Do Investors Care about Carbon Risk?

Patrick Bolton (Columbia University)
Marcin Kacperczyk (Imperial College)

Can Purpose Deliver Better Corporate Governance?

IESE CCG Conference October 28-30, 2020

Motivation

- Rising temperatures and human-made climate change at the front of policy and social debate
  - Challenge for a large host of players, including finance industry
- Strong link between temperature and CO2 (and other gas) emissions => inspires efforts to curb emissions
- Question whether carbon emissions represent a material risk for investors (and firms)
- Transition risk resulting from:
  - Technological risk => shift to cheaper renewables
  - Political risk => costs of imposed regulation
- The economic magnitude of the transition risk is unknown

Contrasting Views

- Two major recent developments to support the positive view:
  - Paris climate agreement COP 21 of December 2015 committing to limit global warming to well below 2C above pre-industrial levels
  - Rising engagement of the finance industry with climate change, largely as a result of the call to non-governmental actors to join the fight against climate change at the COP 21 (BlackRock)
- Considerable skepticism remains, not least in the U.S. where the current administration has vowed to upend the regulations introduced in recent years that limit CO2 emissions
  - "The impression among [U.S.] business leaders is that ESG just hasn't gone mainstream in the investment community" (Eccles & Klimenko, 2019)
  - "Individual companies setting targets and then selling assets to another company so that their portfolio has a different carbon intensity has not solved the problem for the world" (CEO of Exxon, 03/2020)

Research Questions

- Is carbon risk priced?
- Are stock markets pricing carbon risk efficiently?

(1) Use firm-level global information on disaggregated carbon emissions to estimate cross-sectional carbon premia

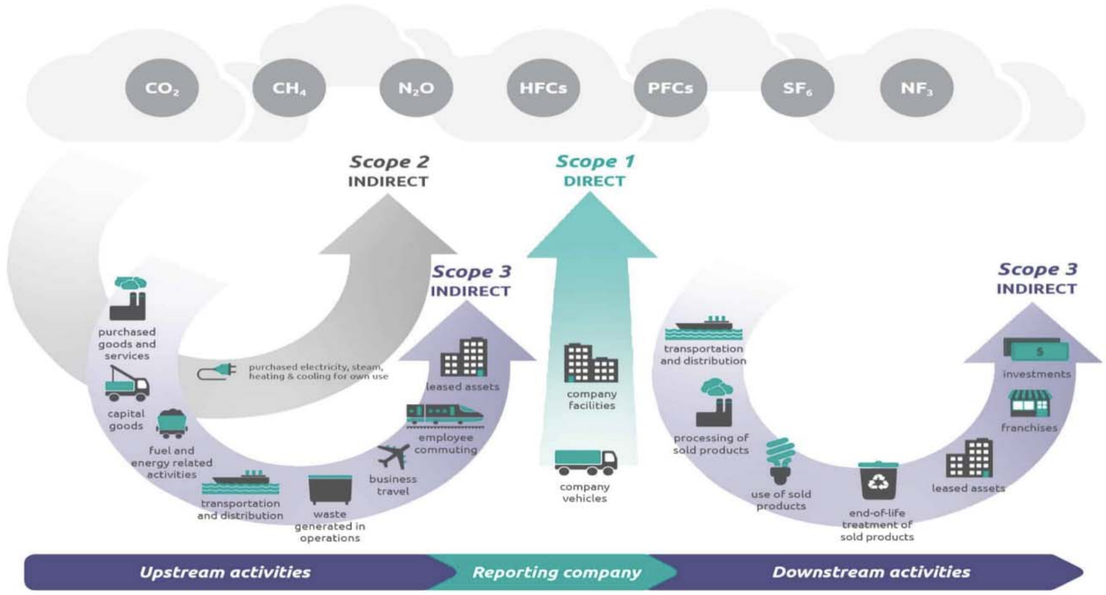
(2) Study the economic mechanism behind the premia

Conceptual Framework

- <u>Static:</u>
- The pricing of the transition risk depends on:
  - The size of carbon emissions (risk level)
  - Relative size of investor clienteles with different climate awareness (green vs. neutral investors)
  - Degree of technological progress and political awareness
- <u>Dynamic:</u>
- If transition risk is material => implications for the behavior of corporate sector and investment community => accelerated adjustment to a greener equilibrium

Primer on Carbon Emissions

- Three different basic sources of carbon emissions from a company's operations and economic activity



Source: GHG Protocol

- Data on scope 1 and scope 2 emissions have been more systematically reported
- Although scope 3 emissions are the most important component of companies' emissions in a number of industries (e.g., automobile manufacturing) they are the hardest to measure and assemble

Data: Firm-Level Emissions

- We consider three different measures of emissions across three scopes:
  - Firm-level emissions: related to long-term risk
  - Percentage changes in firm-level emissions: related to short-term risk
  - Emission intensity (in tons of CO_2/$ million of revenues)

Panel B: Carbon Emissions: Correlations

	S1INT	S2INT	S3INT	LOGS1TOT	LOGS2TOT	LOGS3TOT
S1INT	1					
S2INT	0.2856	1				
S3INT	0.3632	0.3028	1			
LOGS1TOT	0.4934	0.0764	0.2236	1		
LOGS2TOT	0.1249	0.3206	0.1317	0.2916	1	
LOGS3TOT	0.0724	0.0341	0.2489	0.3733	0.4831	1

Summary of Results (1)

- Carbon emissions do affect stock returns, both in the U.S. and globally
  - For all three categories of emissions we find a positive and statistically significant effect of levels & changes in emissions on firms' stock returns
  - The effect is also economically significant: about 2-4% per year per one standard deviation
  - The effect is robust across several markets

Summary of Results (2)

- The premium cannot be explained by a host of firm-level return predictors (size, B/M, IDIO VOL, momentum, investments, PPE, industry)
- The premium cannot be explained by profitability/earnings surprises
- The time-series premium cannot be explained by standard risk factors
- The premium cannot be fully explained by institutional divestment (some shunning of scope 1 salient industries)
- The premium is higher in periods of greater investor attention

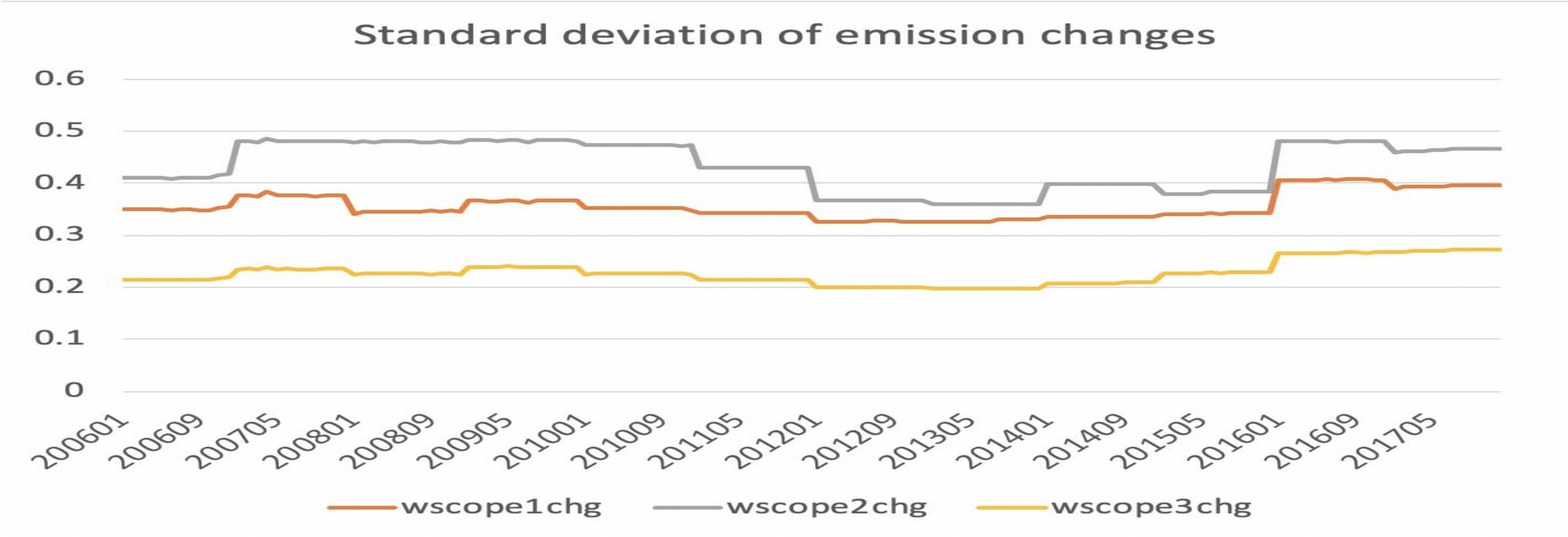
- **Our take:**

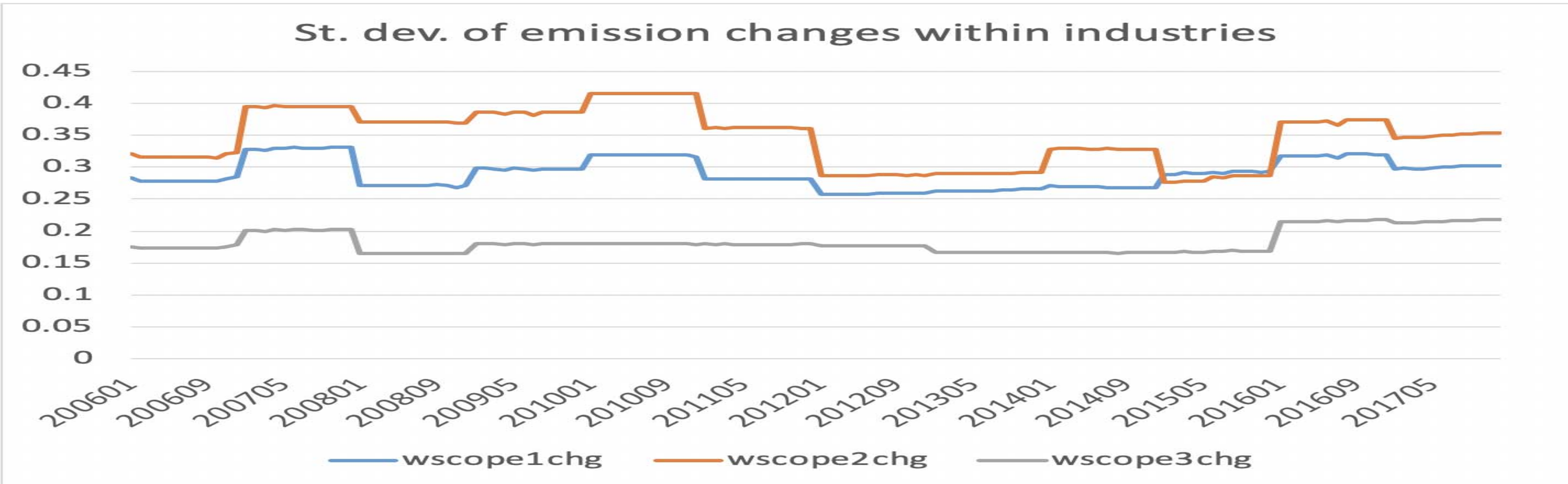
Results consistent with investors' perceptions that higher risk is associated with higher emissions, whether due to policy or technological risk

Data: Sources

- Our primary database covers the period 2005-2017 and is largely a result of matching two data sets by Trucost and FactSet
    - Trucost provides information on corporate carbon and other greenhouse gas emissions
    - Firm-level carbon emissions data are assembled by seven main providers, CDP, Trucost, MSCI, Sustainalytics, Thomson Reuters, Bloomberg, and ISS. All these providers follow the Greenhouse Gas Protocol that sets the standards for measuring corporate emissions
    - FactSet provides data on stock returns, corporate fundamentals, and institutional ownership
- The matching produced 3221 unique companies out of 3281 companies available in Trucost. Among the 60 companies we were not able to match, more than half are not exchange listed and the remaining ones are small

Data: Variation in Emissions





Carbon Premia Measurement

- Carbon emissions are observed on an annual basis
- We estimate the pooled (panel) data regressions with:
  - monthly stock returns as a dependent variable
  - carbon risk as a main explanatory variable
  - various firm-level characteristics as controls
- We include year-month fixed effects
- We double cluster standard errors at firm and year dimensions
- Coefficient of carbon emission measure identifies average carbon premium

Estimating U.S. Carbon Premia (Levels)

Panel A: Total emissions

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
LOG (SCOPE 1 TOT)	0.051**			0.181***		
	(0.022)			(0.044)		
LOG (SCOPE 2 TOT)		0.103**			0.179***	
		(0.039)			(0.052)	
LOG (SCOPE 3 TOT)			0.148***			0.327***
			(0.040)			(0.082)
LOGSIZE	-0.141	-0.188	-0.198	-0.304*	-0.329*	-0.411**
	(0.161)	(0.166)	(0.164)	(0.152)	(0.161)	(0.177)
B/M	0.303	0.312	0.291	0.444	0.430	0.361
	(0.277)	(0.285)	(0.276)	(0.269)	(0.264)	(0.265)
LEVERAGE	-0.558**	-0.579**	-0.491*	-0.686***	-0.697***	-0.778***
	(0.254)	(0.261)	(0.256)	(0.180)	(0.177)	(0.171)
MOM	0.389	0.417	0.407	0.339	0.351	0.355
	(0.280)	(0.277)	(0.279)	(0.293)	(0.293)	(0.292)
INVEST/A	-2.319	-1.971	-1.608	0.342	0.324	0.782
	(1.708)	(1.760)	(1.795)	(2.039)	(2.063)	(1.970)
ROE	0.007	0.006	0.006	0.005	0.005	0.004
	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
HHI	0.080	0.007	0.185*	0.189**	0.102	0.167*
	(0.107)	(0.112)	(0.103)	(0.082)	(0.088)	(0.082)
LOGPPE	-0.009	-0.016	-0.037	0.027	0.029	-0.008
	(0.097)	(0.083)	(0.086)	(0.050)	(0.049)	(0.044)
BETA	0.079	0.041	0.066	0.066	0.060	0.082
	(0.132)	(0.133)	(0.132)	(0.157)	(0.156)	(0.155)
VOLAT	0.906	0.611	0.680	0.752	0.620	0.697
	(3.637)	(3.488)	(3.571)	(3.274)	(3.276)	(3.256)
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	No	No	No	Yes	Yes	Yes
Observations	185,392	185,320	185,488	185,392	185,320	185,488
R-squared	0.200	0.201	0.201	0.203	0.203	0.203

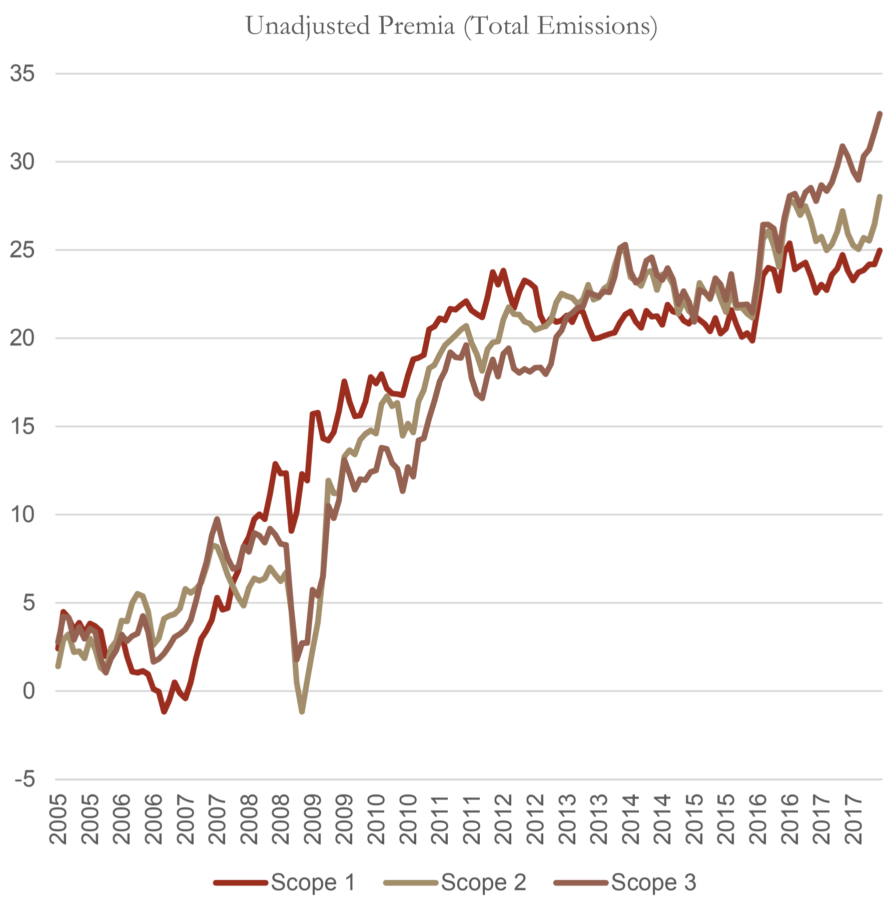
Estimating U.S. Carbon Premia (Changes)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ΔSCOPE 1	0.718***			0.706***		
	(0.181)			(0.164)		
ΔSCOPE 2		0.400**			0.379**	
		(0.150)			(0.143)	
ΔSCOPE 3			1.311***			1.303***
			(0.388)			(0.383)
LOGSIZE	-0.025	-0.013	-0.041	-0.104	-0.094	-0.122
	(0.105)	(0.107)	(0.107)	(0.109)	(0.110)	(0.113)
B/M	0.256	0.242	0.297	0.590*	0.571*	0.633*
	(0.268)	(0.271)	(0.254)	(0.307)	(0.307)	(0.290)
LEVERAGE	-0.454*	-0.434*	-0.454*	-0.788***	-0.778***	-0.785***
	(0.214)	(0.213)	(0.211)	(0.230)	(0.233)	(0.230)
MOM	0.251	0.271	0.197	0.196	0.216	0.146
	(0.266)	(0.270)	(0.259)	(0.262)	(0.265)	(0.255)
INVEST/A	-2.668	-2.366	-2.808	-0.565	-0.377	-0.775
	(1.858)	(1.884)	(1.933)	(2.302)	(2.250)	(2.344)
ROE	0.006**	0.006*	0.007**	0.005	0.004	0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
HHI	-0.122	-0.083	-0.146	-0.028	-0.008	-0.048
	(0.152)	(0.151)	(0.150)	(0.111)	(0.112)	(0.115)
LOGPPE	0.011	0.001	0.025	0.072*	0.062	0.088*
	(0.054)	(0.052)	(0.056)	(0.038)	(0.038)	(0.042)
BETA	0.132	0.147	0.126	0.185	0.200	0.170
	(0.167)	(0.168)	(0.168)	(0.167)	(0.167)	(0.169)
VOLAT	1.858	1.956	1.923	1.511	1.593	1.578
	(4.426)	(4.407)	(4.478)	(4.175)	(4.171)	(4.221)
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	No	No	No	Yes	Yes	Yes
Observations	154,001	153,905	154,073	154,001	153,905	154,073
R-squared	0.215	0.215	0.215	0.218	0.218	0.218

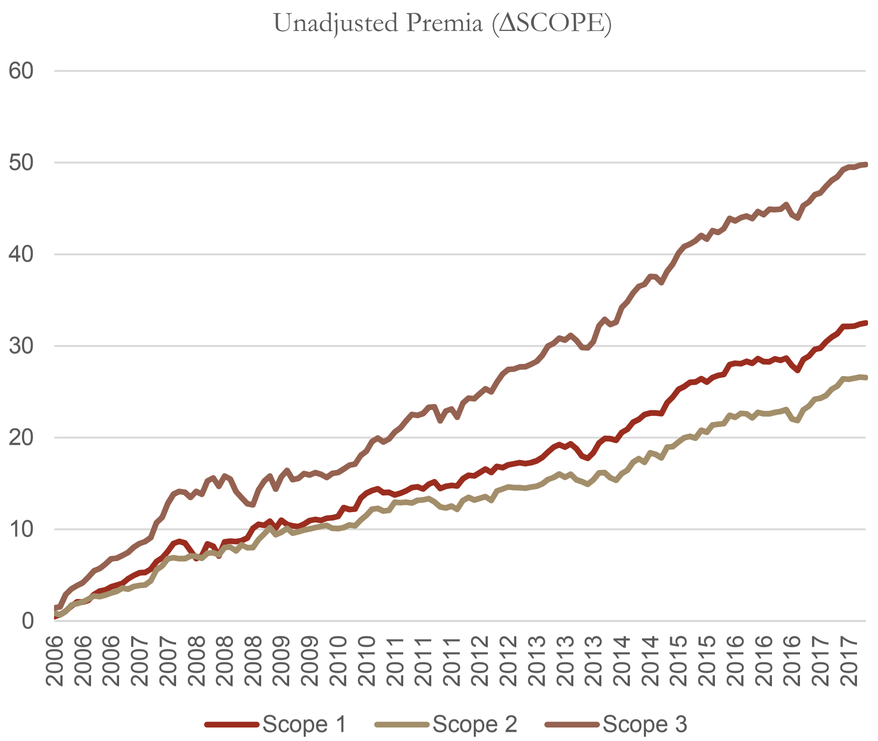
Estimating U.S. Carbon Premia (Intensity)

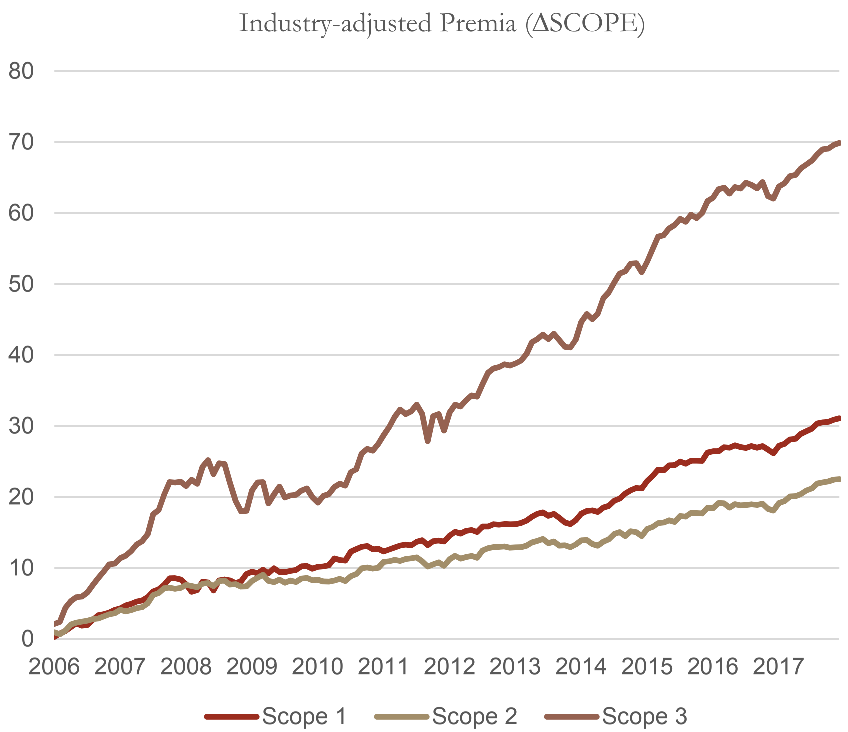
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
SCOPE 1 INT	-0.010			0.004		
	(0.012)			(0.006)		
SCOPE 2 INT		0.126			0.058	
		(0.125)			(0.068)	
SCOPE 3 INT			0.053			0.043
			(0.034)			(0.075)
LOGSIZE	-0.156	-0.138	-0.127	-0.228	-0.229	-0.228
	(0.166)	(0.156)	(0.162)	(0.138)	(0.138)	(0.138)
B/M	0.293	0.304	0.315	0.515*	0.515*	0.515*
	(0.282)	(0.289)	(0.276)	(0.276)	(0.275)	(0.276)
LEVERAGE	-0.543**	-0.556**	-0.531*	-0.585**	-0.583**	-0.581**
	(0.248)	(0.252)	(0.247)	(0.203)	(0.203)	(0.203)
MOM	0.402	0.392	0.388	0.340	0.340	0.339
	(0.280)	(0.284)	(0.283)	(0.294)	(0.294)	(0.293)
INVEST/A	-2.018	-2.102	-1.979	-0.019	-0.016	-0.002
	(1.795)	(1.804)	(1.853)	(2.077)	(2.080)	(2.082)
ROE	0.008	0.008	0.008	0.006*	0.006*	0.006*
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
HHI	-0.108	-0.042	0.051	0.002	-0.008	0.004
	(0.136)	(0.112)	(0.095)	(0.091)	(0.088)	(0.087)
LOGPPE	0.047	0.025	0.021	0.095	0.094	0.094
	(0.096)	(0.084)	(0.091)	(0.062)	(0.061)	(0.063)
BETA	0.068	0.067	0.071	0.057	0.056	0.058
	(0.134)	(0.134)	(0.132)	(0.157)	(0.157)	(0.157)
VOLAT	0.965	0.925	0.959	0.671	0.657	0.667
	(3.568)	(3.578)	(3.617)	(3.287)	(3.285)	(3.289)
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	No	No	No	Yes	Yes	Yes
Observations	185,488	185,488	185,488	185,488	185,488	185,488
R-squared	0.200	0.200	0.200	0.203	0.203	0.203

Cumulative U.S. Carbon Premia (Levels)

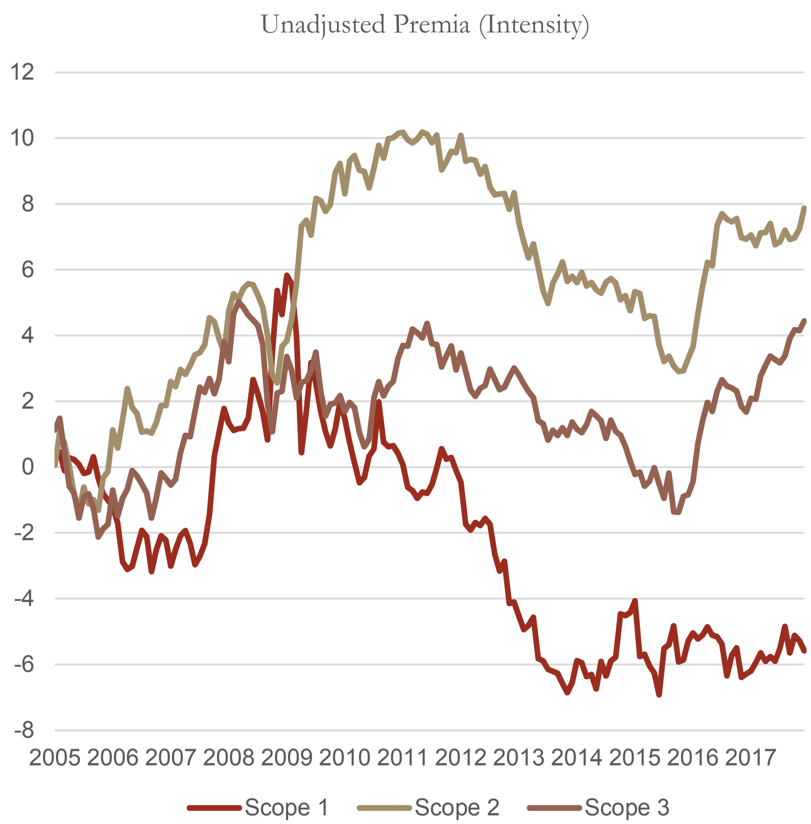


Cumulative U.S. Carbon Premia (Changes)





Cumulative U.S. Carbon Premia (Intensity)



Estimating Global Carbon Premia (Levels)

Panel A: Levels

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
LOGS1TOT	0.029			0.066***		
	(0.022)			(0.016)		
LOGS2TOT		0.096***			0.118***	
		(0.030)			(0.027)	
LOGS3TOT			0.118***			0.174***
			(0.032)			(0.037)
LOGSIZE	-0.150***	-0.182***	-0.182***	-0.186***	-0.225***	-0.249***
	(0.040)	(0.042)	(0.042)	(0.041)	(0.042)	(0.045)
B/M	0.501**	0.496**	0.505**	0.610**	0.588**	0.576**
	(0.216)	(0.214)	(0.215)	(0.216)	(0.210)	(0.211)
LEVERAGE	-0.439**	-0.443**	-0.371**	-0.387**	-0.417**	-0.401**
	(0.182)	(0.170)	(0.168)	(0.163)	(0.151)	(0.154)
MOM	0.823**	0.830**	0.828**	0.815**	0.824**	0.825**
	(0.325)	(0.325)	(0.324)	(0.330)	(0.330)	(0.329)
INVEST/A	-0.775	-0.724	-0.409	-0.466	-0.303	-0.003
	(1.115)	(1.176)	(1.236)	(1.065)	(1.093)	(1.111)
HHI	0.014	0.031	0.104	0.059	0.059	0.108
	(0.120)	(0.118)	(0.115)	(0.126)	(0.122)	(0.128)
LOGPPE	-0.003	-0.025	-0.042	0.008	-0.003	-0.023
	(0.018)	(0.022)	(0.024)	(0.017)	(0.018)	(0.019)
ROE	0.013***	0.013***	0.012***	0.013***	0.013***	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	-0.404	-0.560	-0.494	-0.182	-0.231	-0.202
	(3.465)	(3.415)	(3.451)	(3.244)	(3.222)	(3.238)
Constant	1.874**	1.731**	1.337*	1.666**	1.672**	1.171
	(0.631)	(0.659)	(0.700)	(0.636)	(0.657)	(0.701)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	746,642	746,797	747,290	736,851	737,006	737,499
R-squared	0.150	0.150	0.150	0.151	0.151	0.151

Estimating Global Carbon Premia (Changes)

Panel B: Percentage Changes

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
S1CHG	0.500***			0.515***		
	(0.089)			(0.091)		
S2CHG		0.301***			0.307***	
		(0.062)			(0.065)	
S3CHG			1.342***			1.364***
			(0.257)			(0.266)
LOGSIZE	-0.162***	-0.159***	-0.178***	-0.174***	-0.170***	-0.189***
	(0.042)	(0.041)	(0.042)	(0.041)	(0.041)	(0.041)
B/M	0.519**	0.513**	0.557**	0.657**	0.650**	0.696***
	(0.215)	(0.214)	(0.217)	(0.219)	(0.218)	(0.221)
LEVERAGE	-0.455**	-0.441**	-0.492**	-0.372**	-0.357*	-0.403**
	(0.185)	(0.179)	(0.180)	(0.170)	(0.166)	(0.165)
MOM	0.785**	0.800**	0.705**	0.773**	0.789**	0.694*
	(0.321)	(0.321)	(0.314)	(0.327)	(0.327)	(0.320)
INVEST/A	-0.908	-0.768	-1.115	-0.758	-0.661	-0.961
	(1.187)	(1.205)	(1.204)	(1.065)	(1.065)	(1.058)
HHI	-0.050	-0.040	-0.071	-0.028	-0.018	-0.050
	(0.124)	(0.126)	(0.121)	(0.122)	(0.124)	(0.120)
LOGPPE	0.030	0.026	0.045**	0.048**	0.043**	0.063***
	(0.021)	(0.020)	(0.021)	(0.016)	(0.016)	(0.017)
ROE	0.014***	0.014***	0.015***	0.014***	0.014***	0.015***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	-0.500	-0.434	-0.450	-0.289	-0.239	-0.222
	(3.461)	(3.477)	(3.524)	(3.241)	(3.256)	(3.286)
Constant	2.064***	2.040***	2.067***	1.911***	1.890**	1.909***
	(0.596)	(0.599)	(0.591)	(0.624)	(0.628)	(0.624)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	746,738	746,749	747,290	736,947	736,958	737,499
R-squared	0.150	0.150	0.151	0.152	0.151	0.152

Estimating Global Carbon Premia (Intensity)

Panel C: Emission Intensity

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
S1INT	-0.007			-0.001		
	(0.007)			(0.004)		
S2INT		0.014			-0.001	
		(0.089)			(0.045)	
S3INT			0.019			0.013
			(0.018)			(0.017)
LOGSIZE	-0.157***	-0.152***	-0.145***	-0.164***	-0.164***	-0.163***
	(0.040)	(0.040)	(0.039)	(0.040)	(0.040)	(0.040)
B/M	0.505**	0.500**	0.506**	0.635**	0.635**	0.635**
	(0.214)	(0.214)	(0.218)	(0.218)	(0.217)	(0.218)
LEVERAGE	-0.405*	-0.426**	-0.417**	-0.341*	-0.342*	-0.342*
	(0.188)	(0.180)	(0.174)	(0.171)	(0.167)	(0.168)
MOM	0.830**	0.826**	0.823**	0.816**	0.816**	0.815**
	(0.325)	(0.327)	(0.327)	(0.331)	(0.331)	(0.331)
INVEST/A	-0.542	-0.640	-0.643	-0.519	-0.520	-0.524
	(1.155)	(1.082)	(1.170)	(1.052)	(1.046)	(1.055)
HHI	-0.072	-0.045	-0.023	-0.024	-0.023	-0.017
	(0.120)	(0.121)	(0.108)	(0.118)	(0.120)	(0.119)
LOGPPE	0.026	0.020	0.015	0.037**	0.037**	0.036**
	(0.019)	(0.018)	(0.018)	(0.016)	(0.016)	(0.016)
ROE	0.014***	0.014***	0.014***	0.014***	0.014***	0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	-0.392	-0.391	-0.384	-0.188	-0.187	-0.186
	(3.457)	(3.440)	(3.460)	(3.243)	(3.242)	(3.243)
Constant	2.089***	2.050***	1.969***	1.916***	1.914***	1.883**
	(0.592)	(0.609)	(0.616)	(0.617)	(0.625)	(0.620)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	747,290	747,290	747,290	737,499	737,499	737,499
R-squared	0.150	0.150	0.150	0.151	0.151	0.151

Exploring Economic Mechanisms

- The role of profitability
- Carbon premium and systematic risk factors
- Limited attention and coarse thinking
- Carbon premium and divestment ("sin effect")

Investor Attention (Paris COP21)

Panel A: Total emissions

	2005-2015			2016-2017		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
LOG (SCOPE 1 TOT)	0.151***			0.221***		
	(0.039)			(0.070)		
LOG (SCOPE 2 TOT)		0.148***			0.236***	
		(0.042)			(0.077)	
LOG (SCOPE 3 TOT)			0.320***			0.337***
			(0.087)			(0.097)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	122,118	122,046	122,202	63,274	63,274	63,286
R-squared	0.266	0.266	0.266	0.112	0.112	0.112

Panel B: Growth rate in total emissions

	2005-2015			2016-2017		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ΔSCOPE 1	0.671***			0.712**		
	(0.154)			(0.258)		
ΔSCOPE 2		0.319***			0.512**	
		(0.111)			(0.216)	
ΔSCOPE 3			1.323***			1.149**
			(0.406)			(0.470)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	109,266	109,182	109,326	44,735	44,723	44,747
R-squared	0.276	0.276	0.276	0.086	0.086	0.086

Panel C: Emission intensity

	2005-2015			2016-2017		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
SCOPE 1 INT	0.006			0.005		
	(0.007)			(0.019)		
SCOPE 2 INT		0.076			0.080	
		(0.095)			(0.126)	
SCOPE 3 INT			0.037			0.026
			(0.091)			(0.096)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	122,202	122,202	122,202	63,286	63,286	63,286
R-squared	0.266	0.266	0.266	0.111	0.111	0.111

Investor Attention (Imputed Data)

Panel A: (2005-2017)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
LOG (SCOPE 1 TOT)	0.101***			0.290***		
	(0.022)			(0.055)		
LOG (SCOPE 2 TOT)		0.187***			0.328***	
		(0.042)			(0.079)	
LOG (SCOPE 3 TOT)			0.250***			0.562***
			(0.041)			(0.149)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	No	No	No	Yes	Yes	Yes
Observations	162,087	162,027	162,278	162,087	162,027	162,278
R-squared	0.196	0.197	0.197	0.200	0.200	0.201

Panel B: (1990-1999)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
LOG (SCOPE 1 TOT)	-0.037			0.082		
	(0.034)			(0.078)		
LOG (SCOPE 2 TOT)		0.033			0.236	
		(0.045)			(0.134)	
LOG (SCOPE 3 TOT)			0.005			0.318*
			(0.059)			(0.162)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	No	No	No	Yes	Yes	Yes
Observations	59,878	59,878	59,878	59,878	59,878	59,878
R-squared	0.149	0.149	0.149	0.156	0.156	0.156

Divestment based on Intensity (Aggregate)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
SCOPE 1	-0.193**	-0.218***				
	(0.086)	(0.083)				
SCOPE 2			-0.405	-0.381		
			(1.622)	(1.610)		
SCOPE 3					0.088	-0.130
					(0.552)	(0.581)
LOGSIZE	2.071	1.847	2.090	1.859	2.097	1.850
	(1.522)	(1.702)	(1.496)	(1.678)	(1.511)	(1.706)
PRINV	-29.383***	-37.095***	-29.365***	-37.159***	-29.341***	-37.197***
	(5.626)	(6.452)	(5.623)	(6.396)	(5.652)	(6.480)
MOM	-1.456	-1.792*	-1.545	-1.871**	-1.546	-1.858*
	(0.932)	(0.877)	(0.888)	(0.823)	(0.913)	(0.856)
B/M	-1.104	-0.889	-1.471	-1.205	-1.436	-1.215
	(1.429)	(1.601)	(1.372)	(1.540)	(1.345)	(1.548)
BETA	9.141***	9.470***	9.349***	9.705***	9.317***	9.695***
	(1.493)	(1.459)	(1.406)	(1.375)	(1.415)	(1.388)
VOLAT	-8.111	4.126	-7.332	4.776	-7.577	4.538
	(14.364)	(12.829)	(13.630)	(11.943)	(14.120)	(12.569)
VOLUME	-4.365***	-4.613**	-4.317**	-4.568**	-4.328***	-4.583**
	(1.414)	(1.635)	(1.437)	(1.650)	(1.392)	(1.625)
NASDAQ	-1.215	-1.530	-0.936	-1.255	-0.812	-1.292
	(1.463)	(1.700)	(1.430)	(1.639)	(1.301)	(1.506)
SP500	2.430	1.711	2.290	1.508	2.266	1.510
	(2.121)	(2.092)	(2.121)	(2.088)	(2.128)	(2.095)
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	No	Yes	No	Yes	No	Yes
Observations	170,553	160,394	170,553	160,394	170,553	160,394
R-squared	0.122	0.166	0.119	0.162	0.119	0.162

Divestment (Disaggregate)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Banks	Insurance	Invest. Cos.	Advisers	Pensions	Hedge Funds
SCOPE 1	0.001**	-0.011*	0.026	-0.258***	-0.009*	0.033
	(0.000)	(0.005)	(0.022)	(0.056)	(0.004)	(0.028)
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Banks	Insurance	Invest. Cos.	Advisers	Pensions	Hedge Funds
SCOPE 2	0.009	-0.253	-0.139	-0.156	0.049	0.108
	(0.006)	(0.144)	(0.406)	(0.992)	(0.097)	(0.441)
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Banks	Insurance	Invest. Cos.	Advisers	Pensions	Hedge Funds
SCOPE 3	0.004*	-0.021	0.038	0.052	0.028	-0.230
	(0.002)	(0.071)	(0.115)	(0.409)	(0.030)	(0.151)

Investor Attention (Salience)

Panel A: Aggregate ownership

Variables	(1)	(2)	(3)	(4)	(5)	(6)
SCOPE 1 INT	-0.015	-0.007				
	(0.094)	(0.104)				
SCOPE 2 INT			-0.565	-0.525		
			(1.968)	(2.024)		
SCOPE 3 INT					0.421	0.246
					(0.538)	(0.568)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	No	Yes	No	Yes	No	Yes
Observations	152,799	143,337	152,799	143,337	152,799	143,337
R-squared	0.126	0.169	0.126	0.169	0.127	0.170

Panel B: Disaggregate ownership

VARIABLES	(1) Banks	(2) Insurance	(3) Invest. Cos.	(4) Advisers	(5) Pensions	(6) Hedge Funds
SCOPE 1 INT	0.001*	-0.013	-0.059	-0.060	0.009	0.114
	(0.000)	(0.012)	(0.041)	(0.078)	(0.010)	(0.068)
SCOPE 2 INT	0.006	-0.298*	-0.320	-0.224	0.051	0.261
	(0.006)	(0.164)	(0.487)	(1.252)	(0.124)	(0.523)
SCOPE 3 INT	0.004*	-0.015	0.063	0.436	0.041	-0.282
	(0.002)	(0.077)	(0.125)	(0.376)	(0.031)	(0.170)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year/month F.E.	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143,337	143,337	143,337	143,337	143,337	143,337

Conclusions

- Carbon emissions are positively correlated with stocks returns
- The results cannot be attributed to:
  - Profitability/Earnings surprises
  - Systematic risk factor
  - Divestment
- It is partly linked to investors' limited attention and coarse thinking
- Results challenge previous evidence on "low-carbon alpha"
- Industry focus encourages free-riding by firms within industry