

Paying attention to ESG Matters: Evidence from Big Data Analytics

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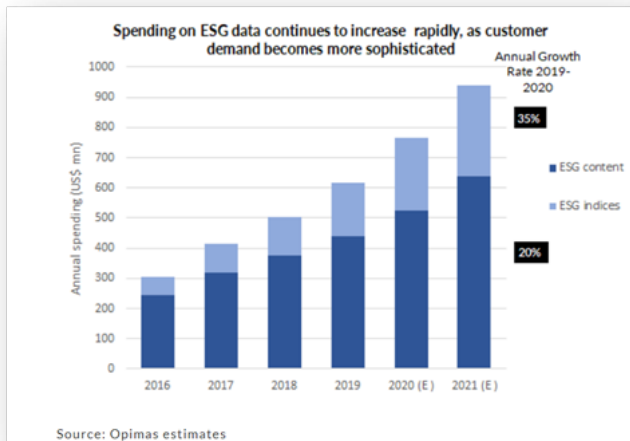
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What do we do in this paper?

- **We introduce novel approach to ESG:** Working with a leading data analytics firm (“The Company”) we leverage a billion daily web content interactions to identify “ESG attention”
- **Spikes in ESG attention by both firms and investors matter**
 - Are associated with positive E & S outcomes (increased benefits, green production facility upgrades) and higher ESG ratings
 - Pro-social actions by investors : voting and trading toward stocks with better ESG ratings
 - Placebo effect absent from non-ESG topics
 - Finally, we discuss implications for existing ratings

Fast-growing ESG data market

- ESG data spending is growing 20% per year
- ESG data market forecasted to approach \$1 billion by 2021



The No. 1 ESG challenge organizations face: data

Data issues biggest barrier to greater ESG adoption, survey finds

OCT 21, 2021

Global study of 1,000 investors by Capital Group highlights need for data alignment and preference for active management

- Issues and concerns of ESG data
 - Divergence in the metrics and methodologies among ESG data providers
 - Firm's sustainability disclosures are subject to "greenwashing"
 - There are also serious challenges in obtaining coverage related to ESG issues for smaller companies and for certain regions

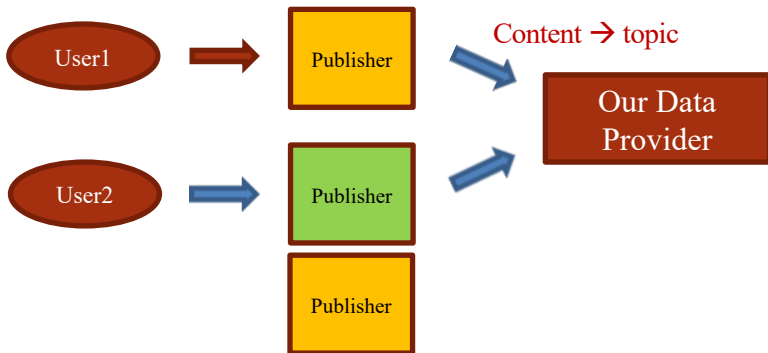
Related literature

- Lack of consistency among ESG ratings
 - Chatterji, Durand, Levine, and Touboul (2016); Berg, Koelbel, and Rigobon (2019); Gibson, Krueger, Riand, and Schmidt (2019); Matos (2020)
 - Greenwashing: Yang (2019); Raghunandan and Rajgopal (2020)
- Attention literature
 - Occasion '97, Dessen et al '16, Kacperczyk '16
- Digital footprints literature
 - Berg, Burg, Gambovic and Puri (2020)

Unique data

- From a genre of digital marketing data called “intent data”
 - Businesses as online shoppers
 - Map each IP or profile to a firm, where available (survives WFH), map content to topic

Profile mapped to organization/firm



Digital footprints

Year	# Topics	# Domains	Domain-mapped Business-Related Interactions Per Day
2015	2462	1677494	(not available)
2016	2962	1819851	506892107
2017	3589	4303994	686276353
2018	5433	5473714	623016344
2019	6765	6907293	272946594

Handpick ESG topics

Category Name	# topics
Compliance	18
Corporate Governance	29
CSR	28
Customer Relation	23
Cybersecurity	39
Data and Sensitive Information Protection	40
Environment	46
Equality & Diversity	21
Labor Relation	63
Total	323

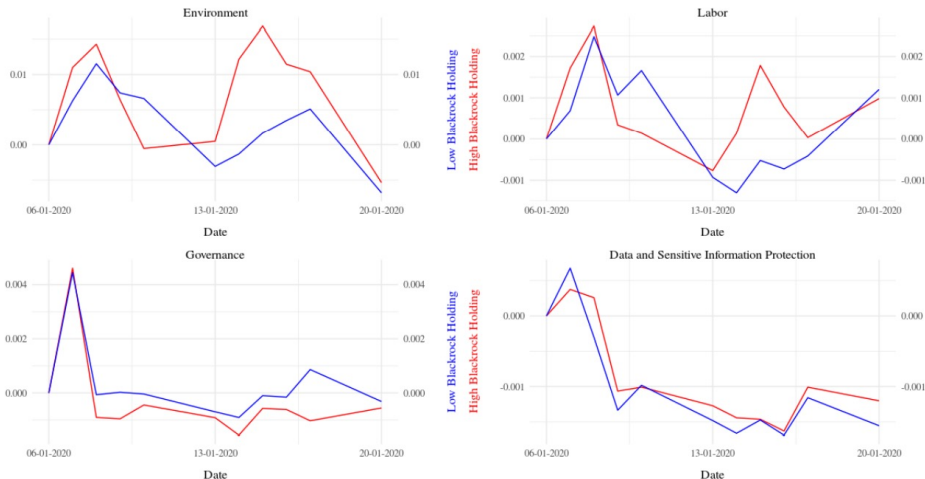
ESG topics

Environment	Labor	Compliance	Data and Sensitive Information Protection
Air Pollution	Diversity Recruiting	Accounting Compliance	Data Privacy and Protection
Alternative-Fuel Vehicles	Employee Safety	Business Law	Data Security
Carbon Footprint	Employee Satisfaction	Compliance	Enterprise Application Security
Carbon Management	Equal Employment Opportunity (EEO)	Compliance Management	Information Security
Climate Change	Equal Pay / Comparable Worth	Compliance Training	Internet Security
Emissions	Gender Equality	Global Employment Law	Intrusion Prevention

The Fink Letter

Figure 2: Firm Attentional Responses to BlackRock's Larry Fink letter on January 14, 2020.

In this figure, we plot the reading intensity of firms surrounding the day of January 14, 2020 on which Larry Fink of Blackrock issued the letter to CEOs regarding sustainability, emphasizing climate issues (although not exclusively). The y-axis is the percentage of total reading that are related to any ESG category for firms in the top 10% of Blackrock holdings versus the firms in the bottom 10% (including those firms where Blackrock had zero holdings), normalized to be 0 on January 6. The ESG category chosen are Environmental, Governance, Labor, and Data and Sensitive Information Protection.



Measuring topic interest

- Nearly 10,000 business topics
 - For each article, obtain 50-100 matching articles
 - Train a classifier engine to identify the topic relevancy
- **For each topic-firm-day**, have the count of (1) articles read, (2) total relevancy score summed, and (3) number of people at the firm
- Normalize either by
 - The firm's total (percentage of attention) or cross-sectional mean (absolute attention)

$$\tilde{r}_d^t := \frac{r_d^t - \hat{R}_{1:D}^t}{\hat{\sigma}_{1:D}^t},$$

Normalized score

$$\tilde{c}_d^t = \frac{c_d^t}{C_d}.$$

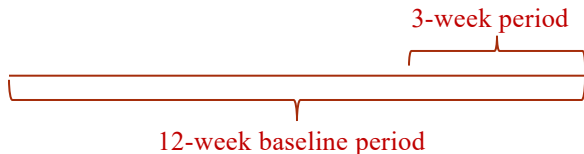
Normalized record

$$\tilde{u}_d^t = \frac{u_d^t}{U_d}.$$

Normalized user

Spikes in attention

- Weekly index score (primary dataset, long history)
 - Start from May 2015
 - “Spike score” for each firm-topic-week
 - Percentile of normalized daily features in the recent period (chosen as 3 weeks) against the baseline period (12 weeks prior)
 - Quantile-based measure --- range from 0 to 100
 - 50 means holds steady, > 50 means increasing interest



ESG measure

- Measure of ESG attention

$$Spikes^{ESG} = \sum_t \sum_j 1\{Spike\ score_{j,t} \geq 80\}$$

Similar to Ben-Rephael, Da, and Israelsen (2017)

- A toy example
 - Consider a firm-month with 4 weeks and 5 topics
 - The two ESG topics are “Charitable Giving” and “Climate Change”, and the three non-ESG topics are “Innovation”, “ROA” and “Brand Loyalty”
 - $Spikes^{ESG}$ is 2 and $Spikes^{Not\ ESG}$ is 2

	Charitable Giving	Climate Change	Innovation	ROA	Brand Loyalty
Week1	17	51	24	80	NA
Week2	20	69	56	61	31
Week3	21	83	78	49	36
Week4	29	85	81	36	38

Overview

- A desirable ESG rating is **real-time, has broad coverage, granular coverage of issues, and accurately assesses ESG performance**
- A joint hypothesis whether our rating or firms' rating is most accurate
 - Benchmark against real outcomes as a baseline
- Turn over to investors for results

Firm-level results

Firm's ESG attention

Firm + time FE

$$ESG\ rating_{i,t} = \beta_1 * \log(1 + Spikes^{ESG})_{i,t} + \beta_2 * \log(1 + Spikes^{Not\ ESG})_{i,t} + \mu_i + \mu_t$$

- Real ESG outcomes (Validation of $Spikes^{ESG}$)
 - Upgrade with green technologies from EPA TRI program
 - Worker benefits from Form 5500
 - OSHA penalties and unplanned inspections
- Assess three ESG ratings
 - Refinitiv ASSET4, RepRisk, MSCI KLD

Real ESG outcomes --- EPA pollution prevention

1 sd \uparrow in ESG attention \rightarrow 12% sd \uparrow in firm's "Green Actions"

	# Green Facilities				
	(1)	(2)	(3)	(4)	(5)
$\text{Log}(1 + \text{Spikes}^{\text{ESG}})$	0.020*** (0.005)	0.029*** (0.008)	0.12**	0.21** (0.009)	0.047** (0.019)
$\text{Log}(1 + \text{Spikes}^{\text{Not ESG}})$		-0.010 (0.008)		-0.011 (0.010)	
Sample	All		No KLD rating		Control for KLD
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	14,590	14,590	12,215	12,215	2,375
Adjusted R ²	0.585	0.585	0.749	0.749	0.443

Environmental topics drive the result .

Predicting ESG ratings

	Asset4	KLD Literature Standard	Adjusted KLD $\frac{str-con}{ str + con }$	Reprisk
	(2)	(3)	(4)	(4)
$\text{Log}(1+\text{Spikes}^{ESG})$	1.031** (0.422)	-0.132 (0.082)	5.367** (2.089)	-0.203*** (0.065)
$\text{Log}(1+\text{Spikes}^{Not\ ESG})$	-0.514 (0.357)	0.099 (0.069)	0.284 (1.993)	-0.133** (0.064)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	6,759	7,396	5,894	59,413
Adjusted R ²	0.677	0.612	0.689	0.706

Investor-level tests

- Mutual fund voting data from ISS Voting Analytics
 - ISS provides each fund's voting record for each proposal during the shareholder meeting
 - Each voting record is classified as “For”, “Against” and “Abstain”
 - We keep ESG-related proposals based on ISS categories
- Trading activity by investors

Investor voting

Investor's ESG attention	Fund vote for ESG				
	All	All	All	E&S	Gov
	(1)	(2)	(3)	(4)	(5)
$\text{Log}(1 + \text{Spikes}^{\text{ESG}})$	0.721*** (0.251)	1.183*** (0.373)	1.177*** (0.373)		
$\text{Log}(1 + \text{Spikes}^{\text{Not ESG}})$		-0.541* (0.291)	-0.534* (0.291)		
$\text{Log}(1 + \text{Spikes}^{\text{Environ}})$				0.672* (0.370)	0.495 (0.440)
$\text{Log}(1 + \text{Spikes}^{\text{Labor}})$				-0.398 (0.484)	0.682 (0.539)
$\text{Log}(1 + \text{Spike}^{\text{Social}})$				-0.491 (0.343)	0.636 (0.500)
$\text{Log}(1 + \text{Spikes}^{\text{Govern}})$				-0.922*** (0.356)	1.160*** (0.436)
ISS Vote	No	No	Yes	Yes	Yes
Management Vote	No	No	Yes	Yes	Yes
Meeting FE	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes
Observations	457,454	457,454	457,454	224,333	233,121
Adjusted R ²	0.486	0.486	0.567	0.504	0.548

Investor trading activity

ESG Score:	KLD1		Refinitiv ^{Combined}		Refinitiv ^{ESG}		% Peak RRI 50	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\text{Log}(1 + \text{Spikes}^{\text{ESG}})$	0.992*** (0.310)	1.063*** (0.395)	1.399*** (0.359)	1.787*** (0.443)	0.633* (0.330)	1.053*** (0.388)	-0.693** (0.321)	-0.867** (0.406)
$\text{Log}(1 + \text{Spikes}^{\text{Non ESG}})$		-0.074 (0.345)		-0.409 (0.396)		-0.444 (0.330)		0.184 (0.360)
Port Size	1.333 (1.284)	1.334 (1.284)	2.578 (1.629)	2.586 (1.629)	-0.183 (1.637)	-0.175 (1.637)	-7.768*** (1.631)	-7.771*** (1.631)
Port Return	-14.906*** (5.218)	-14.910*** (5.219)	-11.681* (6.832)	-11.718* (6.833)	-2.550 (6.021)	-2.590 (6.023)	3.734 (5.082)	3.748 (5.084)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45,748	45,748	45,530	45,530	45,530	45,530	45,870	45,870
Adjusted R ²	0.868	0.868	0.831	0.831	0.876	0.876	0.867	0.867

Conclusions /implications

- There are numerous other sensitivity analyses we conducted / are planning
- Contributions
 - To our best knowledge, we are the first to directly measure firm's and investor's attention to ESG, which provides a novel approach to measuring ESG which helps mitigate existing ESG issues
 - Existing ratings appear to lack timeliness, accuracy coverage and the ability to predict investor actions / real outcome, which our rating provides
 - However, the ratings themselves bear some relation to the existing ratings

Thank you for listening!