

Heard the News? Environmental Policy and Clean Investments

Joëlle Noailly^{1,2}

Laura Nowzohour¹ Matthias van den Heuvel³

¹Graduate Institute Geneva

²Vrije Universiteit Amsterdam

³École Polytechnique Fédérale de Lausanne

EEA Congress
23 August 2021



Sustainable Economy
National Research Programme

Objective and motivation

How has media attention to environmental policy evolved over the years?

How does information about environmental policy affect clean investments?

Objective and motivation

How has media attention to environmental policy evolved over the years?

How does information about environmental policy affect clean investments?

- ▶ We aim to construct meaningful **newspaper-based** measures of US environmental policy over the last 40 years:
 1. general index of environmental policy
 2. 25 topic-specific indexes

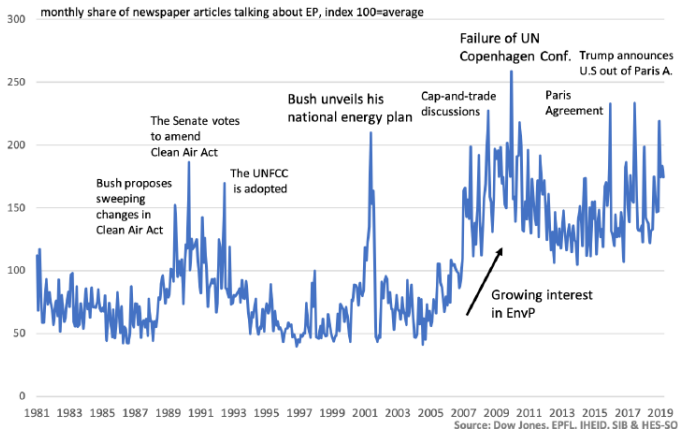


Contribution

1. News are a great tool to study information about environmental policy
 - ▶ **high frequency data** over long time periods (news arrive daily)
 - ▶ covers various **topics** and **multi-dimensional facets** of environmental policy (Brunel and Levinson, 2016; Botta and Kozluc, 2014)
 - ▶ captures aspects of **policy design** (e.g. uncertainty, complexity)
2. Novel methods relying on **text-mining techniques** (Gentzkow and Shapiro, 2010; Bybee et al, 2020)
3. Using our novel indices, we study whether more media attention to EnvP makes clean firms more attractive to investors.

Key findings

Historical evolution of US environmental policy + 25 sub-topics



Meaningful empirical association between our news index and proxies for clean investments (in VAR and firm-level estimations).

Outline

Measuring environmental policy

- Data

- Environmental Policy Index

- Topic-specific indexes

EnvP news and clean investments

- Aggregate clean investments - VAR models

- Firm-level estimations

Conclusions

Data

- ▶ News articles extracted from 10 US newspapers over 1981-2019.
- ▶ Monthly counts of articles relating to environmental and climate policy (EnvP) + total volume of articles.
- ▶ Source: automated access to Factiva, Dow Jones.

Newspapers	Share
New York Times	22.5%
Washington Post	15.3%
Houston Chronicle	13.8%
Tampa Bay Times	11.5%
Dallas Morning News	10.8%
Wall Street Journal	9.8%
San Francisco Chronicle	6.2%
Boston Herald	5.0%
San Jose Mercury News	3.4%
San Diego Union Tribune	1.7%

Measuring environmental policy

Data

Environmental Policy Index

Topic-specific indexes

EnvP news and clean investments

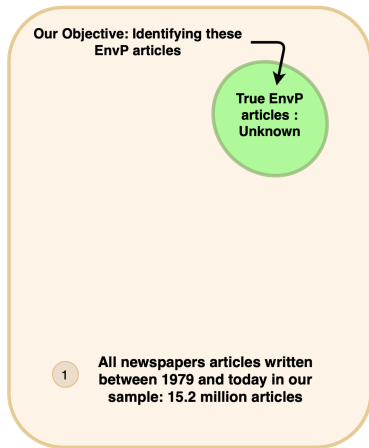
Aggregate clean investments - VAR models

Firm-level estimations

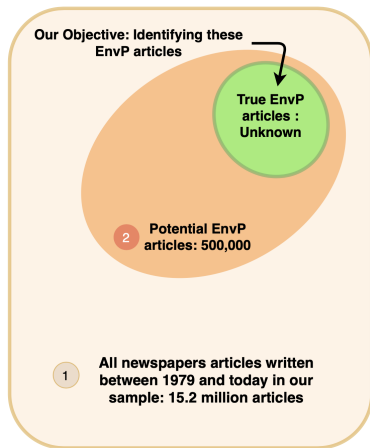
Conclusions

Identifying EnvP articles through text-mining (1)

1. 15.2 million articles (10 newspapers) accessed on Factiva. → only a subset are 'true' EnvP articles.

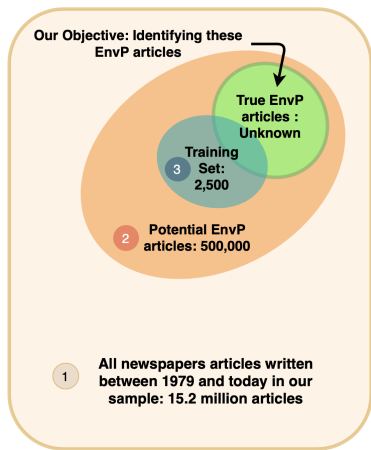


Identifying EnvP articles through text-mining (1)



1. 15.2 million articles (10 newspapers) accessed on Factiva. → only a subset are 'true' EnvP articles.
2. Broad environmental policy query to narrow down the universe of articles (i.e. 500,000)

Identifying EnvP articles through text-mining (1)



1. 15.2 million articles (10 newspapers) accessed on Factiva. → only a subset are 'true' EnvP articles.
2. Broad environmental policy query to narrow down the universe of articles (i.e. 500,000)
3. Training set: random draw of 2,500 articles that we label manually. An article is coded as irrelevant in our codebook if:
 - ▶ **No environment** : *"Brexit has caused changes in the business climate."*
 - ▶ **No policy** : *"New technological breakthrough for solar cells."*

▶ Excerpt of our codebook

Identifying EnvP articles through text-mining (2)

Training a supervised ML algorithm for text classification

- ▶ Training set (2'500 articles) as input into a support vector machine (SVM) classifier. [▶ What is SVM?](#)
- ▶ Algorithm produces a rule predicting whether an article is about EnvP, based on words in a given article.
- ▶ Best performing algorithm: precision: 77% (close to average precision of annotators of 83%), and recall 65%.

[▶ What are precision and recall?](#)

Identifying EnvP articles through text-mining (2)

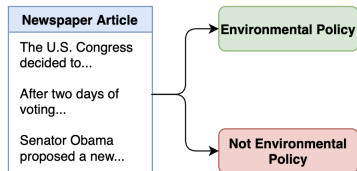
Training a supervised ML algorithm for text classification

- ▶ Training set (2'500 articles) as input into a support vector machine (SVM) classifier. [▶ What is SVM?](#)
- ▶ Algorithm produces a rule predicting whether an article is about EnvP, based on words in a given article.
- ▶ Best performing algorithm: precision: 77% (close to average precision of annotators of 83%), and recall 65%.

[▶ What are precision and recall?](#)

Classifying our newspaper articles

- ▶ Using SVM prediction rule on our set of 500,000 articles, we identify 84,000 news articles as "true" EnvP.



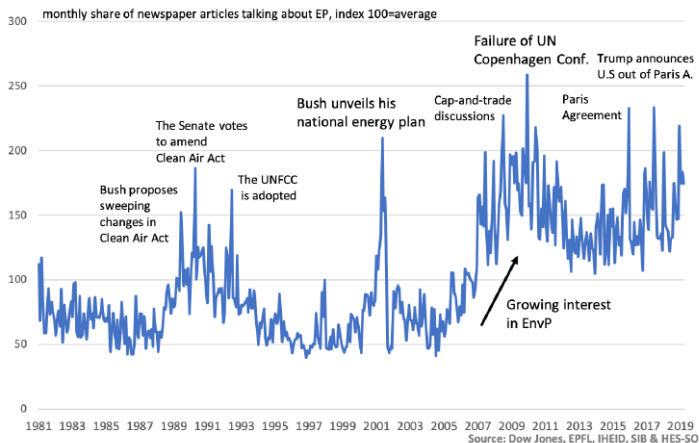
A glimpse into SVM top features

Table: 50 most discriminating words for predicting our EnvP index according to the trained SVM classifier.

Word	Weight	Word	Weight	Word	Weight
energy	3.16	crisis	1.34	volkswagen	1.09
emission	3.06	air	1.33	refrigerator	1.08
environmental	2.95	ethanol	1.32	utility	1.07
epa	2.24	global warming	1.32	cleanup	1.06
solar	2.17	coal	1.30	federal	1.05
obama	2.05	climate	1.26	car	1.00
clean	1.89	regulation	1.24	penalty	0.99
pollution	1.83	program	1.18	house	0.98
waste	1.67	renewable	1.17	bannon	0.98
warming	1.62	reef	1.15	bill	0.98
recycle	1.47	protection	1.14	mercury	0.97
power	1.45	climate change	1.12	electric	0.96
global	1.38	env. protection	1.10	gasoline	0.94
standard	1.36	clean air	1.10	environment	0.94

▶ Top SVM articles

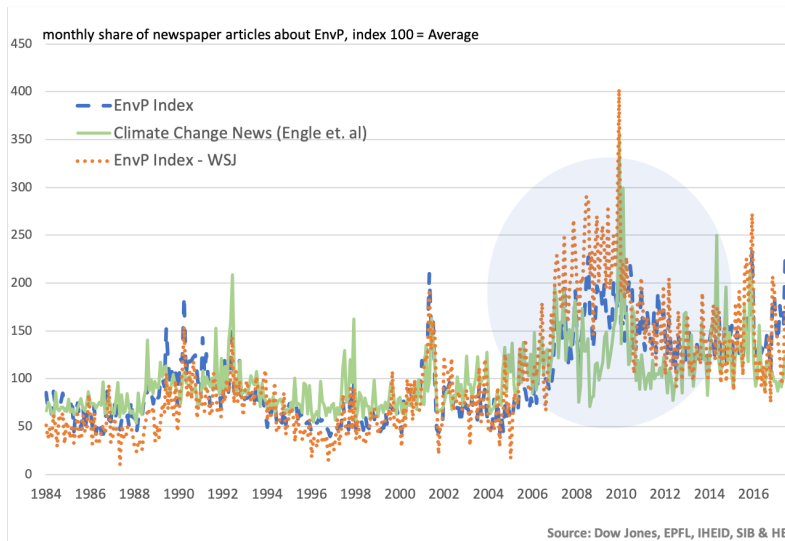
General EnvP Index



Historical evolution of EnvP media coverage (scaled by total volume of articles).

► Political slant

EnvP versus Climate Change Index



Measuring environmental policy

Data

Environmental Policy Index

Topic-specific indexes

EnvP news and clean investments

Aggregate clean investments - VAR models

Firm-level estimations

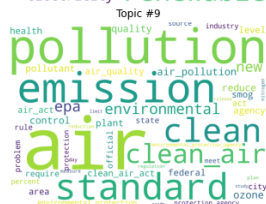
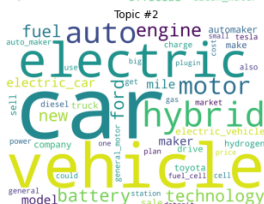
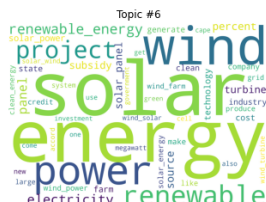
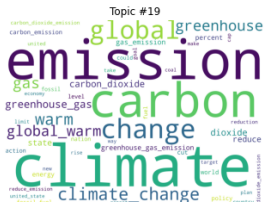
Conclusions

Identifying EnvP topics

Unsupervised ML algorithm for topic identification

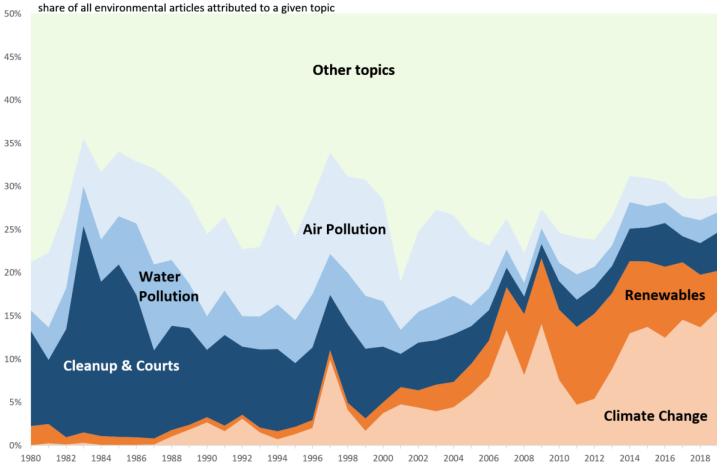
- ▶ 84,000 EnvP articles over 1981-2009.
- ▶ Topic modeling using Latent Dirichlet Allocation (LDA).

Wordclouds EnvP topics

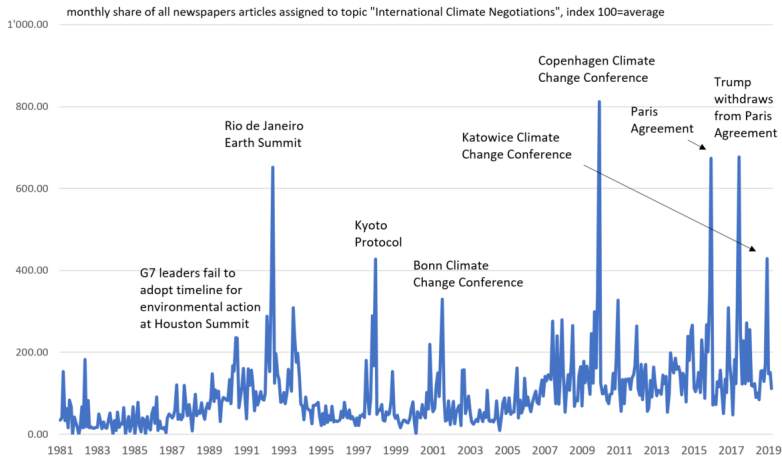


► Full topics list

Evolution of topic sub-indexes over time

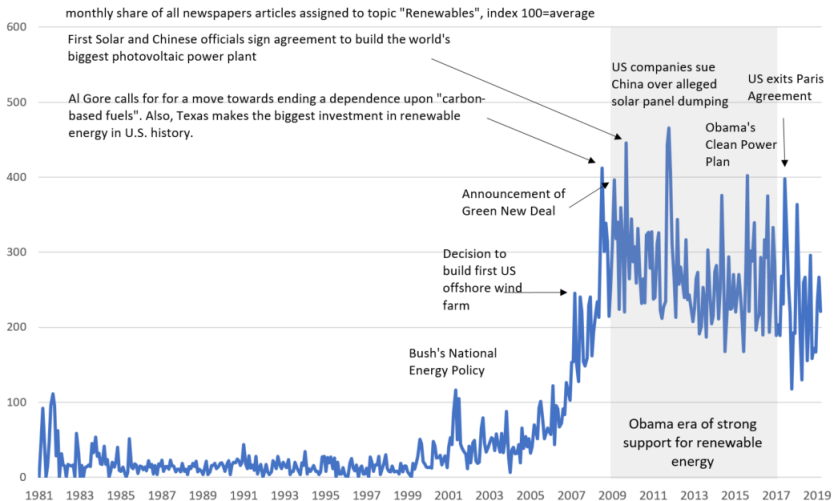


Topic International Agreements



Source: Dow Jones, EPFL, IHEID, SIB & HES-SO

Topic Renewables - EnvP-RE



Source: Dow Jones, EPFL, IHEID, SIB & HES-SO

Measuring environmental policy

Data

Environmental Policy Index

Topic-specific indexes

EnvP news and clean investments

Aggregate clean investments - VAR models

Firm-level estimations

Conclusions

EnvP news and clean investments

How do our news-based environmental policy indexes relate to clean markets?

- ▶ **Hypothesis:** More media attention to EnvP makes clean firms more attractive to investors.
- ▶ **Channels:** increased awareness of investment opportunities in clean markets **and** reflection of increased policy stringency.

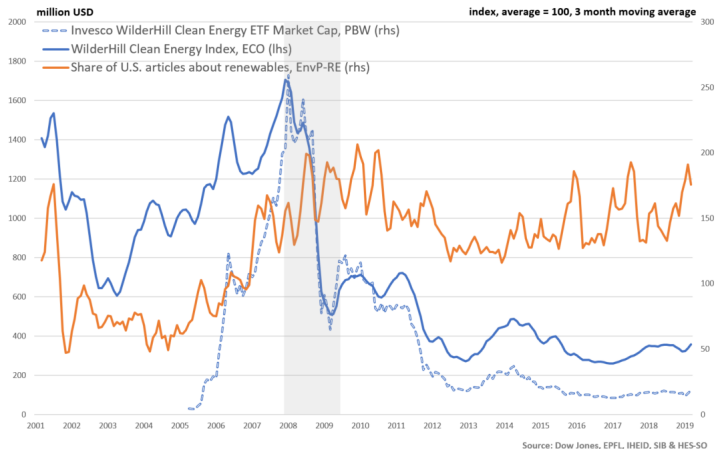
EnvP news and clean investments

How do our news-based environmental policy indexes relate to clean markets?

- ▶ **Hypothesis:** More media attention to EnvP makes clean firms more attractive to investors.
 - ▶ **Channels:** increased awareness of investment opportunities in clean markets **and** reflection of increased policy stringency.
1. Dynamic relationship between our news index and demand for the main benchmark clean-energy ETF and aggregate VC deals in VAR models
 - ▶ Impulse response of to a shock in our renewable policy news index.
 2. Firm-level regressions – identification strategy differentiate firms by exposure to environmental policy.

▶ EnvP vs OECD Policy Stringency

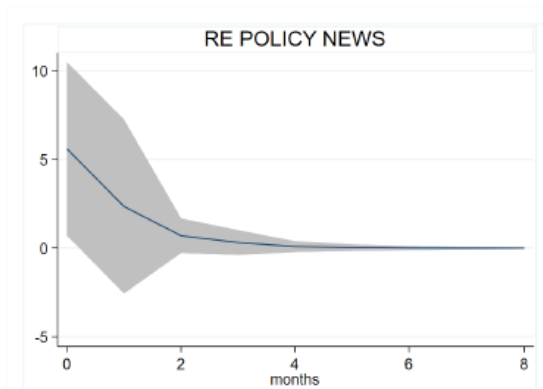
Clean-energy stocks (1)



ECO and PBW-ETF WilderHill Clean-energy Index, 2001-2019 monthly.
Source: Datastream

Clean-energy stocks (2)

Impulse response function: effect of a shock in EnvP-RE news on clean-energy fund demand (AuM of PBW ETF).



A one-SD shock to EnvP-RE news growth is associated with an increase in 5 million USD (0.1 SD) in AuM of the PBW ETF

▶ Robustness to different VAR specifications

▶ Variables and Cholesky ordering

Measuring environmental policy

Data

Environmental Policy Index

Topic-specific indexes

EnvP news and clean investments

Aggregate clean investments - VAR models

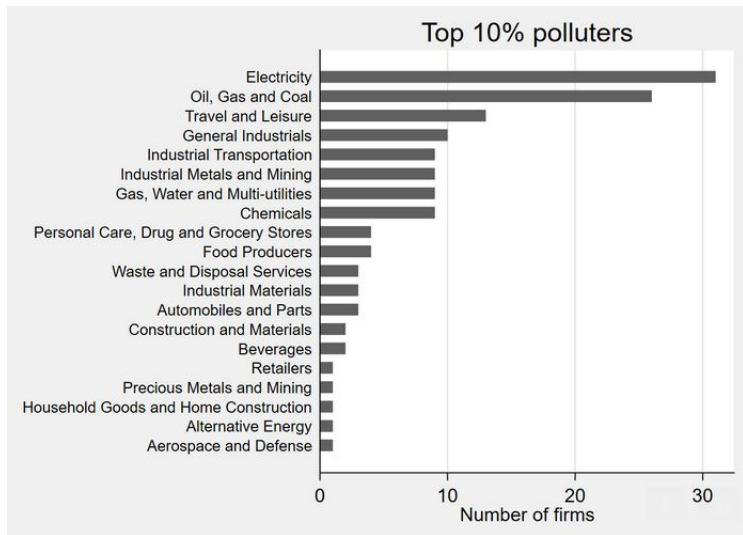
Firm-level estimations

Conclusions

Firm-level stock returns (1)

- ▶ **Hypothesis:** We expect polluting (green) firms to be negatively (positively) affected by EnvP news.
- ▶ **Identification:** differentiate firms by exposure to environmental policy (annual scope-1 GHG emissions / green revenues)
- ▶ **Sample:** 1,400 US firms, Jan 2004-Mar 2019.
 - ▶ Monthly firm-level stock returns and annual firm-level balance sheet data from Datastream.
 - ▶ Annual firm-level GHG emissions (scope 1) from Trucost.
 - ▶ For a subsample, we obtain additional data on firms' yearly green revenue shares (FTSE Russell)

Firm-level GHG emissions



Firm-level stock returns (2)

How does media attention to environmental policy affect firm-level stock returns?

- ▶ **LHS:** continuously compounded log returns in excess of safe interest rate for each firm.

Firm-level stock returns (2)

How does media attention to environmental policy affect firm-level stock returns?

- ▶ **LHS:** continuously compounded log returns in excess of safe interest rate for each firm.
- ▶ **RHS:** unanticipated (white-noise) component of EnvP:
$$EnvP_t = \alpha + \sum_{k=1}^7 \beta_k EnvP_{t-k} + \varepsilon_t^{EnvP}$$
 (Brogaard & Detzel, 2015).

Firm-level stock returns (2)

How does media attention to environmental policy affect firm-level stock returns?

- ▶ **LHS:** continuously compounded log returns in excess of safe interest rate for each firm.
- ▶ **RHS:** unanticipated (white-noise) component of EnvP:
$$EnvP_t = \alpha + \sum_{k=1}^7 \beta_k EnvP_{t-k} + \varepsilon_t^{EnvP}$$
 (Brogaard & Detzel, 2015).
- ▶ **Additional controls**
 - ▶ **Firm heterogeneity:** size, profitability, leverage, dividends per share and fixed effects.
 - ▶ **Technological progress:** industry-year time trend.
 - ▶ **Month FE or Fama-French risk factors** (MKTRF, SMB, HML, RMW and CMA).

Firm-level stock returns (3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ln(<i>r_excess</i>)	ln(<i>r_excess</i>)	ln(<i>r_excess</i>)	ln(<i>r_excess</i>)	ln(<i>r_excess</i>)	ln(<i>r_excess</i>)	ln(<i>r_excess</i>)
EnvP	0.0231*** (0.0006)	0.0231*** (0.0006)	0.0205*** (0.0008)	0.0205*** (0.0008)	0.0351*** (0.0022)	0.0224*** (0.0016)	0.0219*** (0.0013)
EnvP × AVG Emissions	-0.0026*** (0.0004)		-0.0023*** (0.0004)				-0.0013*** (0.0004)
EnvP × AVG Emission Intensity		-0.0021*** (0.0004)		-0.0016*** (0.0005)			
EnvP × Quartile of emissions=2					-0.0107*** (0.0025)		
EnvP × Quartile of emissions=3					-0.0169*** (0.0025)		
EnvP × Quartile of emissions=4					-0.0198*** (0.0024)		
EnvP × Quartile of emission intensity=2						-0.0012 (0.0022)	
EnvP × Quartile of emission intensity=3						-0.0017 (0.0020)	
EnvP × Quartile of emission intensity=4						-0.0043** (0.0020)	
Green Revenue Share							0.0025 (0.0027)
EnvP × Green Revenue Share							0.0060*** (0.0015)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes	Yes	Yes
Risk factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,668	69,668	34,689	34,689	34,689	34,689	9,579
Firms	1,400	1,400	613	613	613	613	230
R ²	0.95	0.95	0.96	0.96	0.96	0.96	0.95

A one SD increase in EnvP news is associated to a -0.3% drop in excess returns for firms with GHG emissions one SD above the sample mean ▶ VC firm results

Firm-level stock returns (3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)
EnvP	0.0231*** (0.0006)	0.0231*** (0.0006)	0.0205*** (0.0008)	0.0205*** (0.0008)	0.0351*** (0.0022)	0.0224*** (0.0016)	0.0219*** (0.0013)
EnvP × AVG Emissions	-0.0026*** (0.0004)		-0.0023*** (0.0004)				-0.0013*** (0.0004)
EnvP × AVG Emission Intensity		-0.0021*** (0.0004)		-0.0016*** (0.0005)			
EnvP × Quartile of emissions=2					-0.0107*** (0.0025)		
EnvP × Quartile of emissions=3					-0.0169*** (0.0025)		
EnvP × Quartile of emissions=4					-0.0198*** (0.0024)		
EnvP × Quartile of emission intensity=2						-0.0012 (0.0022)	
EnvP × Quartile of emission intensity=3						-0.0017 (0.0020)	
EnvP × Quartile of emission intensity=4						-0.0043** (0.0020)	
Green Revenue Share							0.0025 (0.0027)
EnvP × Green Revenue Share							0.0060*** (0.0015)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes	Yes	Yes
Risk factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,668	69,668	34,689	34,689	34,689	34,689	9,579
Firms	1,400	1,400	613	613	613	613	230
R ²	0.95	0.95	0.96	0.96	0.96	0.96	0.95

A one SD increase in EnvP news is associated to a -0.3% drop in excess returns for firms with GHG emissions one SD above the sample mean ▶ VC firm results

Firm-level stock returns (3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)	ln(r_excess)
EnvP	0.0231*** (0.0006)	0.0231*** (0.0006)	0.0205*** (0.0008)	0.0205*** (0.0008)	0.0351*** (0.0022)	0.0224*** (0.0016)	0.0219*** (0.0013)
EnvP × AVG Emissions	-0.0026*** (0.0004)		-0.0023*** (0.0004)				-0.0013*** (0.0004)
EnvP × AVG Emission Intensity		-0.0021*** (0.0004)		-0.0016*** (0.0005)			
EnvP × Quartile of emissions=2					-0.0107*** (0.0025)		
EnvP × Quartile of emissions=3					-0.0169*** (0.0025)		
EnvP × Quartile of emissions=4					-0.0198*** (0.0024)		
EnvP × Quartile of emission intensity=2						-0.0012 (0.0022)	
EnvP × Quartile of emission intensity=3						-0.0017 (0.0020)	
EnvP × Quartile of emission intensity=4						-0.0043** (0.0020)	
Green Revenue Share							0.0025 (0.0027)
EnvP × Green Revenue Share							0.0060*** (0.0015)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes	Yes	Yes
Risk factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,668	69,668	34,689	34,689	34,689	34,689	9,579
Firms	1,400	1,400	613	613	613	613	230
R ²	0.95	0.95	0.96	0.96	0.96	0.96	0.95

A one SD increase in EnvP news is associated to a -0.3% drop in excess returns for firms with GHG emissions one SD above the sample mean ▶ VC firm results

Firm-level stock returns (3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ln(r _{excess})	ln(r _{excess})	ln(r _{excess})	ln(r _{excess})	ln(r _{excess})	ln(r _{excess})	ln(r _{excess})
EnvP	0.0231*** (0.0006)	0.0231*** (0.0006)	0.0205*** (0.0008)	0.0205*** (0.0008)	0.0351*** (0.0022)	0.0224*** (0.0016)	0.0219*** (0.0013)
EnvP × AVG Emissions	-0.0026*** (0.0004)		-0.0023*** (0.0004)				-0.0013*** (0.0004)
EnvP × AVG Emission Intensity		-0.0021*** (0.0004)		-0.0016*** (0.0005)			
EnvP × Quartile of emissions=2					-0.0107*** (0.0025)		
EnvP × Quartile of emissions=3					-0.0169*** (0.0025)		
EnvP × Quartile of emissions=4					-0.0198*** (0.0024)		
EnvP × Quartile of emission intensity=2						-0.0012 (0.0022)	
EnvP × Quartile of emission intensity=3						-0.0017 (0.0020)	
EnvP × Quartile of emission intensity=4						-0.0043** (0.0020)	
Green Revenue Share							0.0025 (0.0027)
EnvP × Green Revenue Share							0.0060*** (0.0015)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes	Yes	Yes
Risk factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,668	69,668	34,689	34,689	34,689	34,689	9,579
Firms	1,400	1,400	613	613	613	613	230
R ²	0.95	0.95	0.96	0.96	0.96	0.96	0.95

A one SD increase in EnvP news is associated to a -0.3% drop in excess returns for firms with GHG emissions one SD above the sample mean [▶ VC firm results](#)

Firm-level stock returns (3)

	(1) ln(<i>r_{excess}</i>)
EnvP	0.0079*** (0.0006)
EnvP × AVG Emissions	-0.0013*** (0.0003)
EnvP net sentiment	-0.0724*** (0.0020)
EnvP net sentiment × AVG Emissions	0.0056*** (0.0011)
Firm FE	Yes
Industry-Year Trend	Yes
Firm controls	Yes
Risk factors	Yes
Observations	34,689
Firms	613
R ²	0.97

A one SD increase in EnvP news is associated to a -0.3% drop in excess returns for firms with GHG emissions one SD above the sample mean [▶ VC firm results](#)

Measuring environmental policy

- Data

- Environmental Policy Index

- Topic-specific indexes

EnvP news and clean investments

- Aggregate clean investments - VAR models

- Firm-level estimations

Conclusions

Conclusions and next steps

- ▶ News provide a very rich dataset covering many environmental topics at high frequency
- ▶ Novel methods based on text-mining ML algorithms to extract information from news
- ▶ Meaningful relationship between our news-based index and clean markets → firms exposed to environmental policy respond to EnvP news
- ▶ Ongoing work on news-index to measure uncertainty about environmental policy (rollbacks, awaiting decisions from courts, etc)

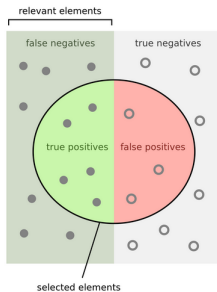
Supplementary Slides

Our codebook

0	Article is about foreign (non US) environmental policy (and is not discussed/compared to or in relation to US env policy)	
RELEVANT below		
1	<p>Article is about environment/climate, with minor but significant (=explicit and specific, not a general statement) reference to environmental policy. (even if it's a opinion piece)</p> <ul style="list-style-type: none">- Article is about local environmental impacts in a very specific geographical area, with some reference to <i>state or federal</i> env/climate policy- Note: env policy implies legislation, laws, but also the financing of <u>large</u> demonstration projects, renewable power plants, etc by a (local) <u>public</u> authority.	

Figure: Excerpt from our codebook

Precision & Recall



How many selected items are relevant?

$$\text{Precision} = \frac{\text{true positives}}{\text{true positives} + \text{false positives}}$$

How many relevant items are selected?

$$\text{Recall} = \frac{\text{true positives}}{\text{true positives} + \text{false negatives}}$$

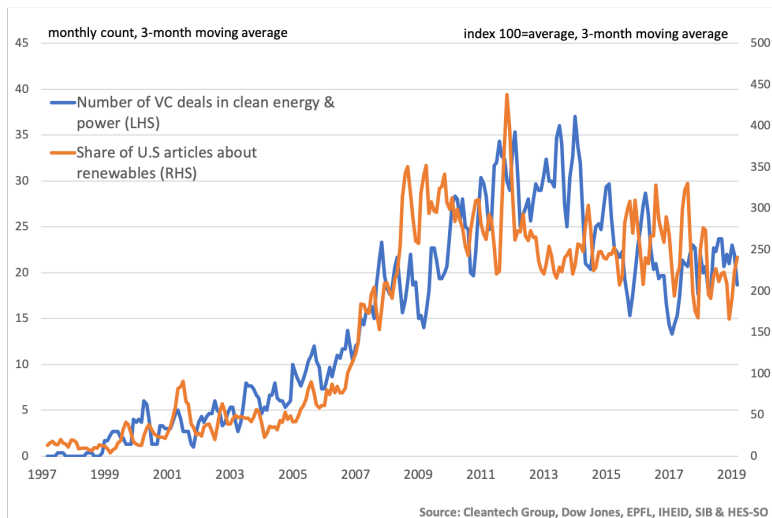
▶ Back

Articles with highest SVM score

Title	Date	SVM	Newspaper	Excerpt
<i>Time to Confront Climate Change</i>	Dec 28, 2012	4.78	New York Times	"That ruling, known as the endangerment finding, made possible the administration's historic new emissions standards for cars and light trucks. It also provided the basis for the first steps toward regulating emissions from new power plants, and, possibly, further steps requiring existing plants to reduce global warming pollution."
<i>Environmentalists, Industry Air Differences on Pollution</i>	Oct 17, 1999	4.66	Washington Post	"As a result, environmental groups are pressing states and Congress for specific environmental protections against increased pollution, financial incentives for energy efficiency and renewable energy, and federal pollution guidelines to be part of the overall deregulatory effort."
<i>Trump can't do much to worsen climate change</i>	Apr 2, 2017	4.64	Washington Post	"Trump does not want to regulate carbon or other fossil-fuel-related pollutants under the Clean Air Act, but the statute and the Supreme Court say that he must. As Trump repeals the Clean Power Plan and updated limits on mercury, coal ash and smog, he will face legal challenges that he may well lose."
<i>On Environmental Rules, Bush Sees a Balance, Critics a Threat</i>	Feb 23, 2003	4.55	New York Times	"Whether rejecting a treaty on global warming, questioning Clinton-era rules on forest protection or pressing for changes in landmark environmental laws, Mr. Bush has imposed a distinctive stamp on a vast landscape of issues affecting air, water, land, energy and the global climate."
<i>Candidates Agree World Is Warming, but Talk Stops There</i>	Oct 26, 2012	4.48	New York Times	"Mr. Obama has supported broad climate change legislation, financed extensive clean energy projects and pushed new regulations to reduce global warming emissions from cars and power plants."

▶ Back

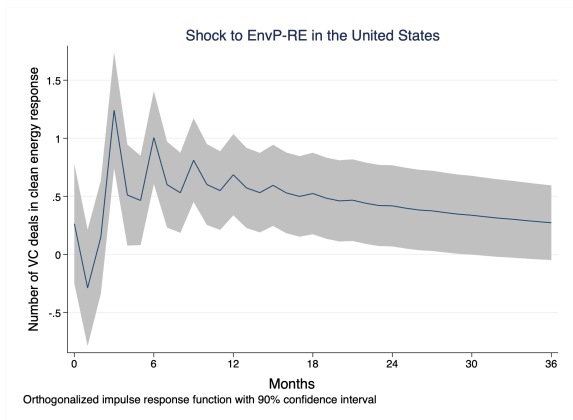
Clean-energy VC deals (1)



Source VC deals: Cleantech Group i3 database, 1997-2019, monthly number of deals in Clean-energy.

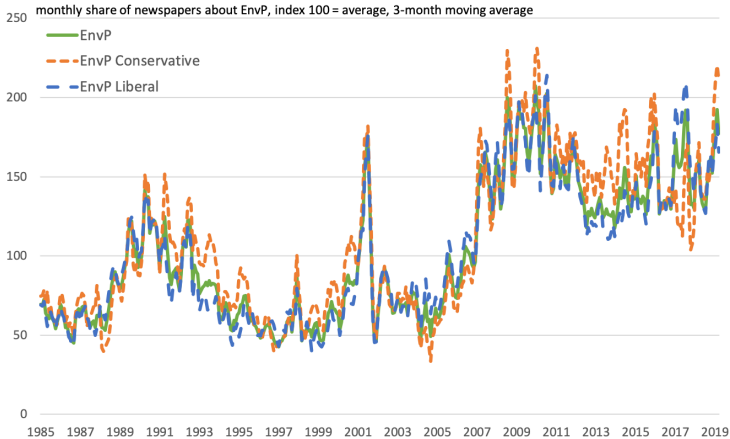
Clean-energy VC deals (2)

Impulse response function: effect of a shock in Env-RE news on number of VC deals.



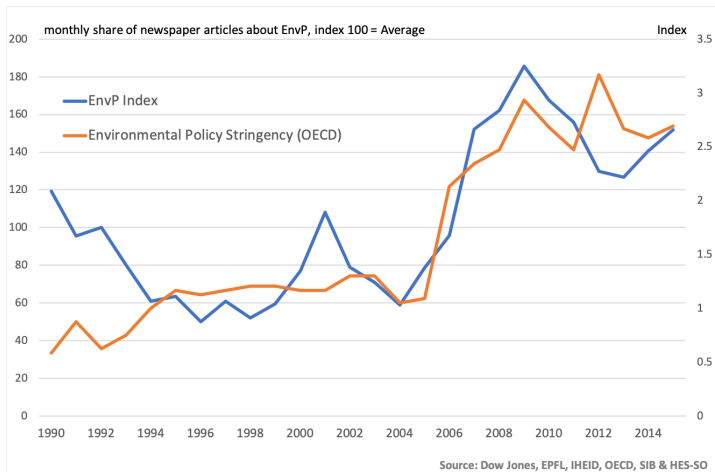
A one-SD increase in EnvP-RE news is associated with nearly one more VC deal in Clean-energy three months after the shock.

Political slant?



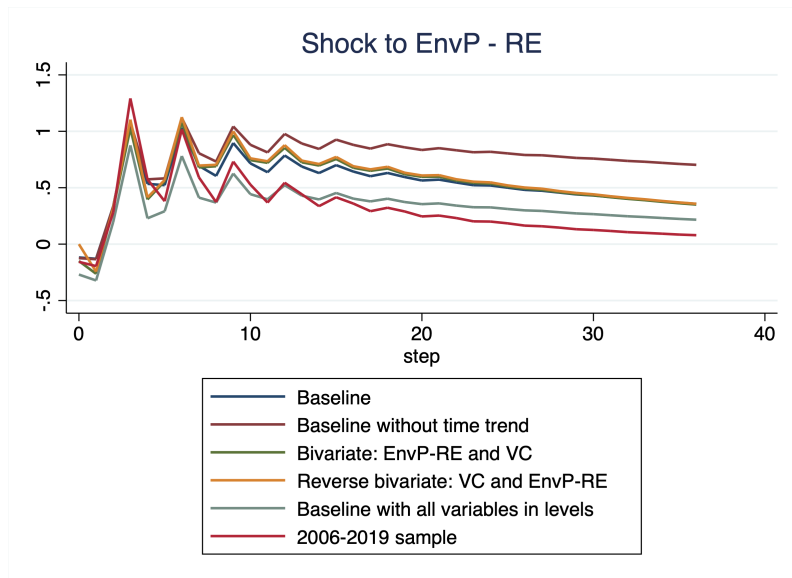
Conservative-leaning – WSJ, Houston Chronicle, Boston Herald, Dallas Morning News. **Liberal-leaning** – NYT, Washington Post, SFC, Tampa Bay Times, San Diego Union Tribune and San Jose Mercury News.

EnvP Index vs OECD Stringency Index



▶ Back

Robustness VAR VC



Variables and Cholesky ordering in VAR VC deals

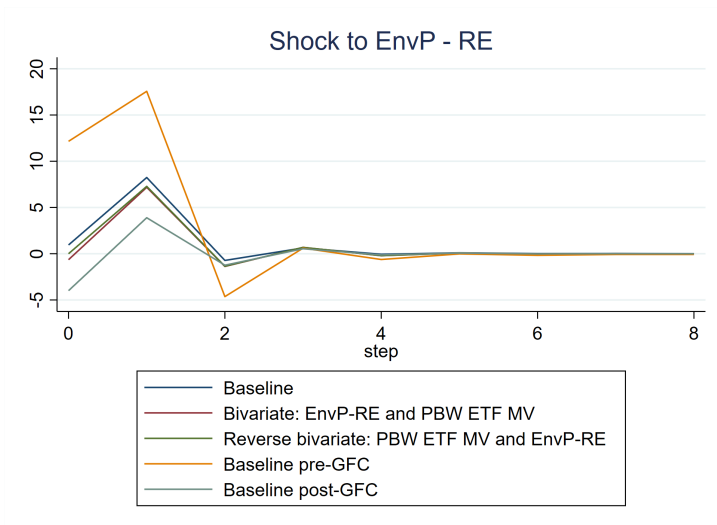
Table: Baseline VAR VC deals

Variables	Version used	Cholesky ordering
Our EnvP-RE policy index	Levels	1
US West Texas Intermediate crude oil spot price	Log diff	2
GDP	Log diff	3
Federal funds effective rate	First diff	4
Number of VC deals in Clean-energy	Levels	5

Time trend; 3 lags.

▶ Back

Robustness VAR stock



Estimated effect of a shock in EnvP-RE news index on PBW-ETF market cap changes, monthly

Variables and Cholesky ordering in VAR stock

Table: Baseline VAR stock

Variables	Version used	Cholesky ordering
Our EnvP-RE policy index	Log diff	1
US West Texas Intermediate crude oil spot price	Log diff	2
Federal funds effective rate	First diff	3
NYSE Arca Technology Stock Index	Log diff	4
WilderHill Clean-energy Stock Index	Log diff	5

No time trend; 2 lags.

▶ Back

Firm-level VC investments (1)

- ▶ Crunchbase: 31,808 active startup firms, venture capital funding rounds over Jan 1998-Mar 2019, firm-quarter panel dataset
- ▶ Estimate impact on EnvP news on probability of receiving VC funding (and amount) in next quarter
- ▶ Identification strategy differentiates startups by exposure to environmental policy → **cleantech** vs. other startups
- ▶ Cleantech = 4% , Clean-energy = 2.4% of VC deals
- ▶ Controls: GDP growth, Fed funds rate, oil price, firm's age

$$VC_{i,t+s} = \alpha + \beta_1 EnvP_t + \beta_2 EnvP_t \cdot Cleantech_i + \beta_3 Controls_{i,t} + \beta_4 TimeTrend_t + \gamma_{quarter/year/industry/state/series} + \epsilon_{i,t}$$

Firm-level VC investments (2)

	(1)	(2)	(3)	(4)	(5)
	Funded (Q+1)	Funded (Q+1)	Funded (Q+1)	Amount (Q+1)	Amount (Q+1)
Log EnvP index	0.00470*** (0.00121)	-0.00529*** (0.00195)	-0.00522** (0.00214)	-0.114** (0.0467)	-0.127*** (0.0467)
Cleantech	-0.126*** (0.0162)	-0.124*** (0.0197)	-0.113*** (0.0200)	-1.707*** (0.586)	-2.736*** (0.614)
Log EnvP x Cleantech	0.0272*** (0.00332)	0.0278*** (0.00461)	0.0209*** (0.00481)	0.391*** (0.119)	0.760*** (0.136)
Log Sentiment Index			-0.00148*** (0.000573)		
Log Sentiment x Cleantech			0.00504*** (0.00171)		
Industry controls	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes
Quarter FE	No	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes
State FE	No	Yes	Yes	Yes	Yes
Industry-time trend	No	Yes	Yes	No	Yes
Series FE	No	Yes	Yes	No	Yes
Observations	1056221	1056221	980975	57319	57319
R ²	0.003	0.006	0.006	0.133	0.135

A doubling of EnvP media coverage is associated with an increase of receiving VC funding by 1.6%-pt (=26% of average probability that a clean-tech startup gets funded). [▶ Back](#)

Topics list

Topic	#	Topic	#	Topic	#
Climate Change	19	Oil & Gas production	15	Vehicle Fuels	12
EPA & Federal Gov.	5	Intl. Climate Negotiations	18	Waste & Recycling	26
Cleanups & Courts	17	Texas	11	Green Buildings	25
Government Budgets	3	Renewables	6	North-East Region	8
Air Pollution	9	Env. Conservation	4	Offshore Oil Drilling	7
Congress & Policy	13	Water Pollution	1	Nuclear Power	21
Businesses & Investments	22	Climate Science	16	Coal Industry	10
Presidents & Campaigns	23	California	14		
Power & Utilities	24	Automobile Industry	2		

Table 4: Topic interpretation and classification (ranked by size). Topic # refers to labels in Figures 5 and 6.

▶ Back