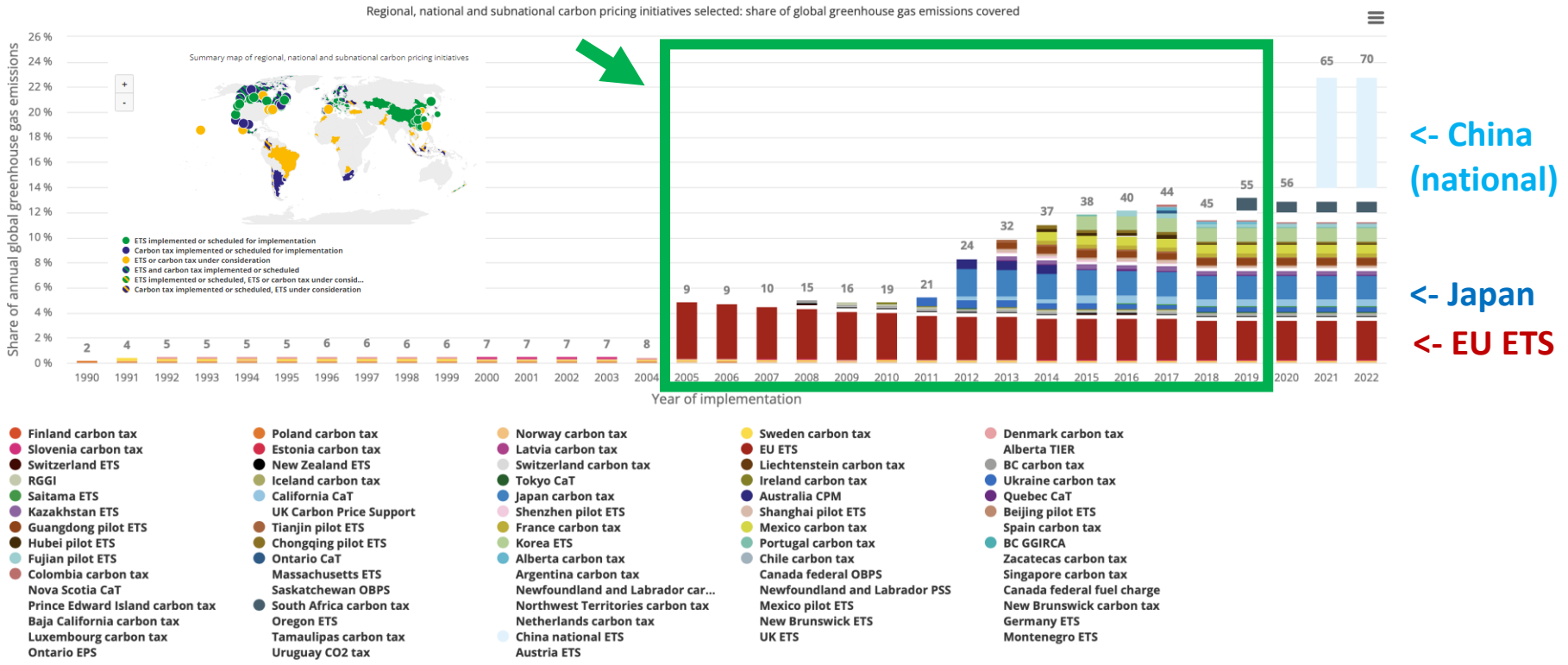
3. Do institutions decarbonize faster if located in a country with an emission pricing scheme?

- Perhaps analyzing CDP investors as a whole conceals heterogeneity among climate conscious institutions. Interaction between public carbon pricing policies and voluntary investor initiatives. To study this, we partition investors into those located in a country
  1. **with** an active carbon emissions pricing scheme
  2. **without** a carbon emissions pricing scheme

  -> Investors in countries with emission pricing schemes should have stronger incentives to decarbonize (e.g. expectation of stricter regulation; reputational concerns)

3. Do institutions decarbonize faster if located in a country with an emission pricing scheme?

- Use data from the World Bank Carbon Pricing Dashboard



<- China (national)

<- Japan

<- EU ETS

- Consider carbon taxes and emission trading schemes
- The largest regional scheme is the EU Emissions Trading Scheme (ETS) launched in 2005

Source: World Bank Carbon Pricing Dashboard) / https://carbonpricingdashboard.worldbank.org/map_data

3. Do institutions decarbonize faster if located in a country with an emission pricing scheme?

- CDP investors based in a country with carbon pricing scheme decarbonize at -3% to -4% / year faster (on average)

  [2015 Paris Agreement called for -7%.6% / year decarbonization in 2020-2030]

Table 4

Panel A: Scope 1 Emissions Yearly Changes (Δ Total)

	Emissions Scheme				No Emissions Scheme			
	Δ Total log Scope 1 (t+1)		Δ Total log Scope 1 Footprint (t+1)		Δ Total log Scope 1 (t+1)		Δ Total log Scope 1 Footprint (t+1)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CDP	-0.030***	-0.027***	-0.039***	-0.035**	-0.004	0.003	-0.016	-0.023*
	[0.008]	[0.008]	[0.013]	[0.013]	[0.015]	[0.015]	[0.014]	[0.011]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11109	11109	11109	11109	39888	39874	39888	39874
Adjusted R^2	0.024	0.026	0.008	0.012	0.011	0.012	0.010	0.011

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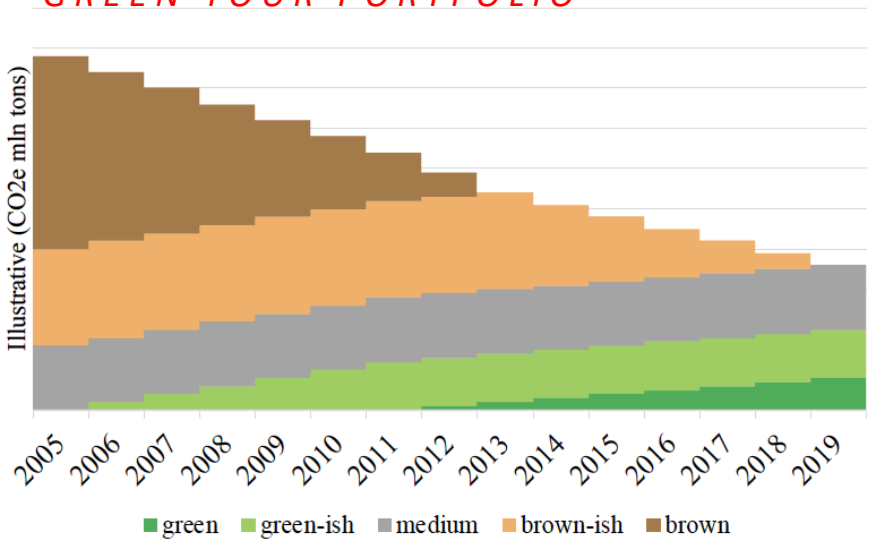
4. Portfolio decarbonization can be achieved by *Re-weighting* and *Corporate Changes*

- **Re-weighting (Exit):**

Reduce stakes in the top GHG emitters and rebalance/tilting towards lower GHG emitters

"GREEN YOUR PORTFOLIO"

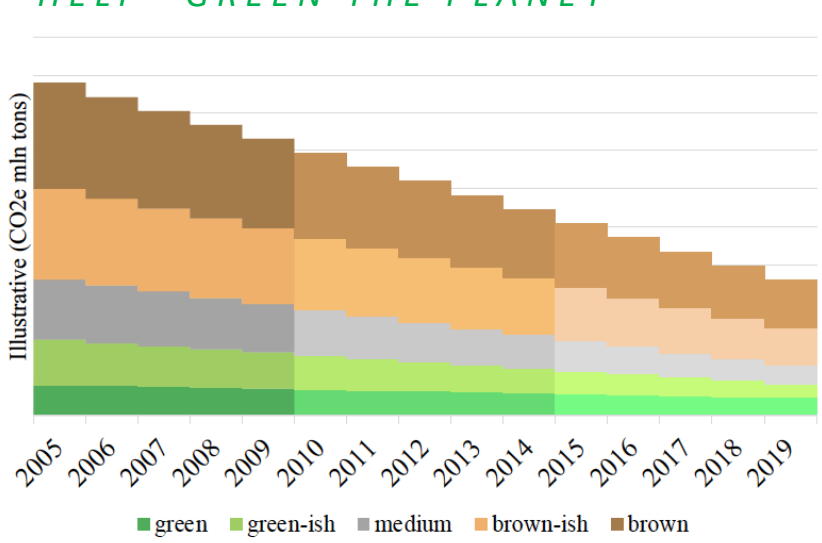


-> impact: *shift in investment base/cost of capital?*

- **Corporate Changes (Voice):**

Engage with portfolio companies to push for corporate changes (GHG emissions reductions)

HELP "GREEN THE PLANET"



-> impact: incentivize & enable transition?

4. Decomposing portfolio emission changes

TOTAL CHANGE

$$\Delta Total \log Scope\ 1_{it} = \log\left(\sum_{j=1}^{N_{jt+1}}\left(\frac{\$\ Shares\ Held_{ijt+1}}{\$\ Portfolio\ Size_{it+1}}\right) * Scope\ 1\ GHG\ Emissions_{jt+1}\right) - \log\left(\sum_{j=1}^{N_{jt}}\left(\frac{\$\ Shares\ Held_{ijt}}{\$\ Portfolio\ Size_{it}}\right) * Scope\ 1\ GHG\ Emissions_{jt}\right)$$

RE-WEIGHTING:

$$\Delta weights - only \log Scope\ 1_{it} = \log\left(\sum_{j=1}^{N_{jt+1}}\left(\frac{\$\ Shares\ Held_{ijt+1}}{\$\ Portfolio\ Size_{it+1}}\right) * Scope\ 1\ GHG\ Emissions_{jt}\right) - \log\left(\sum_{j=1}^{N_{jt}}\left(\frac{\$\ Shares\ Held_{ijt}}{\$\ Portfolio\ Size_{it}}\right) * Scope\ 1\ GHG\ Emissions_{jt}\right)$$

CORPORATE CHANGES:

$$\Delta emissions - only \log Scope\ 1_{it} = \log\left(\sum_{j=1}^{N_{jt}}\left(\frac{\$\ Shares\ Held_{ijt}}{\$\ Portfolio\ Size_{it}}\right) * Scope\ 1\ GHG\ Emissions_{jt+1}\right) - \log\left(\sum_{j=1}^{N_{jt}}\left(\frac{\$\ Shares\ Held_{ijt}}{\$\ Portfolio\ Size_{it}}\right) * Scope\ 1\ GHG\ Emissions_{jt}\right)$$

4. How do climate-conscious investors achieve decarbonization?

- *Portfolio Re-weighting*
  - across both Scope 1 measures
- Corporate Changes
  - no evidence

Table 3: Portfolio Decarbonization by Institutional Investors

	Portfolio re-weighting		Corporate Changes	
	Δ weights-only log Scope 1 (t+1) (5)	Δ weights-only log Scope 1 Footprint (t+1) (6)	Δ emissions-only log Scope 1 (t+1) (7)	Δ emissions-only log Scope 1 Footprint (t+1) (8)
CDP	-0.021***	-0.023**	0.007	-0.008
	[0.006]	[0.010]	[0.006]	[0.005]
Investor Controls	Yes	Yes	Yes	Yes
Portfolio Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	50957	50957	52426	52426
Adjusted R^2	0.010	0.006	0.075	0.107

[NOTE: similar results if use portfolio Sum of Scope 1 + 2 + 3]

4. How do climate-conscious investors achieve decarbonization? (by emissions scheme)

- *Portfolio Re-weighting*
  - Mainly CDP investors inside an emission scheme
- *Corporate Changes*
  - CDP investors outside an emissions scheme (substitution government / investor action?)

Table 4

Panel B: Portfolio Re-weighting Hypothesis (Δ weights-only, assuming portfolio firm emissions at t+1 remain the same as at t)

	Emissions Scheme				No Emissions Scheme			
	Δ weights-only log Scope 1 (t+1)		Δ weights-only log Scope 1 Footprint (t+1)		Δ weights-only log Scope 1 (t+1)		Δ weights-only log Scope 1 Footprint (t+1)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CDP	-0.037***	-0.032***	-0.044***	-0.040**	-0.004	-0.006	0.022*	-0.007
	[0.006]	[0.006]	[0.012]	[0.014]	[0.006]	[0.009]	[0.010]	[0.012]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11106	11106	11106	11106	39865	39851	39865	39851
Adjusted R^2	0.026	0.028	0.006	0.008	0.008	0.008	0.004	0.007

Panel C: Corporate Changes Hypothesis (Δ emissions-only, assuming portfolio weights at t+1 remain the same as at t)

	Emissions Scheme				No Emissions Scheme			
	Δ emissions-only log Scope 1 (t+1)		Δ emissions-only log Scope 1 Footprint (t+1)		Δ emissions-only log Scope 1 (t+1)		Δ emissions-only log Scope 1 Footprint (t+1)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CDP	0.006	0.006	-0.001	0.001	-0.002	0.007	-0.032**	-0.013*
	[0.004]	[0.004]	[0.003]	[0.002]	[0.009]	[0.007]	[0.014]	[0.007]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11365	11365	11365	11365	41077	41061	41077	41061
Adjusted R^2	0.070	0.079	0.066	0.084	0.074	0.082	0.086	0.120

4. Stronger evidence for corporate changes in specific settings?

- So far, evidence that investors use mostly re-weighting to decarbonize … but are there settings in which stronger evidence for corporate changes?

1. Investors likely to focus engagement with top emitting firms
   - ➢ Calculate carbon measures on holdings of Top 100 GHG emitters (Table 6)
2. Corporate changes likely to take time to materialize
   - ➢Examine two year instead of year-on-year changes (Table 7)
3. GHG emissions a more pressing issue post Paris
   - ➢Focus on institutions that are part of Climate Action 100+ (Table 8)

Top 100 emitters

- More evidence of "targeted" corporate changes for Top 100 emitters
  - Concentrated primarily among CDP investors outside an emissions scheme

Table 6

Panel C: Corporate Changes Hypothesis, Yearly Changes, (Δ emissions-only, assuming portfolio weights at t+1 remain the same as at t)

	All		Emissions Scheme		No Emissions Scheme	
	Δ emissions-only log Scope 1 Top 100 (t+1) (1)	Δ emissions-only log Scope 1 Footprint Top 100 (t+1) (2)	Δ emissions-only log Scope 1 Top 100 (t+1) (3)	Δ emissions-only log Scope 1 Footprint Top 100 (t+1) (4)	Δ emissions-only log Scope 1 Top 100 (t+1) (5)	Δ emissions-only log Scope 1 Footprint Top 100 (t+1) (6)
CDP	-0.005*	-0.006**	-0.001	0.002	-0.005	-0.009**
	[0.003]	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42141	42141	9807	9807	32334	32334
Adjusted R^2	0.113	0.130	0.124	0.157	0.126	0.138

Standard errors in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

2-year changes

- More evidence of Corporate Changes over longer horizons (2 years)
  - Decarbonization driven by investors outside an emissions scheme

Table 7

Panel C: Corporate Changes, 2-Year Changes

	All		Emissions Scheme		No Emissions Scheme	
	Δ2 emissions-only log Scope 1 (t+1) (1)	Δ2 emissions-only log Scope 1 Footprint (t+1) (2)	Δ2 emissions-only log Scope 1 (t+1) (3)	Δ2 emissions-only log Scope 1 Footprint (t+1) (4)	Δ2 emissions-only log Scope 1 (t+1) (5)	Δ2 emissions-only log Scope 1 Footprint (t+1) (6)
CDP	0.008	-0.020**	0.008	-0.001	0.007	-0.029**
	[0.006]	[0.007]	[0.005]	[0.005]	[0.007]	[0.010]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47728	47728	10286	10286	37442	37442
Adjusted R^2	0.064	0.118	0.081	0.086	0.066	0.129

Standard errors in brackets

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Post Paris and Climate Action 100+ Investors?

- Total (Panel A)
  - Broad based decarbonization for CA100+ investors (even if outside an emission scheme)
- Portfolio Re-weighting (Panel B)
  - Strong evidence of reweighting
- Corporate Changes (Panel C)
  - Some evidence for Footprint (CA100+ investors headquartered inside an emissions scheme country)
  - But deteriorating average emissions

Table 8

Panel A: Scope 1 Emissions 1-Year Changes (Δ Total)

	All		Emissions Scheme		No Emissions Scheme	
	Δ Total log Scope 1 (t+1) (1)	Δ Total log Scope 1 Footprint (t+1) (2)	Δ Total log Scope 1 (t+1) (3)	Δ Total log Scope 1 Footprint (t+1) (4)	Δ Total log Scope 1 (t+1) (5)	Δ Total log Scope 1 Footprint (t+1) (6)
only CDP	-0.012	-0.030**	-0.026***	-0.036**	0.002	-0.022*
	[0.011]	[0.011]	[0.008]	[0.013]	[0.015]	[0.011]
Climate Action 100+	-0.063***	-0.072***	-0.085***	-0.081***	-0.091***	-0.066**
	[0.011]	[0.018]	[0.008]	[0.017]	[0.013]	[0.025]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50983	50983	11109	11109	39874	39874
Adjusted R^2	0.012	0.010	0.026	0.012	0.012	0.011

Panel B: Portfolio Re-weighting

	All		Emissions Scheme		No Emissions Scheme	
	Δ weights-only log Scope 1 (t+1) (1)	Δ weights-only log Scope 1 Footprint (t+1) (2)	Δ weights-only log Scope 1 (t+1) (3)	Δ weights-only log Scope 1 Footprint (t+1) (4)	Δ weights-only log Scope 1 (t+1) (5)	Δ weights-only log Scope 1 Footprint (t+1) (6)
only CDP	-0.021***	-0.022**	-0.032***	-0.041***	-0.006	-0.006
	[0.007]	[0.010]	[0.007]	[0.013]	[0.009]	[0.012]
Climate Action 100+	-0.059***	-0.093***	-0.072***	-0.075***	-0.070***	-0.105***
	[0.008]	[0.015]	[0.014]	[0.016]	[0.012]	[0.024]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50957	50957	11106	11106	39851	39851
Adjusted R^2	0.010	0.006	0.028	0.008	0.008	0.007

Panel C: Corporate Changes

	All		Emissions Scheme		No Emissions Scheme	
	Δ emissions-only log Scope 1 (t+1) (1)	Δ emissions-only log Scope 1 Footprint (t+1) (2)	Δ emissions-only log Scope 1 (t+1) (3)	Δ emissions-only log Scope 1 Footprint (t+1) (4)	Δ emissions-only log Scope 1 (t+1) (5)	Δ emissions-only log Scope 1 Footprint (t+1) (6)
only CDP	0.007	-0.008	0.006	0.001	0.006	-0.013*
	[0.006]	[0.005]	[0.004]	[0.002]	[0.007]	[0.007]
Climate Action 100+	0.018**	0.002	0.001	-0.010**	0.027***	0.011
	[0.007]	[0.011]	[0.002]	[0.005]	[0.006]	[0.012]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52426	52426	11365	11365	41061	41061
Adjusted R^2	0.075	0.107	0.079	0.084	0.082	0.120

Outline

1. Are institutional investors decarbonizing their public equity portfolios?
2. What is the role of investor-led climate initiatives such as CDP or Climate Action 100+ ?
3. How do carbon emission pricing schemes and investor initiatives interact?
4. How are institutional investors decarbonizing?
5. **Are institutional investors going beyond portfolio decarbonization?**

Measures of Green Business Activities

- Look at forward-looking measures: Do climate-conscious investors go beyond emissions and promote solutions and green business activities?

UVA DARDEN
GLOBAL CORPORATE
PATENT DATASET

OECD
New Green Growth Indicator 2015
Green patents

1. Climate Patents (2005-2012)

Granted patents from UVA Darden GCPD (https://patents.darden.virginia.edu/, by Bena, Ferreira, Matos and Pires 2017) and OECD mapping developed by Hascic and Migotto (2015) and used by **Cohen et al. (2022), Hege et al. (2022).**

Climate Patent % = ratio of average green patents to total patents by firms held by institutional investors

FTSE Russell

2. Green Revenues (2017-2019)

FTSE Russell data for 16,000+ stocks.

Green Revenue % = percentage of revenues classified as "green" using the EU Taxonomy on sustainable activities (climate change mitigation and adaptation, water, resource use, pollution, and agricultural efficiency) as % of total revenues

Are Climate-Conscious Investors "*Greening*" their Portfolios – Climate Patents?

- Climate Patents (Table 9)
  - no evidence

$$Portfolio\ green\ metric_{it} = a + b * CDP_{it} + c * Controls_{it} + FEffects + \varepsilon_{it}$$

Panel A: All Institutional Investors

	Climate Patent % (t+1)			Δ Total Climate Patent % (t+1)			Δ weights-only Climate Patent % (t+1)			Δ patent-only Climate Patent % (t+1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CDP	0.364*	0.242	0.151	-0.111*	-0.113	-0.138*	-0.077**	-0.048	-0.059	0.063	0.017	0.020
	[0.179]	[0.180]	[0.166]	[0.047]	[0.063]	[0.061]	[0.025]	[0.035]	[0.037]	[0.062]	[0.066]	[0.066]
log Scope 1/Revenue			0.582***			0.036			-0.041			0.070
			[0.093]			[0.059]			[0.033]			[0.041]
Carbon Disclosure %			0.058***			0.001			0.001			0.001
			[0.008]			[0.005]			[0.003]			[0.004]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26505	26505	23465	22230	22230	19286	25701	25701	22746	22894	22894	19875
Adjusted R^2	0.059	0.073	0.111	0.003	0.004	0.004	0.008	0.009	0.009	0.016	0.017	0.018

Panel B: Institutional Investors in an Emissions Scheme

	Climate Patent % (t+1)			Δ Total Climate Patent % (t+1)			Δ weights-only Climate Patent % (t+1)			Δ patent-only Climate Patent % (t+1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CDP	0.320	0.280	0.288	-0.130	-0.112	-0.107	-0.119	-0.092	-0.090	0.081	0.057	0.057
	[0.225]	[0.207]	[0.202]	[0.130]	[0.151]	[0.154]	[0.076]	[0.093]	[0.106]	[0.059]	[0.059]	[0.061]
log Scope 1/Revenue			0.994***			0.103			-0.012			0.080
			[0.216]			[0.209]			[0.133]			[0.081]
Carbon Disclosure %			0.042**			-0.006			-0.005			-0.003
			[0.014]			[0.011]			[0.009]			[0.008]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5293	5293	5195	4380	4380	4284	5139	5139	5042	4503	4503	4406
Adjusted R^2	0.043	0.084	0.110	0.007	0.008	0.008	0.009	0.009	0.010	0.078	0.081	0.083

Panel C: Institutional Investors outside an Emissions Scheme

	Climate Patent % (t+1)			Δ Total Climate Patent % (t+1)			Δ weights-only Climate Patent % (t+1)			Δ patent-only Climate Patent % (t+1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CDP	0.303	0.160	0.013	-0.050	-0.062	-0.123	-0.013	0.016	-0.006	0.063	0.002	-0.011
	[0.292]	[0.297]	[0.272]	[0.071]	[0.090]	[0.102]	[0.066]	[0.070]	[0.074]	[0.113]	[0.113]	[0.120]
log Scope 1/Revenue			0.532***			0.028			-0.046*			0.073*
			[0.086]			[0.054]			[0.022]			[0.034]
Carbon Disclosure %			0.061***			0.001			0.002			0.000
			[0.007]			[0.006]			[0.002]			[0.004]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Are Climate-Conscious Investors "*Greening*" their Portfolios – Green Revenues?

- Green revenues (Table 10)
  - Climate conscious investors **reweight** towards firms with higher green revenues (driven by investors outside of emissions scheme)

Panel A: All Institutional Investors

	Green Revenue % (t+1)			Δ Total Green Revenue % (t+1)			Δ weights-only Green Revenue % (t+1)			Δ revenue-only Green Revenue % (t+1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CDP	0.483***	0.337***	0.344***	0.082**	0.080**	0.079**	0.079**	0.090***	0.092***	0.024**	0.014	0.009
	[0.099]	[0.099]	[0.098]	[0.034]	[0.034]	[0.034]	[0.032]	[0.033]	[0.033]	[0.011]	[0.012]	[0.012]
log Scope 1/Revenue			0.376***			-0.006			-0.011			-0.003
			[0.040]			[0.018]			[0.017]			[0.005]
Carbon Disclosure %			-0.001			0.001			-0.000			0.001***
			[0.002]			[0.001]			[0.001]			[0.000]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17889	17876	17827	12944	12935	12888	12944	12935	12888	13373	13362	13314
Adjusted R^2	0.034	0.063	0.083	0.001	0.002	0.001	0.002	0.002	0.002	0.019	0.041	0.042

Panel B: Institutional Investors in an Emissions Scheme

	Green Revenue % (t+1)			Δ Total Green Revenue % (t+1)			Δ weights-only Green Revenue % (t+1)			Δ revenue-only Green Revenue % (t+1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CDP	0.526***	0.481***	0.457***	0.018	0.007	0.010	0.024	0.013	0.019	0.004	0.008	0.006
	[0.158]	[0.155]	[0.152]	[0.051]	[0.051]	[0.051]	[0.050]	[0.050]	[0.049]	[0.016]	[0.016]	[0.017]
log Scope 1/Revenue			0.485***			-0.003			-0.039			0.012
			[0.104]			[0.044]			[0.043]			[0.014]
Carbon Disclosure %			0.012**			-0.003			-0.004			0.001
			[0.006]			[0.003]			[0.003]			[0.001]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4080	4080	4076	2977	2977	2974	2977	2977	2974	3060	3060	3057
Adjusted R^2	0.042	0.113	0.142	0.002	0.002	0.002	0.006	0.005	0.007	0.028	0.031	0.031

Panel C: Institutional Investors outside an Emissions Scheme

	Green Revenue % (t+1)			Δ Total Green Revenue % (t+1)			Δ weights-only Green Revenue % (t+1)			Δ revenue-only Green Revenue % (t+1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CDP	0.457***	0.277**	0.303**	0.124***	0.130***	0.127***	0.125***	0.144***	0.146***	0.026	0.017	0.010
	[0.129]	[0.132]	[0.130]	[0.047]	[0.048]	[0.048]	[0.044]	[0.046]	[0.046]	[0.017]	[0.017]	[0.017]
log Scope 1/Revenue			0.399***			-0.005			-0.005			-0.004
			[0.042]			[0.020]			[0.018]			[0.005]
Carbon Disclosure %			-0.006***			0.001			0.000			0.001***
			[0.002]			[0.001]			[0.001]			[0.000]
Investor Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13809	13796	13751	9967	9958	9914	9967	9958	9914	10313	10302	10257
Adjusted R^2	0.013	0.037	0.060	0.002	0.002	0.002	0.001	0.001	0.001	0.022	0.040	0.051

Conclusions

1. Institutional investors have been **decarbonizing their equity portfolios** (2005-2019)
2. "Climate-conscious" (CDP) institutional investors have **decarbonized faster**, …
3. … in particular, when located **in countries with carbon emissions pricing schemes**
4. … ***portfolio re-weighting*** seems the predominant portfolio decarbonization strategy

   … limited evidence of corporate changes in specific contexts: Holdings of top 100 emitting firms, over longer time periods, and following the Paris Agreement through the CA100+ initiative
5. No evidence of institutional investor preference in favor of stocks developing climate patents but some **re-weighting towards companies generating green revenues**

- **Take-aways:** Institutions mostly "**Greening their Portfolios**" not necessarily helping "**Green the Planet**"!
  -> calls into question effectiveness of investor-led climate initiatives to reduce global GHG emissions ?


Thanks!
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