

Oil and Gas Companies - Transition towards Zero Emissions?

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September 2020



BP sets ambition for net zero by 2050, fundamentally changing organisation to deliver

12 February 2020

BP today set a new ambition to become a net zero company by 2050 or sooner, and to help the world get to net zero. The ambition is supported by ten aims:

ExxonMobil dismisses carbon targets as a 'beauty' match

Big oil chief resists pressure over climate and carbon

ExxonMobil will eschew a “beauty match” on carbon emissions as rivals set out firm targets, marking a divide with international oil groups under pressure to address their impact on the global climate.

The largest US oil company on Thursday reaffirmed plans for \$30bn-\$35bn in capital spending in each of the next five years, most of it on big oil and gas projects from the US Permian Basin to Papua New Guinea.

Its shares fell another 4.4 per cent to \$50.11 on Thursday, near the lowest price in 15 years, leaving it with a market value of \$212bn against as much as \$527bn in 2007.

Once the largest company by market value, Exxon has lost allure to investors spooked by declining returns and questions over future demand. Some have pledged to [divest](#) from oil and other fossil fuel stocks as worries build over climate change.

Introduction

- Oil and gas industry is facing increasing opposition (public/ media, shareholders, policy makers) driven by considerations regarding the environmental impact of fossil fuels and stranded asset risk.
- Can respond by
 - diversifying their business models
 - increasing investment in renewable energy
 - working on technological advances to make energy use more efficient
 - producing more to mitigate stranded asset risk

Introduction (2)

- continuous and complex news flow about oil and gas companies' ambitious goals for decarbonisation
 - contrasting information about lobbying, climate change denial etc.
 - makes it difficult for various stakeholders to develop a coherent understanding of the companies' actual activities
- > Can financial market data help?
- We test whether oil and gas (O&G) companies reduce their oil exposure or increase their exposure to clean and renewable energy.

Is the focus on oil and gas companies justified?

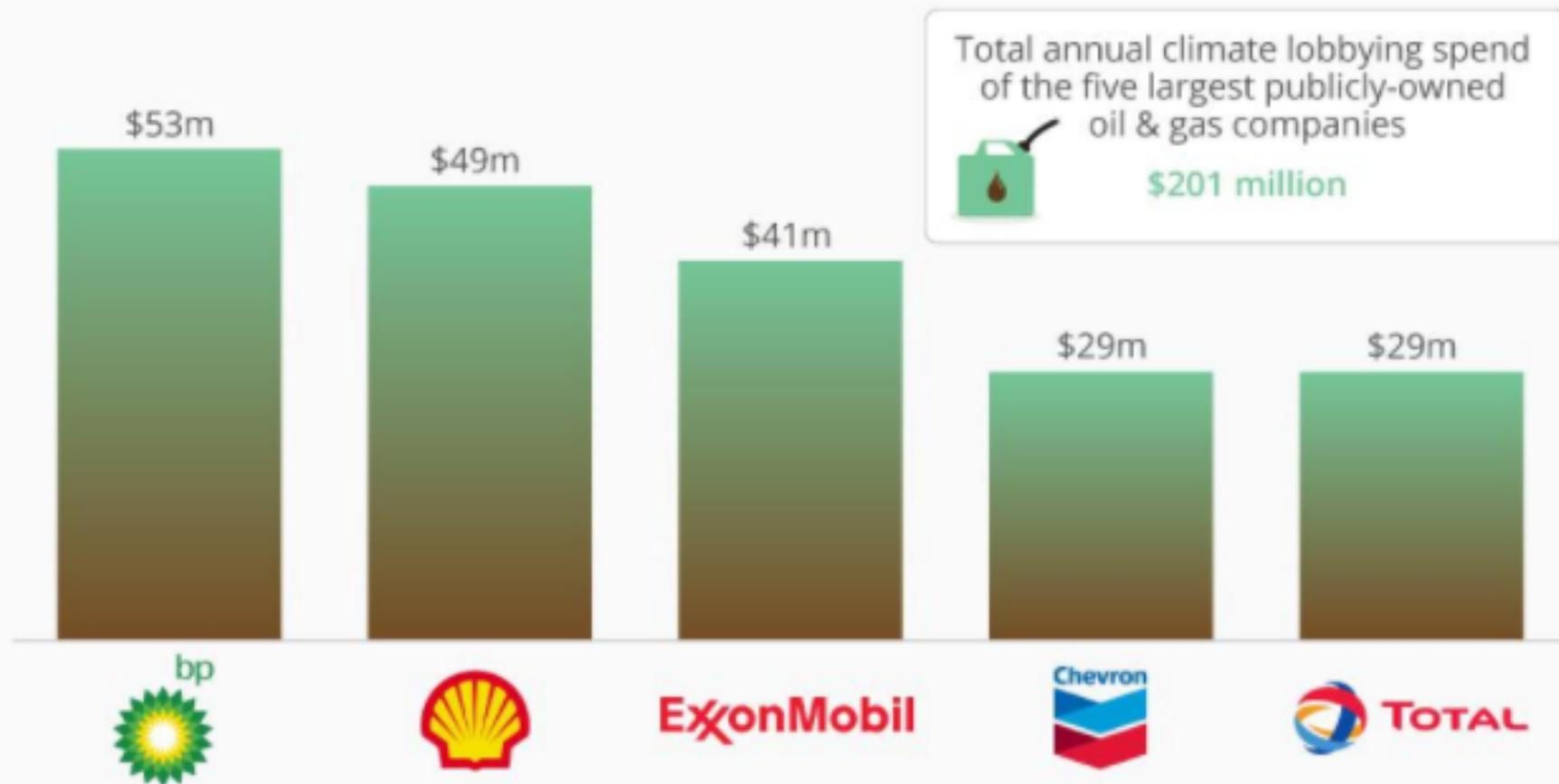
- The world's biggest 60 O&G companies contributed to more than 40% of global cumulative industrial emissions in the period 1988-2015; with the top 20 companies contributing by more than 30% (Grasso, 2019).
- Recent research suggests that oil and gas emissions could exceed current estimates substantially due to often neglected ethane and propane emissions related to simultaneous emissions of methane (Nature Editorial, 2018).

Greenwashing?

- Influencemap (2019) alerts that the five largest public oil and gas companies (ExxonMobil, Royal Dutch Shell, Chevron, BP and Total) have invested over one billion \$ on misleading climate-related branding and lobbying in the three years following the Paris Agreement.
- Especially European companies respond to this negative publicity by exiting US lobbying groups (Bloomberg, 2019a; Bloomberg, 2020b; Reuters, 2019) and joining, for example, carbon tax initiatives. (Bloomberg, 2019b).
- Nevertheless: critical voices question the motives behind such undertakings (Recharge News, 2019).

Oil Firms Spend Millions On Climate Lobbying

Annual expenditure on climate lobbying by oil and gas companies*



Contribution

- Propose a test for decarbonization or for transition to low(er)-carbon state.
- Literature focuses on correlation of clean and renewable energy firms with oil price changes (e.g. Sadorsky, 2012) based on stock market indices
 - no explicit test for a transition to a low-carbon economy through lower oil price exposures or compensating clean and renewable energy exposures
- This study provides a firm-level analysis of O&G companies.

Hypothesis

- We conjecture that the actual activities of companies in diversifying their business models to renewable energy as well as exploiting existing O&G reserves will be reflected in their sensitivities towards fossil fuel and renewable energy indices.

Data

- Constituents of the Refinitiv Datastream Integrated Oil & Gas Index as of Feb 2020, namely BP (UK), Royal Dutch Shell (UK/NE)8, Total SA (FR), Chevron (US), ExxonMobil (US), Repsol (SP), Eni (IT), Suncor Energy (CA), Husky Energy (CA), Imperial Oil (CA), Cenovus Energy (CA), Gibson Energy (CA), Hess (US), Enable Midstream Partners (US) and Idemitsu Kosan (JP).
- Sample period January 2010 – February 2020.
- Daily prices
- Account for potential non-synchronicity in time series by additionally conducting the empirical analysis at two-day and weekly return frequencies.

Data (2)

- WilderHill Clean Energy Index (ECO)
 - first index created to track the stock prices of renewable energy companies
 - ECO is comprised of companies in the areas of renewable energy supplies harvesting, energy storage, energy conversion, power delivery and conservation, greener utilities and cleaner fuels.
 - ECO is rebalanced quarterly and as of 2020, consists of 40 international stocks.
- As a proxy of the oil market we use NYMEX WTI crude oil continuous futures prices.

Data (3)

- Robustness & extension:
 - 67 individual constituents of the STOXX 1800 Global Oil & Gas

Data (4)



Methodology

To assess the exposure of O&G company share price changes to oil price changes, clean and renewable energy price changes and to the market changes, we estimate the following regression model for each of the O&G companies in our sample:

$$R_{i,t} = \alpha + \beta_M R_{M,t} + \beta_{Oil} R_{Oil,t} + \beta_{Clean} R_{Clean,t} + \mathbf{Change} + \varepsilon_{i,t}, \quad (1)$$

where $\mathbf{Change} = D\alpha^* + D\beta_M^* R_{M,t} + D\beta_{Oil}^* R_{Oil,t} + D\beta_{Clean}^* R_{Clean,t}$ captures the change in the exposures to oil, clean energy and the market over an assumed transition period represented by D .

Methodology (2)

- The regression model allow us to test for
 - changes in companies' oil price sensitivity after a certain date, e.g. 2015.
 - A decrease would indicate that companies have restructured their business models to limit their oil price exposure, by diversifying their activities toward renewable energy sources.
 - An increase would suggest intensified exploitation of existing fossil fuel reserves.
 - changes in companies' clean and renewable energy price sensitivity after a certain date, e.g. 2015
 - An increase indicates increasing investment in clean and renewable energy.
 - changes in the companies' exposure to systematic risk

Methodology (3)

Cross-sectional analysis

We also analyze whether there is a correlation between changes in the exposure to clean and renewable energy and to oil. Such a correlation would indicate that firms use investments in clean and renewable energy to compensate for the exposure to non-clean and non-renewable oil. We analyze the correlation in the pre-transition phase,

$$\hat{\beta}_{oil} = \alpha + \gamma \hat{\beta}_{clean} + \varepsilon_i, \quad (2)$$

Estimation Results

Estimation results for two-day average returns using WTI futures prices and S&P500

	α	β_M	β_{Oil}	β_{Clean}	α^*	β_M^*	β_{Oil}^*	β_{Clean}^*	R^2
BP		0.729	0.152			-0.533	0.107	0.154	0.272
Cenovus Energy		0.581	0.335	0.164			0.144		0.379
Chevron		0.886	0.188						0.574
Enable Midstream Partners		0.629	0.183	0.283					0.201
Eni		0.935	0.158			-0.565	0.087	0.113	0.437
ExxonMobil		0.905	0.130	-0.056			0.039		0.579
Gibson Energy			0.285	0.211		0.336			0.262
Hess		1.028	0.327	0.133			0.175	0.199	0.586
Husky Energy		0.514	0.217	0.079			0.122		0.310
Idemitsu Kosan		0.282	0.109	0.160					0.098
Imperial Oil		0.322	0.223	0.126	-0.150		-0.079		0.331
Repsol		1.031	0.240			-0.574		0.149	0.370
Royal Dutch Shell		0.708	0.173			-0.408	0.069		0.309
Suncor Energy		0.628	0.306	0.144			-0.069		0.429
Total SA		0.911	0.177			-0.459	0.059	0.110	0.456
Average	-0.062	0.681	0.211	0.074	-0.004	-0.156	0.053	0.026	0.370

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Panel estimation results: firm-fixed effects, daily returns

	S&P500	MSCI World
Market	0.615*** (0.024)	0.881*** (0.022)
Oil	0.180*** (0.009)	0.104*** (0.009)
Clean	0.022* (0.013)	-0.028** (0.011)
D	0.012 (0.015)	0.030** (0.015)
Market x D	-0.080*** (0.028)	-0.055** (0.028)
Oil x D	0.047*** (0.009)	0.108*** (0.010)
Clean x D	0.054*** (0.016)	0.057*** (0.014)
Observations	40,864	40,864
R ²	0.265	0.299
Adjusted R ²	0.265	0.299
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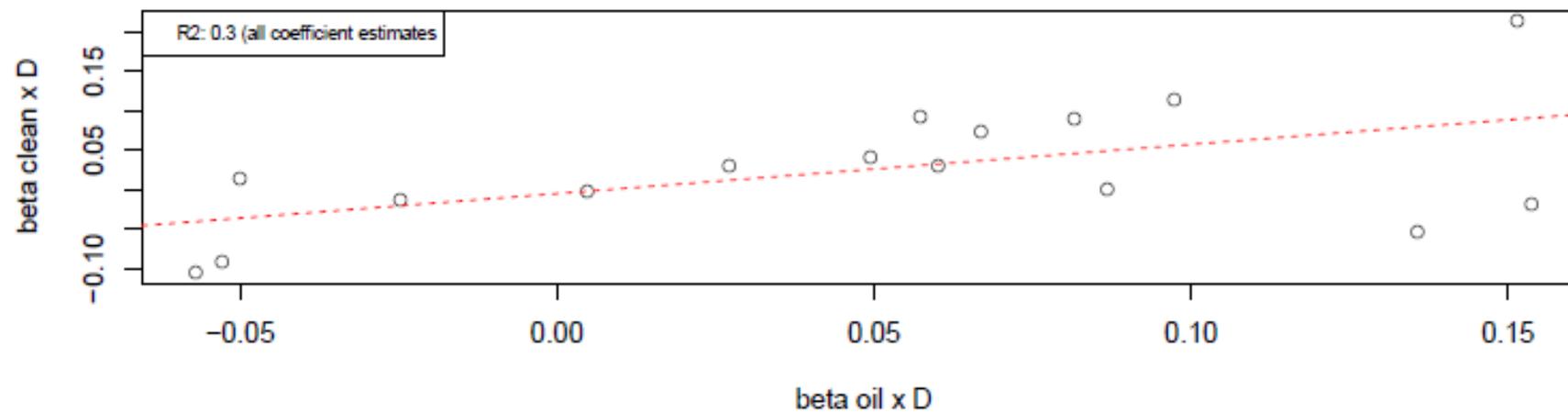
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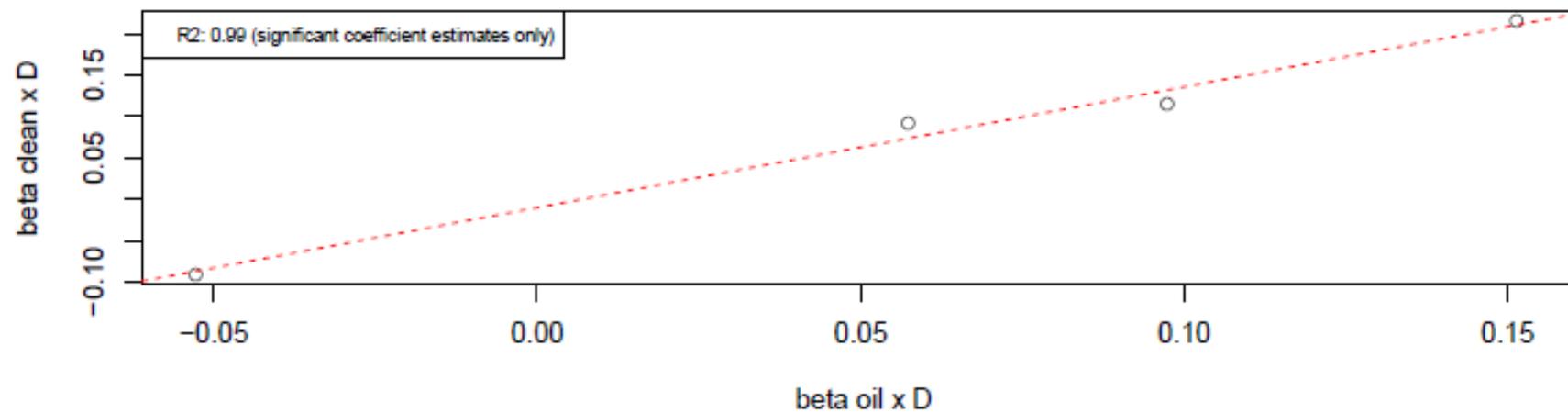
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Cross-sectional regression

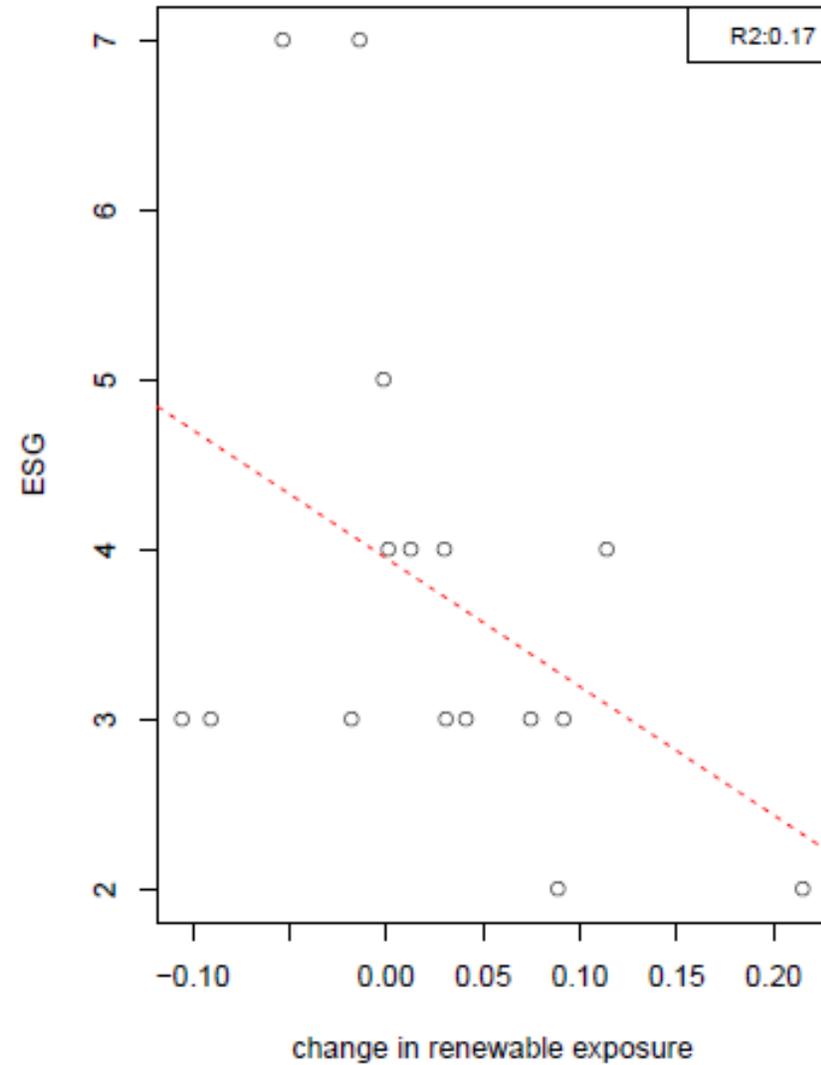
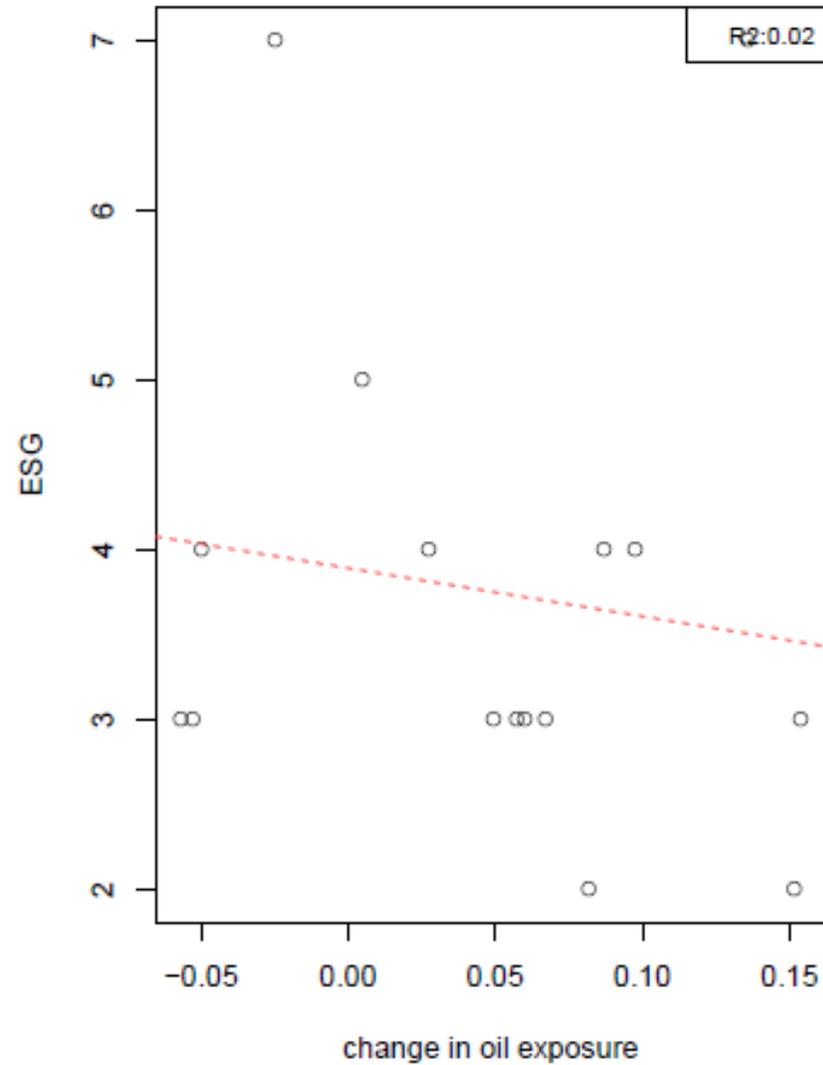
transition year 2016



transition year 2016



MSCI ESG scores versus transition



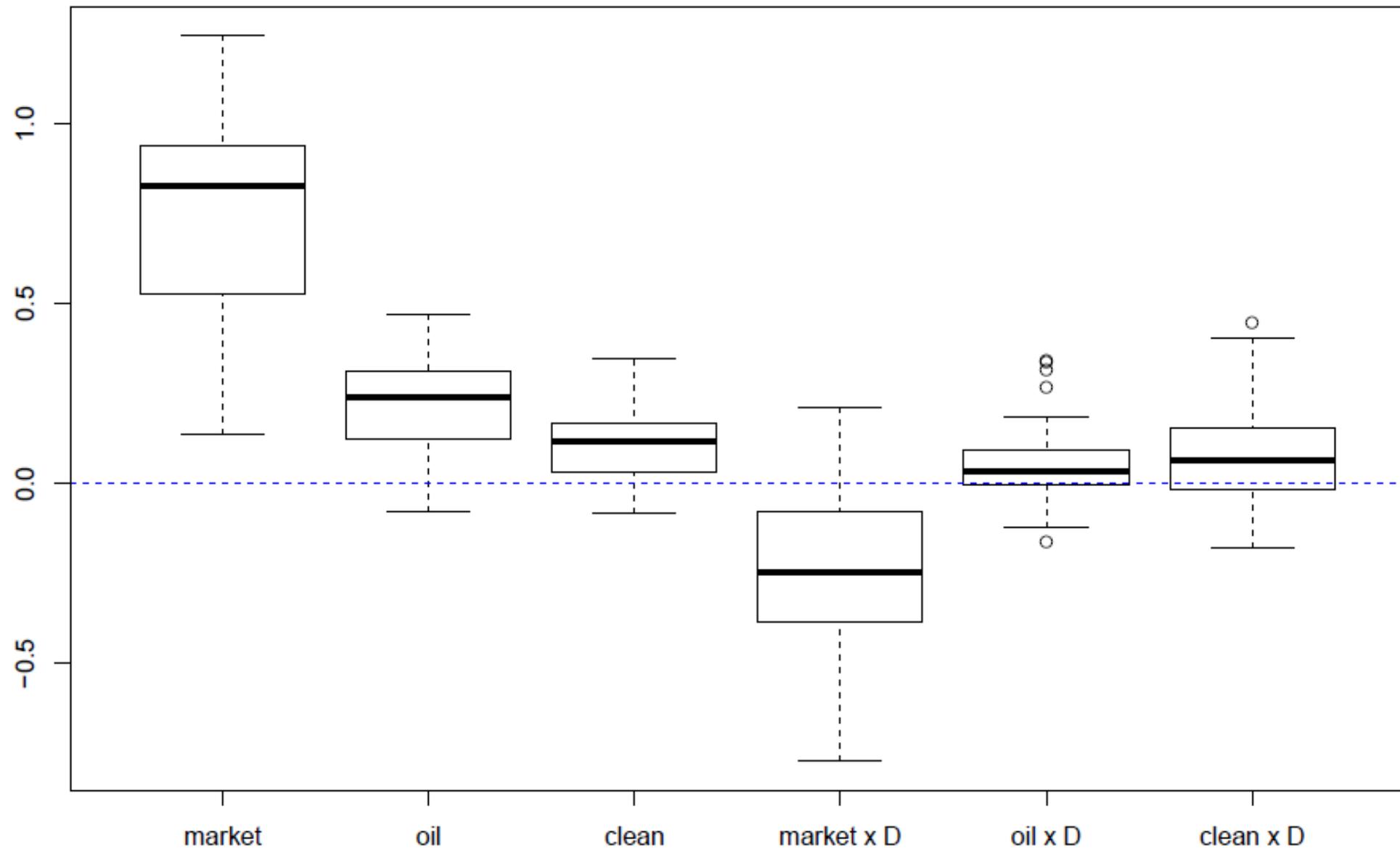
Larger sample

STOXX 1800 oil and gas index

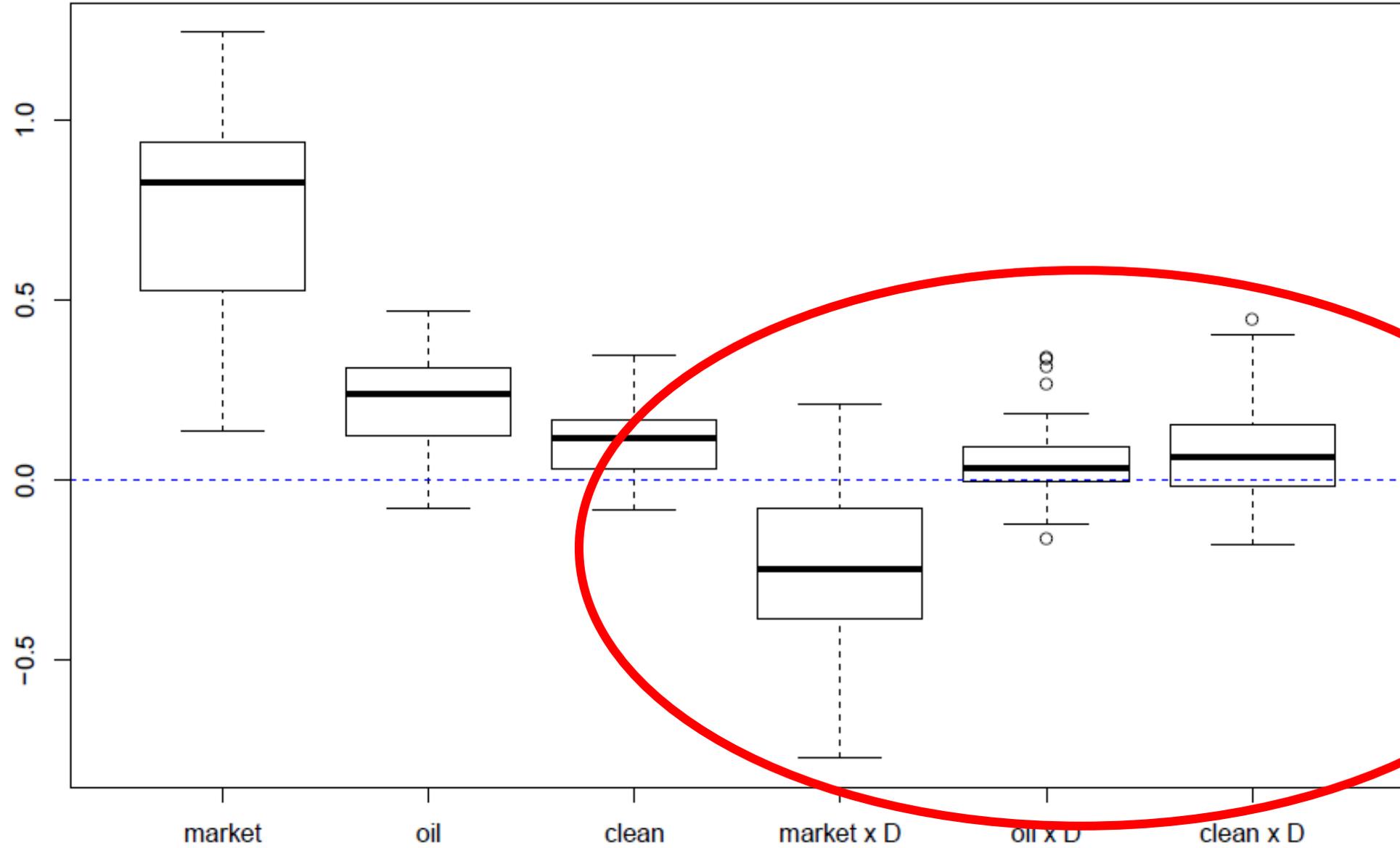
Table 7: Estimation results for the constituents of the STOXX 1800 Global Oil & Gas Index

	α	β_M	β_{Oil}	β_{Clean}	α^*	β_M^*	β_{Oil}^*	β_{Clean}^*	R^2
Aker BP		0.476	0.212						0.102
APA	0.066			0.075			-0.054		0.009
Apache	-0.067	0.905	0.308	0.128		-0.232	0.172	0.215	0.438
Baker Hughes		1.022	0.275	0.130		-0.231			0.413
Beach Energy			0.139	0.206					0.022
BP		0.500	0.149			-0.250	0.097	0.114	0.203
Cabot Oil & Gas		0.957	0.264	0.114		-0.340	-0.118		0.274
Caltex Australia	0.097		0.046	0.120	-0.107				0.018
Canadian Natural Resources		0.552	0.356	0.151					0.404
Cenovus		0.517	0.305	0.161			0.154		0.355
Chevron		0.927	0.189						0.576
Concho Resources		0.768	0.445	0.213	-0.129				0.452
ConocoPhillips		0.894	0.234				0.182	0.137	0.529
Devon Energy	-0.071	0.940	0.300	0.071			0.286	0.272	0.500
Diamondback Energy	0.167	0.734	0.417	0.298	-0.217				0.362
<hr/>									
Vestas Wind Systems		0.566		0.232					0.075
Williams		1.079	0.182	0.082		-0.364		0.328	0.317
John Wood Group		0.553	0.248	0.085			0.079		0.206
Woodside Petroleum				0.193					0.030
Worley	-0.106			0.189	0.205		0.120		0.022
Average	-0.006	0.614	0.186	0.103	-0.025	-0.135	0.056	0.055	0.269

Distribution of Betas

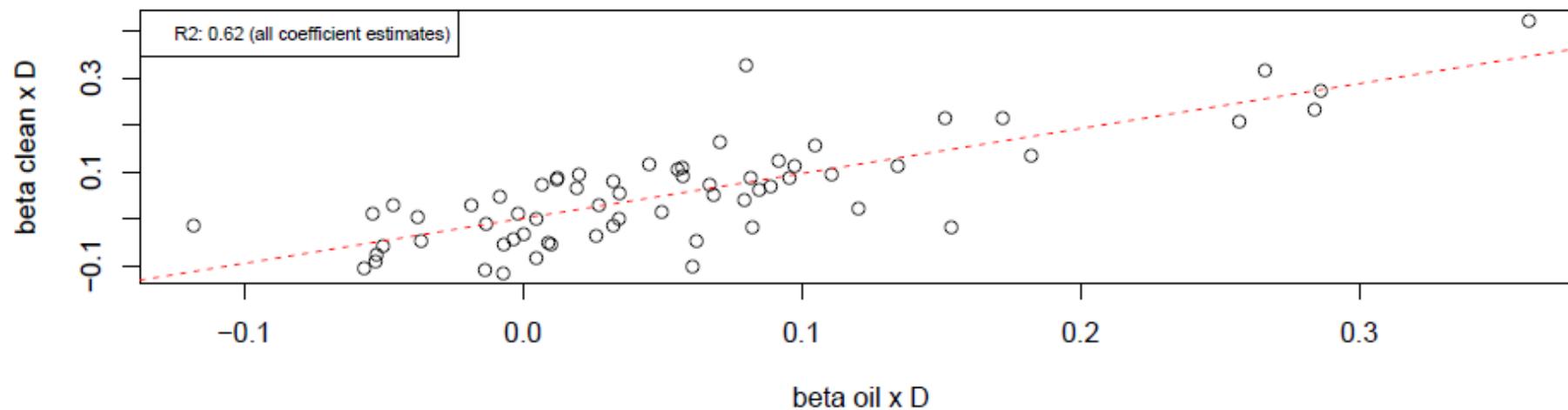


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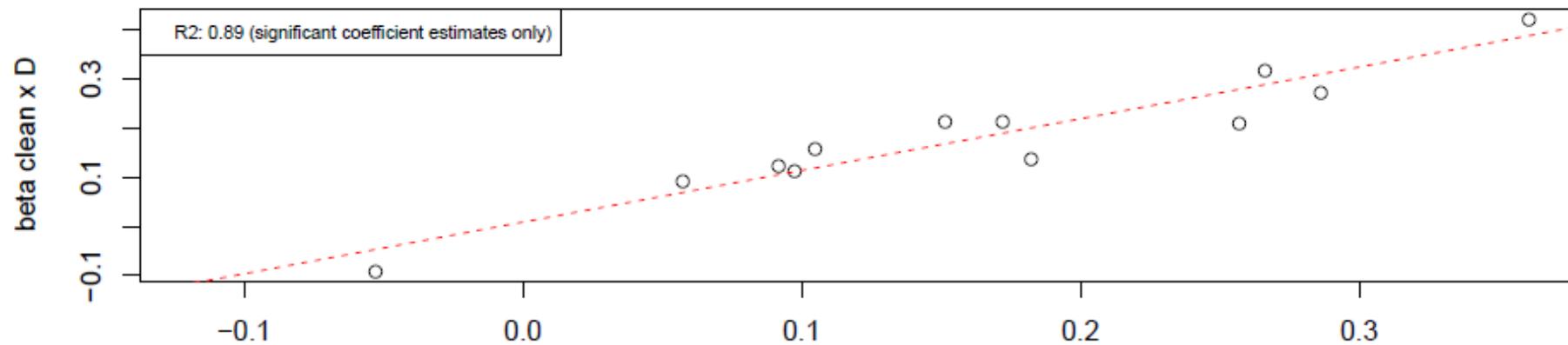


Cross-sectional regression

transition year 2016



transition year 2016



Summary

- Motivation:
 - More and more firms announce ambitious targets to reduce their carbon emissions
 - It is not clear how oil and gas companies can reach such goals without fundamentally changing their business model
- Hypothesis:
 - Firms try to compensate their fossil-fuel related carbon emissions with investments in clean and renewable energy that result in increased exposures to clean and renewable energy firms.
- Findings:
 - firms increase investments in clean and renewable energy **and** in oil.
 - reduced market exposure

Concluding Remarks

- The increased exposure to oil price changes suggests that firms react to increased stranded asset risk with increased production of oil.
 - consistent with the “Green Paradox” (Sinn, 2012) which states that the risk of regulatory changes resulting in stranded asset risk leads to the increased and early exploitation of resources that are prone to such risks.
- This study shows that firms react to climate change risk and that such reactions are reflected in firms’ share price changes (and their sensitivity to oil price changes and clean and renewable energy price changes).

Thank you!

Appendix

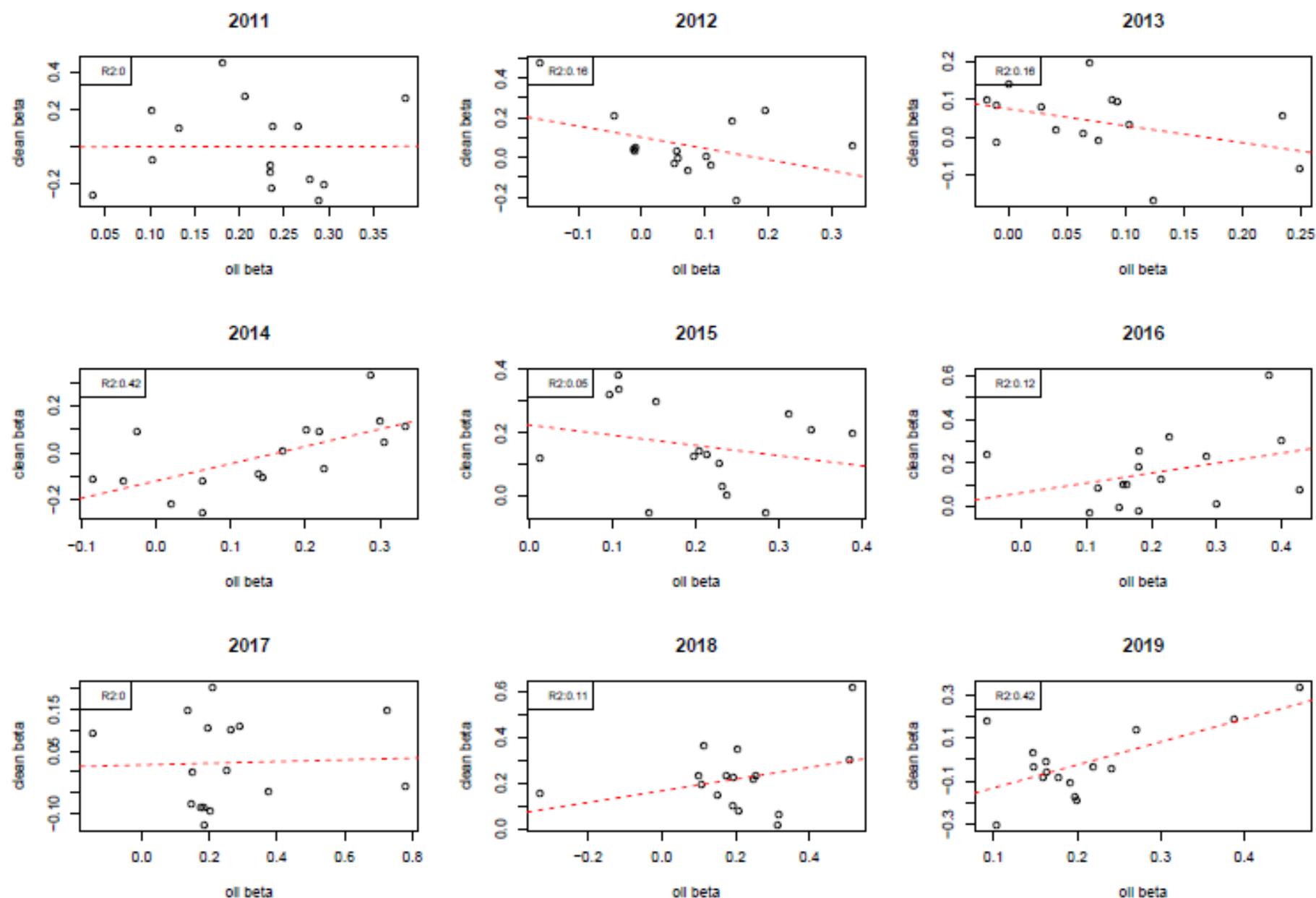
Estimation results for daily returns using WTI futures prices and MSCI World

	α	β_M	β_{Oil}	β_{Clean}	α^*	β_M^*	β_{Oil}^*	β_{Clean}^*	R^2
BP		0.879	0.104	-0.099		-0.267	0.126	0.101	0.258
Cenovus Energy		0.582	0.286	0.175			0.159		0.359
Chevron		0.754	0.178	0.096					0.524
Enable Midstream Partners		0.692	0.163	0.163			0.127		0.188
Eni	-0.052	1.352	0.082	-0.169		-0.309	0.111		0.450
ExxonMobil		0.739	0.126	0.057	-0.063				0.508
Gibson Energy		0.210	0.227	0.141		0.300			0.199
Hess		0.900	0.316	0.216			0.157	0.180	0.531
Husky Energy		0.480	0.207	0.088		0.285	0.091		0.289
Idemitsu Kosan		0.591				0.280			0.048
Imperial Oil		0.401	0.198	0.124	-0.073		-0.047		0.315
Repsol	-0.061	1.507	0.097	-0.163		-0.332	0.129		0.405
Royal Dutch Shell		0.901	0.126	-0.111		-0.157	0.077		0.313
Suncor Energy		0.678	0.270	0.130				-0.089	0.410
Total SA		1.235	0.088	-0.149		-0.202	0.093		0.468
Average	-0.028	0.799	0.161	0.020	-0.003	0.0005	0.065	0.002	0.349

Estimation results for weekly returns using WTI futures prices and S&P500

	α	β_M	β_{Oil}	β_{Clean}	α^*	β_M^*	β_{Oil}^*	β_{Clean}^*	R^2
BP	-0.293	0.783	0.192			-0.771		0.219	0.315
Cenovus Energy		0.451	0.263	0.211			0.300		0.398
Chevron		0.950	0.189						0.562
Enable Midstream Partners	-1.046	0.819	0.231						0.117
Eni		0.889	0.176			-0.554	0.118		0.478
ExxonMobil		0.942	0.170	-0.089					0.571
Gibson Energy			0.309	0.191					0.291
Hess		0.934	0.396	0.162			0.176		0.589
Husky Energy		0.354	0.203	0.132					0.307
Idemitsu Kosan		0.449		0.205			0.249	-0.290	0.207
Imperial Oil		0.327	0.217	0.173	-0.384				0.396
Repsol		1.053	0.199			-0.518			0.375
Royal Dutch Shell		0.751	0.207			-0.462	0.114		0.349
Suncor Energy		0.571	0.249	0.166					0.434
Total SA		0.877	0.200			-0.425			0.526
Average	-0.172	0.691	0.219	0.073	0.019	-0.162	0.084	0.032	0.396

Figure 4: Correlation oil and clean exposures over time (250-day rolling estimates)



Story

- Climate change a problem
- Oil and gas companies key contributor to problem
- Real efforts to decarbonize or greenwashing?
- Do financial markets provide estimates of real efforts?
- Yes. Oil and gas firms appear to produce more oil and gas and use more clean and renewable energy