ESG news spillovers across the value chain

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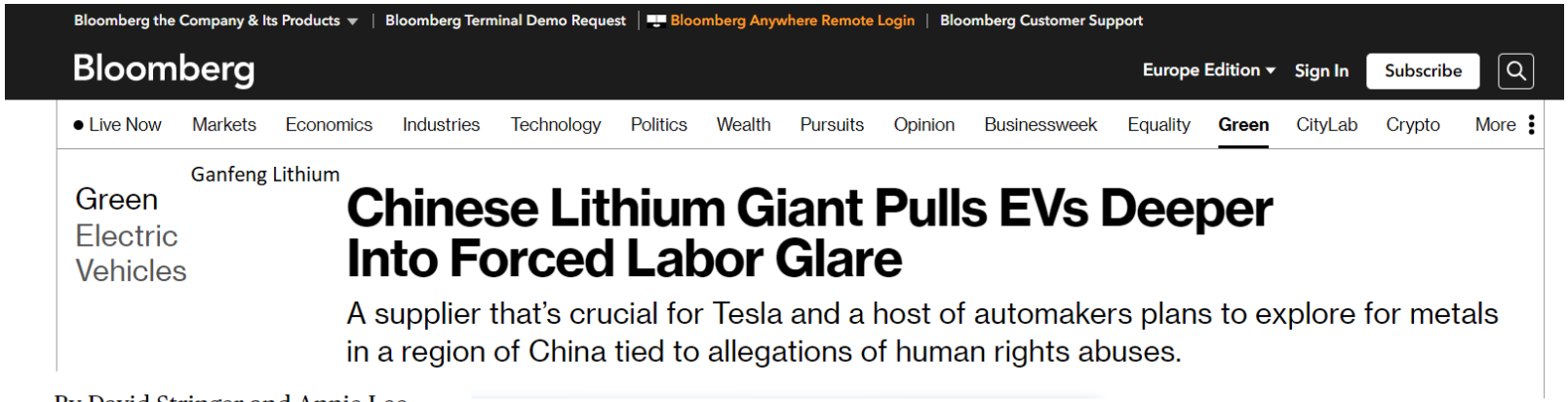
By Juliana Liu, CNN Business

Updated 5:33 AM EST, Sat November 26, 2022

Motivation



By David Stringer and Annie Lee
July 18, 2022 at 12:00 AM GMT+2

From **Hyperdrive**

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Literature & research question

- ESG investment is a current **leading trend** for investors, regulators, and, ultimately, to the real economy (firms).
- ESG preferences: investors are willing to pay extra for ESG friendly stocks *presently* $\rightarrow$ lower *expected* return (Pástor et al., 2021; Avramov et al., 2022).
- And at the same time, positive ESG shocks $\rightarrow$ price appreciation (Pástor et al., 2022; Serafeim and Yoon, 2022b,a).
- **Question**: is there *spill-over effect* of ESG shocks from *customer to supplier* firms and vice versa?

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Summary & contributions

- **Direct** Channel: ESG shocks $\rightarrow$ stocks return intra-daily *conditioning* on the *current* ESG profile.
- **Indirect** Channel: ESG shocks $\rightarrow$ stocks return of customer/supplier firms *conditioning* on the *current* company's ESG profile. However, the effects take some days.
- Direct and Spill-over effect is stronger after the **Paris Agreement**.
- ESG spill-over is more salient in small stocks, in low ESG-attention stocks, and is robust to other fundamental spillovers
- The regressions are inspired by a stylized theoretical model.

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Data & estimation specifications

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Data and notations

We aggregate 3 sources:

- **Truvalue** for daily ESG news data, with 2 sets of news: generic ESG (**ACP** = all categories pulse) and material ESG (**MP**) - normalized to $[0, 1]$ in the cross-section for each date;
- **FactSet** for prices and returns;
- **FactSet Revere** for the supply chain relationships.

For simplicity, we only consider the *largest* suppliers and providers. In addition, we rely on **Fama-French 5 factors** and **momentum** to control for the usual asset pricing effects.

$\rightarrow$ The data covers the 2007-2021 period.

Notations and main equation

- $r_{t,n}$ is the return of the firm n at time t, and $r_{t,f}$ the risk-free rate;
- $g_{t,n}$ is the time-t ESG score of firm n, Δg will denote the shock;
- Superscripts *Sup* will stand for *suppliers* and *Cus* for *customers*.

The model for the estimation of the **direct effect** is:

$$r_{t,n} - r_{t,f} = \underbrace{\sum_{j=0}^{3} \theta_j \Delta g_{t-j,n}}_{\text{ESG shocks}} + \underbrace{\sum_{j=0}^{3} \beta_j g_{t-1,n} \times \Delta g_{t-j,n}}_{\text{cross-effects}} + \underbrace{\cdots}_{\text{controls}} + \varepsilon_{t,n}$$

Standard errors post-estimation are clustered to account for correlations across time and firms.

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Indirect models

The indirect estimations follow the same lines, with returns on the left that are decoupled from variables on the right:

$$r_{t,n}^{Sup} - r_f = \sum_{j=0}^{3} \theta_j^{Cus} \Delta g_{t-j,n}^{Cus} + \sum_{j=0}^{3} \beta_j^{Cus} g_{t-1,n}^{Sup} \times \Delta g_{t-j,n}^{Cus} + \dots + \varepsilon_{t,n}$$

$$r_{t,n}^{Cus} - r_f = \sum_{j=0}^{3} \theta_j^{Sup} \Delta g_{t-j,n}^{Sup} + \sum_{j=0}^{3} \beta_j^{Sup} g_{t-1,n}^{Cus} \times \Delta g_{t-j,n}^{Sup} + \dots + \varepsilon_{t,n}$$

In this case, controls include ESG levels and shocks related to the variables on the left.

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Empirical results

Baseline results

Direct ESG shock

Table: **Panel regression of the effect of ESG shocks to returns**

Variable \ Model:	(1) $g = ACP$	(2) $g = MP$
L(Δ g,3)	0.0008 (0.866)	0.0009 (0.815)
L(Δ g,2)	0.002* (2.31)	0.002* (2.08)
L(Δ g,1)	-7.88e-5 (-0.066)	0.0003 (0.234)
Δ g	0.012** (6.91)	0.010** (4.91)
L(Δ g,3) × L(g,1)	-0.0004 (-0.281)	-0.002 (-0.953)
L(Δ g,2) × L(g,1)	-0.003* (-2.01)	-0.004* (-2.47)
L(Δ g,1) × L(g,1)	0.0004 (0.225)	0.0009 (0.467)
Δ g × L(g,1)	-0.025** (-8.02)	-0.018** (-5.28)
Fixed-Effects:		
Firm id	Yes	Yes
Time via Factors' return	Yes	Yes
VCOV: Clustered	Firm & Date.	Firm & Date.
Observations	10 089 466	8 970 685
R2	0.03003	0.02804

→ **bottomline**: significant *synchronous* direct effect.

The negative cross term mitigates the magnitude of the shocks.

Impact of ESG level

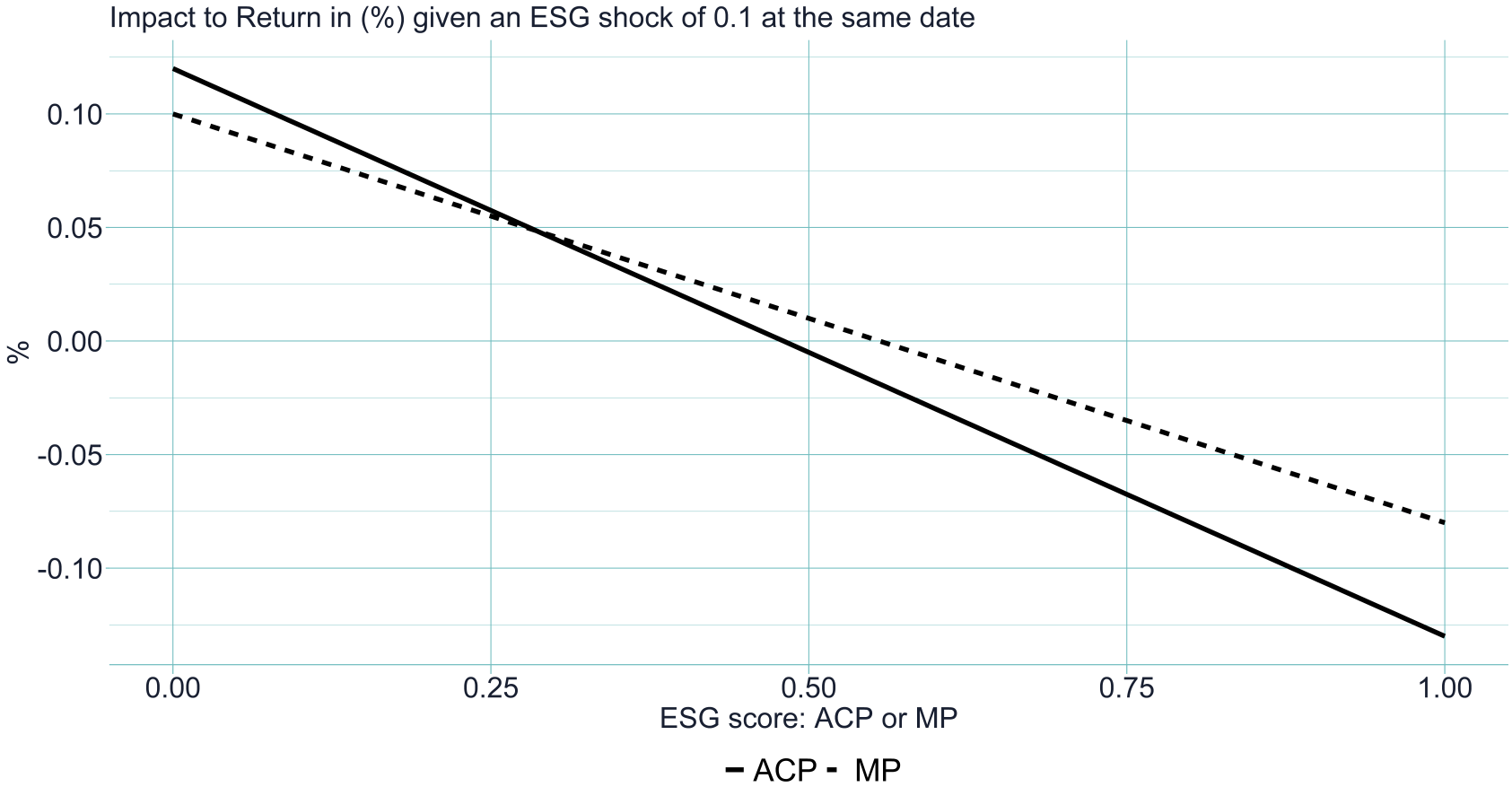

Figure: **Impact to daily return (in %) given an ESG shock (Δg_t) of +0.1 at the same date contingent on different firm's ESG level, g_{t-1}.** The plot shows $\tilde{r}_t(g_{t-1}) = (\theta_0 + \beta_0 \times g_{t-1})\Delta g_t$, with $\Delta g_t = 0.1$, θ_0, and β_0 from Table 1.

$\rightarrow$ surprising/counter-intuitive result: high ESG firms risk facing negative effects from a positive shock!

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Baseline results

ESG news shock to suppliers' stock returns

Table: **Panel regression: spillover effect of ESG news from customer to supplier.**

Variable \ Model:	(1) $g = ACP$	(2) $g = MP$
L($\Delta\ g^{Cus}$,3)	0.003* (2.09)	0.003 (1.73)
L($\Delta\ g^{Cus}$,2)	-0.003 (-1.84)	0.0001 (0.069)
L($\Delta\ g^{Cus}$,1)	-0.0007 (-0.458)	-0.005** (-2.90)
$\Delta\ g^{Cus}$	-0.0004 (-0.224)	-0.002 (-1.26)
L($\Delta\ g^{Cus}$,3) $\times$ L(g^{Sup},1)	-0.005* (-2.08)	-0.004 (-1.44)
L($\Delta\ g^{Cus}$,2) $\times$ L(g^{Sup},1)	0.002 (0.651)	-0.0007 (-0.284)
L($\Delta\ g^{Cus}$,1) $\times$ L(g^{Sup},1)	0.0007 (0.297)	0.008** (2.96)
$\Delta\ g^{Cus}$ $\times$ L(g^{Sup},1)	-2.61e-6 (-0.0010)	0.003 (1.14)
Fixed-Effects:		
Supplier ID	Yes	Yes
Time via Factors' return	Yes	Yes
Cluster	Supplier ID and Date	Supplier ID and Date
Observations	4 496 060	4 031 087
R2	0.1487	0.14712

$\rightarrow$ effect no longer synchronous (shocks diffuse) & ESG score types matter. Cross effect still here.

Baseline results

ESG news shock to customers' stock returns

Table: **Panel regression of the spillover effect of ESG news from supplier to customer**

Model:	(1) $g = ACP$	(2) $g = MP$
L($\Delta\ g^{Sup}$,3)	-0.004* (-1.98)	-0.004 (-1.43)
L($\Delta\ g^{Sup}$,2)	-4.43e-5 (-0.027)	0.004* (2.38)
L($\Delta\ g^{Sup}$,1)	-0.0002 (-0.074)	-3.37e-5 (-0.015)
$\Delta\ g^{Sup}$	0.003 (1.21)	0.0008 (0.402)
L($\Delta\ g^{Sup}$,3) $\times$ L(g^{Cus},1)	0.005 (1.72)	0.005 (1.19)
L($\Delta\ g^{Sup}$,2) $\times$ L(g^{Cus},1)	0.0004 (0.130)	-0.008** (-2.73)
L($\Delta\ g^{Sup}$,1) $\times$ L(g^{Cus},1)	0.001 (0.309)	0.001 (0.369)
$\Delta\ g^{Sup}$ $\times$ L(g^{Cus},1)	-0.005 (-1.48)	-0.001 (-0.393)
Fixed-Effects:		
Customer ID	Yes	Yes
Time via Factors' return	Yes	Yes
Cluster	Customer ID and Date	Customer ID and Date
Observations	3 520 532	3 142 980
R2	0.09405	0.08975

$\rightarrow$ similar conclusions here!

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Economic significance - Doubly sorted portfolios

Table: **Double Sorting Portfolios based on ESG shocks from customer/supplier firms while controlling for the firm's ESG level**. The α is in percentage.

Panel A: From Customer To Supplier

	A1: $g = ACP$			A2: $g = MP$		
Signal	Portfolio	H-L Annualized SR	H-L Annualized α	Portfolio	H-L Annualized SR	H-L Annualized α
L($\Delta\ g^{Cus}$,1)	EW	0.44	3.46 (1.55)	EW	0.39	4.4 (1.51)
	VW	0.52	3.92 (1.68)	VW	0.39	4.85 (1.63)
L($\Delta\ g^{Cus}$,2)	EW	0.09	1.21 (0.49)	EW	0.04	1.11 (0.33)
	VW	0.10	1.24 (0.47)	VW	0.07	1.64 (0.52)
L($\Delta\ g^{Cus}$,3)	EW	0.17	2.07 (0.8)	EW	0.50	6.77* (1.98)
	VW	-0.06	-0.31 (-0.11)	VW	0.59	8.28* (2.36)

Panel B: From Supplier To Customer

	B1: $g = ACP$			B2: $g = MP$		
Signal	Portfolio	H-L Annualized SR	H-L Annualized α	Portfolio	H-L Annualized SR	H-L Annualized α
L($\Delta\ g^{Sup}$,1)	EW	0.28	5.00 (1.04)	EW	0.10	0.93 (0.29)
	VW	0.41	8.05 (1.47)	VW	0.30	4.33 (1.03)
L($\Delta\ g^{Sup}$,2)	EW	0.42	5.65 (1.64)	EW	0.16	2.51 (0.56)
	VW	0.05	0.95 (0.21)	VW	-0.02	-0.72 (-0.14)
L($\Delta\ g^{Sup}$,3)	EW	-0.59	-7.1* (-2.06)	EW	0.07	1.31 (0.34)
	VW	-0.38	-5.49 (-1.3)	VW	0.13	1.95 (0.42)

$\rightarrow$ **disappointing**: hard to make money with daily ESG shocks!

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Extensions: further results

Chronological subsampling

Direct ESG shock pre- and post- Paris Agreement

Table: **Panel regression of the effect of ESG shocks to returns before and afer 2017.**

	Panel A: Before 2017		Panel B: After 2017	
Model	(1) $g = ACP$	(2) $g = MP$	(3) $g = ACP$	(4) $g = MP$
L(Δ g,3)	0.0006 (0.525)	0.001 (0.876)	0.0008 (0.554)	0.0002 (0.133)
L(Δ g,2)	0.002 (1.76)	0.003* (2.03)	0.002 (1.31)	0.001 (0.809)
L(Δ g,1)	0.0001 (0.102)	0.0010 (0.596)	-0.0007 (-0.334)	-0.0009 (-0.407)
Δ g	0.008** (4.68)	0.007** (3.70)	0.018** (5.28)	0.014** (3.47)
L(Δ g,3) $\times$ L(g,1)	-0.0002 (-0.089)	-0.001 (-0.531)	-0.0004 (-0.162)	-0.002 (-0.739)
L(Δ g,2) $\times$ L(g,1)	-0.002 (-1.36)	-0.004 (-1.84)	-0.004 (-1.37)	-0.005 (-1.63)
L(Δ g,1) $\times$ L(g,1)	-7.39e-5 (-0.034)	-0.0004 (-0.147)	0.002 (0.498)	0.003 (0.961)
Δ g $\times$ L(g,1)	-0.018** (-5.69)	-0.014** (-3.77)	-0.037** (-5.93)	-0.024** (-3.82)
Fixed-Effects:				
Firm id	Yes	Yes	Yes	Yes
Time via Factors' return	Yes	Yes	Yes	Yes
Cluster	Firm ID and Date	Firm ID and Date	Firm ID and Date	Firm ID and Date
Observations	6 307 257	5 461 448	3 775 309	3 502 891
R2	0.0203	0.0182	0.12465	0.12582

$\rightarrow$ same patterns, but coefficients are twice larger post-2017.

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Chronological subsampling

ESG news shock to suppliers' stock returns pre- and post- Paris Agreement

Table: **Panel regression of the spillover effect of ESG news from customer to supplier before and after 2017.**

	Panel A: Before 2017		Panel B: After 2017	
Model	(1) $g = ACP$	(2) $g = MP$	(3) $g = ACP$	(4) $g = MP$
L($\Delta\ g^{Cus}$,3)	0.002 (1.20)	0.001 (0.654)	0.005 (1.70)	0.005 (1.79)
L($\Delta\ g^{Cus}$,2)	-0.003 (-1.55)	0.002 (0.889)	-0.003 (-0.924)	-0.002 (-0.863)
L($\Delta\ g^{Cus}$,1)	0.0003 (0.163)	-0.003 (-1.68)	-0.003 (-0.926)	-0.008* (-2.41)
$\Delta\ g^{Cus}$	-0.001 (-0.731)	-0.002 (-0.890)	0.001 (0.386)	-0.003 (-1.09)
L($\Delta\ g^{Cus}$,3) $\times$ L(g^{Sup},1)	-0.003 (-0.886)	-0.0004 (-0.129)	-0.01* (-1.98)	-0.009 (-1.92)
L($\Delta\ g^{Cus}$,2) $\times$ L(g^{Sup},1)	0.0008 (0.251)	-0.004 (-1.20)	0.003 (0.673)	0.004 (0.841)
L($\Delta\ g^{Cus}$,1) $\times$ L(g^{Sup},1)	-0.0004 (-0.159)	0.005 (1.63)	0.003 (0.718)	0.012* (2.55)
$\Delta\ g^{Cus}$ $\times$ L(g^{Sup},1)	0.001 (0.471)	0.003 (0.856)	-0.003 (-0.512)	0.005 (0.927)
Fixed-Effects:				
Supplier ID	Yes	Yes	Yes	Yes
Time via Factors' return	Yes	Yes	Yes	Yes
Cluster	Supplier ID and Date	Supplier ID and Date	Supplier ID and Date	Supplier ID and Date
Observations	2 763 656	2 415 333	1 729 188	1 612 776
R2	0.16342	0.16001	0.1324	0.13404

$\rightarrow$ statistical significance is concentrated in the **recent** period

Chronological subsampling

ESG news shock to customers' stock returns pre- and post- Paris Agreement

Table: **Panel regression of the spillover effect of ESG news from supplier to customer before and after 2017.**

	Panel A: Before 2017		Panel B: After 2017	
Model	(1) $g = ACP$	(2) $g = MP$	(3) $g = ACP$	(4) $g = MP$
L($\Delta\ g^{Sup}$,3)	-0.001 (-0.706)	-3.27e-5 (-0.014)	-0.006* (-2.03)	-0.008 (-1.65)
L($\Delta\ g^{Sup}$,2)	0.001 (0.522)	0.005* (2.09)	-0.002 (-0.620)	0.004 (1.27)
L($\Delta\ g^{Sup}$,1)	0.0003 (0.081)	0.0006 (0.181)	-0.0009 (-0.353)	-0.0009 (-0.321)
$\Delta\ g^{Sup}$	0.004 (1.62)	0.0008 (0.339)	0.0010 (0.241)	0.0007 (0.200)
L($\Delta\ g^{Sup}$,3) $\times$ L(g^{Cus},1)	0.003 (0.987)	-0.0004 (-0.108)	0.008 (1.41)	0.012 (1.47)
L($\Delta\ g^{Sup}$,2) $\times$ L(g^{Cus},1)	-0.002 (-0.496)	-0.010** (-2.59)	0.003 (0.769)	-0.005 (-1.18)
L($\Delta\ g^{Sup}$,1) $\times$ L(g^{Cus},1)	-0.0005 (-0.104)	-0.0009 (-0.154)	0.004 (0.784)	0.004 (0.887)
$\Delta\ g^{Sup}$ $\times$ L(g^{Cus},1)	-0.007 (-1.86)	0.0006 (0.162)	-0.002 (-0.355)	-0.004 (-0.666)
Fixed-Effects:				
Customer ID	Yes	Yes	Yes	Yes
Time via Factors' return	Yes	Yes	Yes	Yes
Cluster	Customer ID and Date	Customer ID and Date	Customer ID and Date	Customer ID and Date
Observations	1 987 743	1 708 304	1 530 145	1 432 228
R2	0.07738	0.06983	0.12395	0.12478
Within R2	0.07623	0.06859	0.12268	0.1235

Evidence is much more *mixed* here...

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ESG spillover - small vs large stocks

Table: **Panel regression of the spillover effect of ESG news from the supplier firm, and from the customer firm - breakdown on market-size.**

Panel A: From Customer To Supplier

	A1: $g = ACP$			A2: $g = MP$		
Size:	*Big*	*Medium*	*Small*	*Big*	*Medium*	*Small*
L($\Delta\ g^{Cus}$,3)	0.0003 (0.142)	0.004 (1.84)	0.005 (1.45)	-5.82e-5 (-0.039)	0.002 (1.17)	0.007 (1.94)
L($\Delta\ g^{Cus}$,2)	0.0009 (0.486)	-0.003 (-1.33)	-0.006 (-1.78)	0.001 (0.755)	-0.001 (-0.498)	-0.0004 (-0.119)
L($\Delta\ g^{Cus}$,1)	0.001 (0.653)	-1.59e-5 (-0.008)	-0.003 (-0.925)	-0.0004 (-0.251)	8.53e-5 (0.042)	-0.013** (-3.17)
$\Delta\ g^{Cus}$	-7.08e-5 (-0.045)	0.001 (0.724)	-0.003 (-0.736)	-0.0004 (-0.240)	-0.0007 (-0.301)	-0.006 (-1.59)
L($\Delta\ g^{Cus}$,3) × L(g^{Sup},1)	0.0005 (0.153)	-0.007* (-2.18)	-0.009 (-1.55)	-0.0003 (-0.127)	-0.003 (-0.987)	-0.011 (-1.72)
L($\Delta\ g^{Cus}$,2) × L(g^{Sup},1)	-0.004 (-1.14)	0.0003 (0.095)	0.007 (1.22)	-0.002 (-0.641)	-0.0009 (-0.264)	0.001 (0.164)
L($\Delta\ g^{Cus}$,1) × L(g^{Sup},1)	-0.002 (-0.580)	0.002 (0.562)	0.002 (0.348)	0.0004 (0.141)	0.002 (0.709)	0.019** (2.85)
$\Delta\ g^{Cus}$ × L(g^{Sup},1)	0.002 (0.613)	-0.001 (-0.393)	0.0003 (0.045)	0.0001 (0.050)	0.003 (0.728)	0.008 (1.21)
Fixed-Effects:						
Supplier ID	Yes	Yes	Yes	Yes	Yes	Yes
Time via Factors' return	Yes	Yes	Yes	Yes	Yes	Yes
VCOV: Clustered	Supplier ID and Date	Supplier ID and Date	Supplier ID and Date	Supplier ID and Date	Supplier ID and Date	Supplier ID and Date

Panel B: From Supplier To Customer

	B1: $g = ACP$			B2: $g = MP$		
Size:	*Big*	*Medium*	*Small*	*Big*	*Medium*	*Small*
L($\Delta\ g^{Sup}$,3)	0.0009 (0.490)	-0.0002 (-0.123)	-0.01* (-2.33)	0.002 (1.08)	0.0006 (0.268)	-0.013 (-1.78)
L($\Delta\ g^{Sup}$,2)	0.001 (0.648)	0.0003 (0.122)	-0.0005 (-0.152)	0.002 (1.16)	0.003 (1.28)	0.006 (1.62)
L($\Delta\ g^{Sup}$,1)	-0.003 (-1.80)	0.0008 (0.363)	0.002 (0.357)	-0.002 (-0.934)	0.001 (0.422)	0.002 (0.383)
$\Delta\ g^{Sup}$	0.002 (1.29)	7.36e-5 (0.036)	0.006 (1.12)	0.0006 (0.408)	-0.0004 (-0.166)	0.003 (0.561)
L($\Delta\ g^{Sup}$,3) × L(g^{Cus},1)	-0.002 (-0.598)	-0.0005 (-0.131)	0.017* (2.38)	-0.004 (-1.11)	-0.001 (-0.290)	0.018 (1.60)
L($\Delta\ g^{Sup}$,2) × L(g^{Cus},1)	-0.003 (-0.981)	0.0004 (0.112)	0.003 (0.533)	-0.004 (-1.55)	-0.005 (-1.18)	-0.012 (-1.79)
L($\Delta\ g^{Sup}$,1) × L(g^{Cus},1)	0.005 (1.57)	-0.002 (-0.441)	-0.002 (-0.221)	0.001 (0.443)	9.36e-5 (0.023)	-0.002 (-0.172)
$\Delta\ g^{Sup}$ × L(g^{Cus},1)	-0.004 (-1.28)	-0.0006 (-0.192)	-0.010 (-1.31)	-0.0002 (-0.065)	-0.002 (-0.556)	-0.002 (-0.237)
Fixed-Effects:						
Customer ID	Yes	Yes	Yes	Yes	Yes	Yes
Time via Factors' return	Yes	Yes	Yes	Yes	Yes	Yes
VCOV: Clustered	Customer ID and Date	Customer ID and Date	Customer ID and Date	Customer ID and Date	Customer ID and Date	Customer ID and Date

→ most of the effect is concentrated in *small* firms.

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ESG spillover - the role of ESG attention

Table: **Panel regression of the spillover effect of ESG news from supplier to customer, and customer to supplier - breakdown on ESG-attention.**

Panel A: From Customer To Supplier

	A1: $g = ACP$			A2: $g = MP$		
ESG-Attention:	*High*	*Neutral*	*Low*	*High*	*Neutral*	*Low*
L($\Delta\ g^{Cus}$,3)	0.0010 (0.308)	0.005 (1.85)	0.003 (1.40)	-0.0006 (-0.280)	0.005 (1.58)	0.005 (1.83)
L($\Delta\ g^{Cus}$,2)	-0.0010 (-0.444)	-0.003 (-1.01)	-0.005 (-1.76)	0.001 (0.627)	5.81e-5 (0.017)	-0.001 (-0.541)
L($\Delta\ g^{Cus}$,1)	0.003 (1.09)	-0.001 (-0.439)	-0.003 (-1.25)	0.0003 (0.153)	-0.009* (-2.14)	-0.007** (-2.76)
$\Delta\ g^{Cus}$	-0.001 (-0.434)	-0.003 (-1.14)	0.002 (0.878)	-0.001 (-0.584)	-0.007* (-2.24)	0.002 (0.755)
L($\Delta\ g^{Cus}$,3) × L(g^{Sup},1)	-0.002 (-0.451)	-0.007 (-1.42)	-0.006 (-1.56)	-0.0005 (-0.156)	-0.004 (-0.790)	-0.008 (-1.83)
L($\Delta\ g^{Cus}$,2) × L(g^{Sup},1)	-0.002 (-0.497)	0.003 (0.601)	0.004 (0.956)	-0.003 (-0.876)	-6.96e-5 (-0.012)	0.002 (0.381)
L($\Delta\ g^{Cus}$,1) × L(g^{Sup},1)	-0.004 (-0.867)	-0.0001 (-0.022)	0.005 (1.24)	0.0007 (0.230)	0.012 (1.92)	0.012** (2.79)
$\Delta\ g^{Cus}$ × L(g^{Sup},1)	0.003 (0.606)	0.003 (0.521)	-0.004 (-0.920)	0.0010 (0.243)	0.011 (1.88)	-0.003 (-0.495)
Fixed-Effects:						
Supplier ID	Yes	Yes	Yes	Yes	Yes	Yes
Time via Factors' return	Yes	Yes	Yes	Yes	Yes	Yes
VCOV: Clustered	Supplier and Date	Supplier and Date	Supplier and Date	Supplier and Date	Supplier and Date	Supplier and Date

Panel B: From Supplier To Customer

	B1: $g = ACP$			B2: $g = MP$		
ESG-Attention:	*High*	*Neutral*	*Low*	*High*	*Neutral*	*Low*
L($\Delta\ g^{Sup}$,3)	-0.004 (-1.66)	-0.003 (-0.740)	-0.004 (-1.51)	0.001 (0.452)	-0.005 (-0.680)	-0.007* (-2.02)
L($\Delta\ g^{Sup}$,2)	-0.003 (-0.980)	0.003 (0.993)	0.0005 (0.171)	0.0004 (0.171)	0.006 (1.66)	0.007* (2.17)
L($\Delta\ g^{Sup}$,1)	-0.0004 (-0.141)	-0.002 (-0.742)	0.001 (0.279)	-0.002 (-0.740)	0.0006 (0.165)	0.0009 (0.181)
$\Delta\ g^{Sup}$	0.004 (1.60)	-0.0005 (-0.158)	0.004 (1.06)	0.0003 (0.138)	-0.003 (-0.698)	0.004 (1.21)
L($\Delta\ g^{Sup}$,3) × L(g^{Cus},1)	0.008 (1.78)	0.006 (0.892)	0.003 (0.704)	-0.002 (-0.568)	0.005 (0.402)	0.012* (2.31)
L($\Delta\ g^{Sup}$,2) × L(g^{Cus},1)	0.003 (0.656)	-0.003 (-0.630)	0.0003 (0.064)	-0.003 (-0.736)	-0.009 (-1.53)	-0.012* (-2.32)
L($\Delta\ g^{Sup}$,1) × L(g^{Cus},1)	0.003 (0.595)	0.006 (1.01)	-0.004 (-0.732)	0.003 (0.765)	0.0010 (0.154)	0.0003 (0.038)
$\Delta\ g^{Sup}$ × L(g^{Cus},1)	-0.009 (-1.68)	-0.0002 (-0.040)	-0.007 (-1.27)	-0.0003 (-0.068)	0.006 (0.896)	-0.009 (-1.65)
Fixed-Effects:						
Customer ID	Yes	Yes	Yes	Yes	Yes	Yes
Time via Factors' return	Yes	Yes	Yes	Yes	Yes	Yes
VCOV: Clustered	Customer and Date	Customer and Date	Customer and Date	Customer and Date	Customer and Date	Customer and Date

→ low attention + MP shocks drive the significant results.

Controlling for other non-ESG propagation

Table: **Panel regression of the spillover effect of ESG news from supplier to customer, and customer to supplier controlling for other fundamental propagation.**

Panel A: Customer to Supplier			**Panel B: Supplier to Customer**		
Model:	(1) $g = ACP$	(2) $g = MP$		(3) $g = ACP$	(4) $g = MP$
L(Δ g^{Cus},3)	0.003* (2.07)	0.003 (1.74)	L(Δ g^{Sup},3)	-0.003 (-1.89)	-0.004 (-1.44)
L(Δ g^{Cus},2)	-0.003 (-1.83)	0.0001 (0.066)	L(Δ g^{Sup},2)	-0.0001 (-0.078)	0.004* (2.31)
L(Δ g^{Cus},1)	-0.0007 (-0.440)	-0.005** (-2.91)	L(Δ g^{Sup},1)	-0.0004 (-0.188)	-0.0005 (-0.206)
Δ g^{Cus}	-0.0003 (-0.202)	-0.002 (-1.26)	Δ g^{Sup}	0.002 (1.05)	0.0010 (0.483)
L(Δ g^{Cus},3) × L(g^{Sup},1)	-0.005* (-2.06)	-0.004 (-1.45)	L(Δ g^{Sup},3) × L(g^{Cus},1)	0.005 (1.69)	0.005 (1.19)
L(Δ g^{Cus},2) × L(g^{Sup},1)	0.002 (0.642)	-0.0007 (-0.282)	L(Δ g^{Sup},2) × L(g^{Cus},1)	0.0004 (0.129)	-0.008** (-2.66)
L(Δ g^{Cus},1) × L(g^{Sup},1)	0.0007 (0.276)	0.008** (2.97)	L(Δ g^{Sup},1) × L(g^{Cus},1)	0.001 (0.415)	0.002 (0.556)
Δ g^{Cus} × L(g^{Sup},1)	-5.16e-6 (-0.002)	0.003 (1.15)	Δ g^{Sup} × L(g^{Cus},1)	-0.004 (-1.35)	-0.001 (-0.399)
L(RET^{Cus},3)	-7.34e-5 (-0.675)	-7.44e-5 (-0.374)	L(RET^{Sup},3)	0.001 (0.440)	0.001 (0.508)
L(RET^{Cus},2)	0.0003 (1.68)	0.0005 (1.53)	L(RET^{Sup},2)	0.005* (2.01)	0.005 (1.69)
L(RET^{Cus},1)	0.0008 (1.47)	0.001 (1.25)	L(RET^{Sup},1)	0.019** (6.87)	0.019*** (6.50)
RET^{Cus}	0.003 (1.52)	0.006 (1.23)	RET^{Sup}	0.100** (19.3)	0.104*** (18.8)
Fixed-Effects:			Fixed-Effects:		
Supplier ID	Yes	Yes	Supplier ID	Yes	Yes
Time via Factors' return	Yes	Yes	Time via Factors' return	Yes	Yes
VCOV: Clustered	Supplier ID and Date	Supplier ID and Date	VCOV: Clustered	Customer ID and Date	Customer ID and Date
Observations	4 492 021	4 027 515	Observations	3 513 024	3 137 011
R^2	0.14889	0.14741	R^2	0.09742	0.09318

We include returns from supplies/customers in addition to ESG shocks... and our results still stand!

Takeaways

Conclusion

- **Direct Channel**: ESG shocks $\rightarrow$ stocks returns intra-daily *conditioning* on the *current* ESG profile.
- **Indirect Channel**: ESG shocks $\rightarrow$ stocks return of customer/supplier firms *conditioning* on the *current* company's ESG profile. However, the effects take some days.
- Direct and Spill-over effects are stronger after the **Paris Agreement**.
- ESG spill-over is more salient in small stocks, in low ESG-attention stocks, and holds when controlling for other spillovers.
- The results are inspired by a stylized theoretical model that predicts links between ESG levels, shocks and stock returns.

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THANK YOU

Time for questions!

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Model and theoretical grounding

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Model I

- Two agents: μ ESG **signal** traders versus $(1-\mu)$ **noise** traders. μ is unknown and will implicitly drive the relevance of our model/results (see also Berk and van Binsbergen (2021)).
- CARA preferences for *signal* traders:

$$\mathbf{x}_t^* = \gamma^{-1}\Sigma^{-1}(\mathbb{E}_t[\mathbf{p}_{t+1}^*] - r\mathbf{p}_t)$$

- In equilibrium (market clearing), supply of *noise* traders ($\boldsymbol{\nu}_t$) imposes $\mu\mathbf{x}_t^* = (1-\mu)\boldsymbol{\nu}_t$ and yields

$$r_{t+1} \propto r_f^{-1}\left(\overbrace{\text{diag}(p_t)^{-1}(\mathbb{E}_{t+1}[p_{t+2}^*] - \mathbb{E}_t[p_{t+1}^*])}^{\text{update in (relative) expectations}} + e_{t+1}\right),$$

where e_{t+1} is a noise term.
It comes from (orthogonal) changes in supply.

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Model II

The important term for us is the **update in expectations**.

- ESG Signal traders use a DDM: $p(g) = \frac{c}{r(g)-\delta(g)}$, with c being the cashflow, δ its growth rate and r the cost of capital. Both are functions of g, the ESG score of the firm.
- For simplicity/tractability, we make a strong assumption:

$$p(g) = ce^{ag^2+bg} \quad (\textit{stylized model})$$

- We then obtain (e.g., via 1st order Taylor expansion)

$$r_{t+1,n} = a_n + b_1 \Delta g_{t+1,n} + b_2 g_{t,n} \Delta g_{t+1,n} + e_{t+1,n},$$

- where a_n, b_1 and b_2 will be subject to estimation. The first two terms are standard (e.g. Serafeim and Yoon (2022b)), the third (interaction effect) less so.

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Model III

A brief discussion on the impact of g on DDM components:

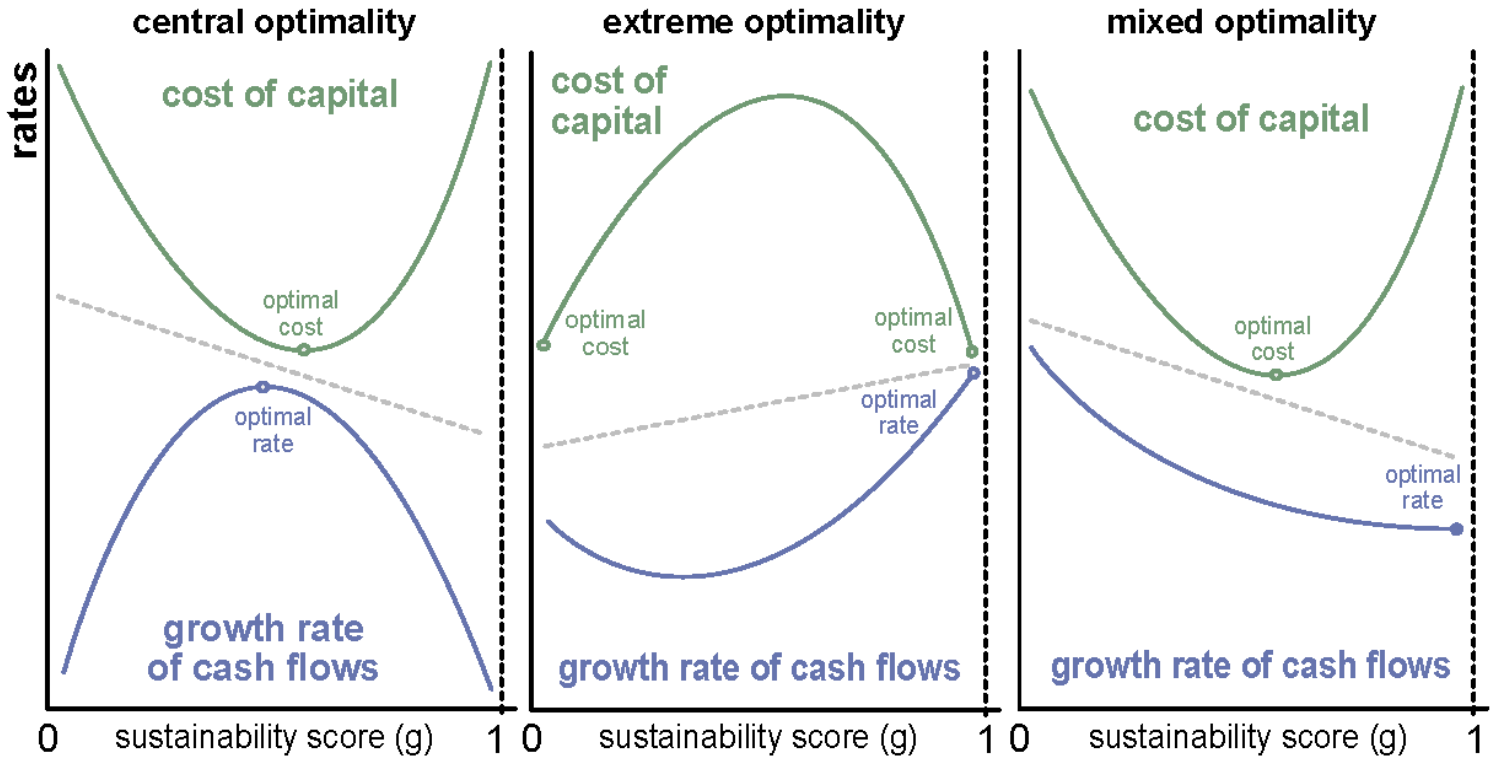

Figure: **Impact of sustainability on the components (r and δ) of the discounted dividend-growth model**. Depending on the configuration, the optimal price is reached for very different sustainability scores.

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Model IV

The final stage of the model is to consider the **value chain**, i.e., suppliers and customers. To do so, we posit that ESG signal traders believe that shocks to firms' ESG scores have reputation effects and, in the case of negative shocks:

1. customers do not want to be associated with negative coverage, and
2. suppliers fear shrinking demand in the future.

- This is channeled linearly in cash-flow growth rates and cost of capital so that

$$r_{t+1,n} = a_n + b_1 \left(\Delta g_{t+1,n} + \sum_{i \in S_n} \eta_i \Delta g_{t+1,i} \right) + b_2 g_{t,n} \left(\Delta g_{t+1,n} + \sum_{i \in S_n} \zeta_i \Delta g_{t+1,i} \right) + e_{t+1,n},$$

where S_n is the set of largest suppliers/customers of firm n.

Major conclusions from the model

- Impact of ESG shocks $\rightarrow$ the return depends on *sign*, *magnitude* of the shocks and the interaction with the *current ESG profile* of the firm.
- Direct and indirect (spill-over) effects.

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