

Is investment capital cheaper for green firms? Evidence from equity issues at Euronext – Oslo

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November 2024

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Research issue

Stock markets key to financing the circular economy

- Financing large green investments (e.g. Renewable energy generation).
- Financing green innovations – IPO and subsequent SEO's finance the scaling up of startups – particularly green innovations.

Question: Is “green” investment different?

- Do investor demand different returns depending on ESG properties?
 - Is there an additional “green glow”?
 - investors demand less return from green projects (subsidized financing)
 - Reluctance to finance “brown” projects (exclusions)?
 - brown projects have to offer higher returns?

→ Investigate in context of recent Norwegian IPO (Initial Public Offers):

Research question

Are IPO terms linked to firm ESG properties?

Summarizing findings

- Find some evidence that IPO price is higher for firms concerned about climate issues.
- But no evidence that underpricing is linked to ESG.
- Magnitudes: Small

Literature – ESG and stock returns

Modelling differences in cost of capital due to ESG

- The pecuniary view.
 - Stock prices do not fully reflect future ESG consequences (e.g. climate).
 - Short-termism (Stein, 1989)

→ Green stocks higher long term return
- The non-pecuniary view (ESG in utility function)
 - Equilibrium models – tradeoff ESG/Cost of Capital
 - Pástor et al. (2021) Pedersen et al. (2021)

→ Green stocks can sustain lower return

Literature - ESG and stock returns

Estimates of a Green Return Premium

- Evidence support non-pecuniary view (Green Return Premium < 0)

Examples (estimated return difference)

- Sin (Hong and Kacperczyk, 2009) (-3.5%)
- Environment (Chava, 2014) (-0.7% to -1.4%)
- Carbon (Bolton and Kacperczyk, 2021) (-1.5% to -3.6%).
- Green vs Brown (Pástor, Stambaugh, and Taylor, 2022) (-1.4%)
- Exclusions from The Oil Fund (Berle, He, and Ødegaard, 2024) (-5%)

Hypothesis development – ESG in context of IPOs

Argument from asset pricing theory:

→ Cost of capital depend on ESG properties.

Implications for IPO outcomes

- IPO price depend on cost of capital
→ IPO price *should* depend on ESG.

Ways to test – depend on theoretical framing.

Hypothesis development – Tests based on IPO *price*

Theoretical framing: The link between ESG and Cost of Capital is understood by all (no asymmetrical information).

→ IPO *issue price* reflect the ESG properties of the firm.

→ Method: Infer cost of capital from issue price.

Hypothesis 1: Measures of environmental/ESG qualities of a firm are linked to the implied cost of capital of the IPO price.

Hypothesis development – Tests based on IPO *underpricing*

Underpricing: Price evolution from IPO price to efficient price.

Common empirical finding: Underpricing in IPOs substantial.

Typical assumption that generate underpricing:

Informational differences between parties in IPO:

- Investment bank – set price
- Buyers of stocks at IPO stage.

Theories

- *Partial adjustment* theory: Investors better informed about their valuations (ESG preferences). To elicit true revelation (during bookbuilding) from investors, issue price lower than true price.
- *Neglected demand* theory: ESG aspects of cost of capital ignored by investment bank in price setting

Hypothesis development - Tests based on *underpricing*(ctd)

Implication of both theories

→ Underpricing increasing in sustainability.

Hypothesis 2: Measures of underpricing increases with the firm's environmental quality.

Also: To move prices to their correct price trading is necessary

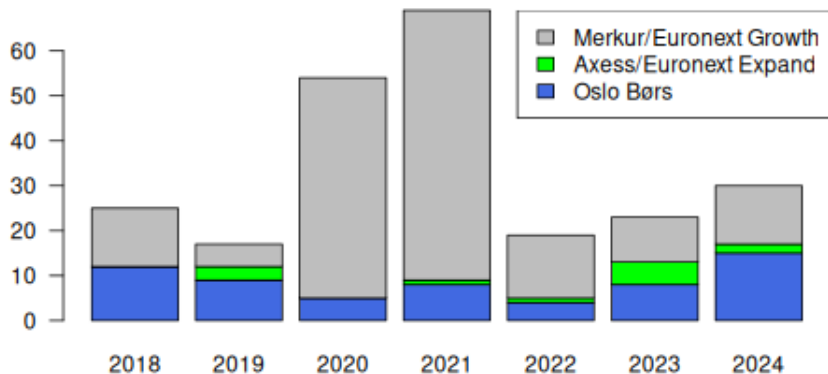
→ first day trading increasing in sustainability.

Hypothesis 3. Early trading interest (which we measure as turnover) is increasing in the measure of environmental quality of the firm.

Hypothesis development – Tests based on Post-IPO returns

If cost of capital differ with ESG, will be reflected in realized return:
Hypothesis 4: The post-IPO return depends on the company's environmental stance.

Data – New stocks at OSE. 2018-2024.



Data – Listings in period (2018–2024)

Analysis start in 2018 (Limited by ESG data)

Distinguish

- IPO – raising additional capital
- Pure listing – no additional capital

	IPO	Listing	Total
Oslo Børs(Main List)	26	7	33
Euronext Expand(Axess)	3	1	4
Euronext Growth(Merkur)	78	62	140
Total	107	70	177

Data - ESG measurement - How to?

ESG - Environmental Social Governance

Of particular concern for this paper: E

- Environment
- Sustainability
- Climate

Data – ESG measurement –

Proxy 1 - Firms' emphasis in prospectus

Text analysis

- Nonstandard part of prospectus (business plan)
- Among the IPOs at OSE, relative occurrence of terms:
 - Positive towards environment. ESG(environment).
 - Negative towards environment. ESG(brown)

→ Idea: Measure how central these issues are to business plan of firm.

Note

- Ranking is relative to the corpus of OSE IPOs.
- Does not imply ranking by “Greenness”

Data – ESG measurement –

Proxy 2 – Self-reported emissions

Reporting (accounts) requirements widen

- *Scope 1* – Direct greenhouse (GHG) emissions from firm. Normalized by Enterprise Value (EV).
- *Total GHG Emissions* – Sum of the firms Scope 1, 2 and 3 emissions. also normalized by EV.
- Fossil fuel sector – dummy variable

	mean	std	min	med	max	n
Scope1/EV	40	143	0	0	817	59
TotalGHGEmissions/EV	668	3120	0	41	24379	63
ind(FossilFuel)	0	0	0	0	1	140

Data – ESG measurement –

Proxy 3 – Categorizing business plan

Manual group firms into 3 types

- 1 **Green.** Renewable energy. Sustainability innovation. Circular Economy.
- 2 **Neutral.** Firms not easily categorized. Example: Financials.
- 3 **Brown.** Oil and Gas related.

	No Obs
Green	66
Neutral	85
Brown	26
Total	177

(listings since 2018).

Results - IPO price inferred cost of capital (Hypothesis 1)

From finance 101

$$P_i = \frac{EPS_i}{r_i}$$

→ Estimate *implied cost of capital*

$$\hat{r}_i = \frac{EPS_i}{P_i}$$

Only use companies with $EPS_i \geq 0$.

	min	med	mean	max	no EPS > 0
EPS Year before IPO/Issue Price	0.00	0.02	0.09	1.24	53
EPS Year of IPO/Issue Price	0.00	0.03	0.07	0.65	62
EPS Year after IPO/Issue Price	0.00	0.03	0.06	0.41	49

Results - IPO price inferred cost of capital (Hypothesis 1)

Asking whether ESG matters

$$\text{EPS}_i/P_i = \alpha + \beta^{\text{ESG}} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

- **ESG measures**

- Three ESG proxy groups

- **Controls**

- Firm size
- Industry sector (ICB)
- Listing market (Merkur dummy)

Results - IPO price inferred cost of capital (Hypothesis 1)

$$\text{EPS}_i/P_i = \alpha + \beta^{\text{ESG}} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

ESG measure: Group 1 – ESG inferred from

	(4)	(5)	(6)
(Intercept)	0.004 (0.328)	0.024 (0.320)	0.072 (0.351)
ln(ESG Environment)	-0.023 (0.009)**	-0.020 (0.005)***	
ln(ESG Brown)	0.003 (0.006)		-0.010 (0.004)**
ln(MktCap)	0.004 (0.015)	0.003 (0.014)	0.002 (0.016)
Merkur	-0.060 (0.039)	-0.058 (0.038)	-0.029 (0.040)
ICB-10 (Tech)	-0.099 (0.052)	-0.106 (0.048)*	-0.142 (0.052)**
ICB-45 (Cons Stapl)	-0.034 (0.056)	-0.040 (0.053)	-0.101 (0.053)
ICB-50 (Indus)	-0.064 (0.039)	-0.065 (0.038)	-0.089 (0.041)*
ICB-60 (Energy)	-0.068 (0.045)	-0.065 (0.043)	-0.076 (0.048)
Adj. R ²	0.331	0.348	0.227
Num. obs.	42	42	42

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Results - IPO Underpricing and ESG (Hypothesis 2)

To estimate

$$\text{Underpricing}_i = \alpha + \mathbf{b}^{ESG} \mathbf{ESG\ measures}_i + \mathbf{b}^2 \mathbf{Controls}_i + \varepsilon_i,$$

Underpricing:

IPO issue price vs Closing price (efficient price)

Controls

- Firm size
- Listing market (Merkur dummy)

Results - IPO Underpricing and ESG (Hypothesis 2)

$$\text{Underpricing}_i = \alpha + \mathbf{b}^{ESG} \text{ESG measures}_i + \mathbf{b}^2 \text{Controls}_i + \varepsilon_i,$$

ESG measure: Group 3 – manual categorization

	(1)	(2)	(3)
(Intercept)	4.2 (31.2)	4.0 (31.0)	4.5 (31.1)
Green	-2.4 (3.4)	-2.6 (3.2)	
Brown	0.6 (4.6)		1.6 (4.4)
ln(MktCap)	-0.1 (1.4)	-0.1 (1.4)	-0.1 (1.4)
Merkur	3.2 (3.9)	3.2 (3.9)	2.5 (3.8)
Adj. R ²	-0.0	-0.0	-0.0
Num. obs.	107	107	107

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Results – Liquidity and ESG (Hypothesis 3)

Idea: More under-priced stocks need more activity to move prices to efficient price.

To test

$$\text{Liquidity}_i = \alpha + \mathbf{b}^{ESG} \text{ESG measures}_i + \mathbf{b}^2 \text{Controls}_i + \varepsilon_i,$$

Liquidity measure: Turnover

Controls

- Firm size
- Listing market (Merkur dummy)

Results – Liquidity and ESG (Hypothesis 3)

$$\text{Liquidity}_i = \alpha + \mathbf{b}^{ESG} \mathbf{ESG\ measures}_i + \mathbf{b}^2 \mathbf{Controls}_i + \varepsilon_i,$$

ESG measure: Group 3 – manual categorization

	First Day		
	(1)	(2)	(3)
(Intercept)	3.2** (1.4)	3.1** (1.4)	3.0* (1.4)
Green	0.4** (0.2)	0.4* (0.2)	
Brown	0.1 (0.2)		-0.0 (0.2)
ln(MktCap)	-0.1* (0.1)	-0.1 (0.1)	-0.1 (0.1)
Merkur	-0.3 (0.2)	-0.3 (0.2)	-0.2 (0.2)
Adj. R ²	0.0	0.0	0.0
Num. obs.	166	166	166

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Results: Post IPO analysis (Hypothesis 4)

Standard crosssectional investigation:

Is there a return difference linked to ESG?

Apply to IPO sample:

Estimate a difference portfolio p . For example $p = \text{Green Stocks} - \text{Brown stocks}$.

Estimate alpha

$$R_{p,t} - R_{f,t} = \alpha_p + b^m(R_{m,t} - R_{f,t}) + b^{HML}HML_t + b^{SMB}SMB_t + \varepsilon_t$$

Results: Post IPO analysis (Hypothesis 4)

Alpha estimation

$$R_{p,t} - R_{f,t} = \alpha_p + b^m(R_{m,t} - R_{f,t}) + b^{HML}HML_t + b^{SMB}SMB_t + \varepsilon_t$$

	ESG Envir	Scope1	Green-Brown
alpha	-0.013	0.008	0.002
	(0.013)	(0.013)	(0.012)
RMRF	0.109	0.296	-0.233
	(0.229)	(0.205)	(0.214)
HML	0.174	0.342	-0.438**
	(0.190)	(0.191)	(0.177)
SMB	-0.213	0.006	0.181
	(0.359)	(0.358)	(0.337)
Adj. R ²	-0.003	0.139	0.147
Num. obs.	69	56	68

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Conclusion

Results support link between ESG properties of firms and IPO issue price.
But no link with underpricing

Attempting to look at magnitude: No significant return difference.

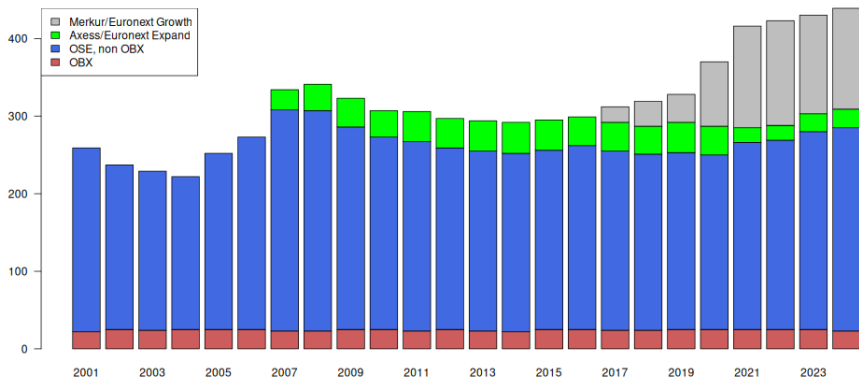
Issues

- Norway is only one country, is it representative?
- The sample period is special, with the Ukrainian war coinciding with drying up of the IPO market.

Extra results

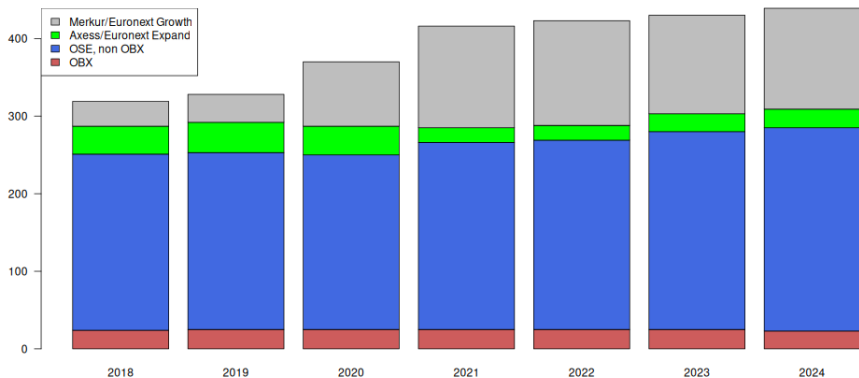
Data – Stocks traded at OSE – 2001-2024

- OSE (main board)
- Axess / Euronext Expand
- Merkur / Euronext Growth



Data – Stocks traded at OSE – 2018-2024

- OSE (main board)
- Axess / Euronext Expand
- Merkur / Euronext Growth



Descriptive – underpricing

Opening day underpricing (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors(Main List)	-8.25	0.00	2.82	7.97	28.00	26
IPO Euronext Expand (Acess)	-5.17	0.00	-1.72	2.98	0.00	3
IPO Euronext Growth (Merkur)	-37.36	2.47	4.96	17.44	65.69	78
Listing Oslo Bors	-28.57	0.00	-4.28	16.13	17.76	7
Listing Euronext Growth	-129.06	-1.60	-3.70	22.21	40.97	60

First week underpricing (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors (Main List)	-19.09	2.23	4.04	13.38	58.73	26
IPO Euronext Expand (Acess)	-21.67	-1.18	-7.72	12.09	-0.31	3
IPO Euronext Growth (Merkur)	-30.31	0.03	7.73	26.76	131.60	78
Listing Oslo Bors	-26.39	-1.53	-0.97	15.27	17.57	7
Listing Euronext Growth	-33.50	-2.33	7.47	52.24	282.80	59

Descriptive – turnover

Describing turnover

Opening day turnover (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors (Main List)	0.0	0.2	0.3	0.3	1.2	25
IPO Euronext Expand (Axess)	0.0	0.1	0.1	0.1	0.3	3
IPO Euronext Growth (Merkur)	0.0	0.2	0.4	0.7	4.2	75
Listing Oslo Bors	0.0	0.2	1.4	3.3	8.9	7
Listing Euronext Growth	0.0	0.2	0.4	1.0	7.2	56

First week turnover (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors (Main List)	0.2	0.9	1.4	1.4	6.9	26
IPO Euronext Expand (Axess)	0.2	0.9	0.7	0.5	1.1	3
IPO Euronext Growth (Merkur)	0.0	1.1	2.1	3.0	15.4	78
Listing Oslo Bors	0.0	1.5	4.1	8.2	22.6	7
Listing Euronext Growth	0.0	0.8	2.3	6.0	41.2	60

Results - IPO price inferred cost of capital

$$\text{EPS}_i/P_i = \alpha + \beta^{\text{ESG}} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

Regressing EPS/Price on measures of ESG inferred from prospectus

	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	0.16 (0.52)	0.16 (0.53)	0.11 (0.45)	0.30 (0.48)	0.26 (0.50)	-0.01 (0.41)
ln(ESG Environment)	0.00 (0.02)	-0.00 (0.02)		0.02 (0.02)	0.01 (0.02)	
ln(ESG Brown)	-0.01 (0.00)		-0.01 (0.00)	-0.01* (0.00)		-0.01 (0.00)
ln(MktCap)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	0.01 (0.02)
ICB-10 (Tech)				-0.19** (0.07)	-0.17* (0.08)	-0.19** (0.07)
ICB-45 (Cons Stapl)				-0.20*** (0.07)	-0.17* (0.07)	-0.16** (0.06)
ICB-50 (Indus)				-0.15*** (0.05)	-0.16*** (0.05)	-0.13** (0.05)
ICB-60 (Energy)				-0.07 (0.07)	-0.11 (0.07)	-0.07 (0.07)

Results - IPO price inferred cost of capital

$$\text{EPS}_i/P_i = \alpha + \beta^{\text{ESG}} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

Regressing EPS/Price on reported emissions

	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	0.198 (0.540)	0.224 (0.532)	0.021 (0.284)	0.186 (0.596)	0.257 (0.570)	-0.059 (0.294)
Scope1/EV	-0.000 (0.000)			-0.000 (0.000)		
Tot GHG/EV		0.000 (0.000)			0.000 (0.000)	
FossilFuel			-0.059 (0.048)			-0.014 (0.054)
ln(MktCap)	-0.004 (0.025)	-0.007 (0.024)	0.003 (0.013)	-0.000 (0.027)	-0.004 (0.026)	0.009 (0.014)
ICB-10 (Tech)				-0.173 (0.109)	-0.152 (0.106)	-0.140* (0.067)
ICB-45 (Cons Stapl)				-0.126 (0.136)	-0.117 (0.129)	-0.094 (0.060)
ICB-50 (Indus)				-0.143 (0.073)	-0.166** (0.067)	-0.105** (0.042)

Results - IPO Underpricing and ESG

Regressing first day underpricing on measures of ESG inferred from prospectus

	(1)	(2)	(3)
(Intercept)	12.5 (31.8)	10.8 (31.6)	16.6 (31.5)
ln(ESG Environment)	-0.8 (0.9)	-1.2 (0.7)	
ln(ESG Brown)	-0.4 (0.5)		-0.6 (0.4)
ln(MktCap)	-0.4 (1.5)	-0.3 (1.5)	-0.6 (1.5)
Adj. R ²	0.0	0.0	0.0
Num. obs.	82	82	82

Results - IPO Underpricing and ESG

Regressing underpricing on reported emissions data.

	(1)	(2)	(3)
(Intercept)	-44.59 (52.64)	-7.96 (58.80)	-5.47 (28.58)
Scope1/EV	-0.00 (0.02)		
Tot GHG/EV		-0.00 (0.00)	
FossilFuel			-3.17 (5.54)
ln(MktCap)	2.18 (2.39)	0.55 (2.67)	0.44 (1.35)
Adj. R ²	-0.03	-0.04	-0.02
Num. obs.	39	43	90

Results – Liquidity and ESG

Regressing turnover on measures of ESG inferred from prospectus

	First Day			First Week		
	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	2.5 (1.3)	2.5 (1.3)	2.8* (1.3)	34.5 (23.8)	2.7*** (0.6)	34.4 (23.7)
ln(ESG Environment)	-0.1 (0.0)	-0.0 (0.0)		0.0 (0.1)	0.0 (0.1)	
ln(ESG Brown)	0.0 (0.0)		0.0 (0.0)	-10.4 (7.8)		-10.4 (7.8)
ln(MktCap)	-0.1 (0.1)	-0.1 (0.1)	-0.1 (0.1)	-0.9 (0.7)	-1.0 (0.7)	-0.8 (0.7)
Adj. R ²	0.0	0.0	0.0	0.0	0.0	0.0
Num. obs.	120	120	120	124	124	124

Results – Liquidity and ESG

Regressing turnover on emissions data

	First Day			First Week		
	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	1.0 (0.9)	1.8 (1.0)	2.5* (1.1)	1.9 (5.4)	5.4 (5.9)	10.1 (6.2)
Scope1/EV	-0.0 (0.0)			-0.0 (0.0)		
Total GHG Emissions/EV		-0.0 (0.0)			-0.0 (0.0)	
FossilFuel			-0.2 (0.2)			-1.1 (1.1)
ln(MktCap)	-0.0 (0.0)	-0.1 (0.0)	-0.1 (0.1)	-0.0 (0.3)	-0.2 (0.3)	-0.4 (0.3)
Adj. R ²	-0.0	0.0	0.0	-0.0	-0.0	0.0
Num. obs.	55	59	132	59	63	139

Results: Post IPO analysis

What is going on?



Merging hypothesis 1 and 2

Hypothesis 1 – symmetric info – IPO price correct

Hypothesis 2 – asymmetric info – Price moves to the close price.

Joining the hypotheses: Use the close price to estimate implied cost of capital.

Results

→ Only *ESG Environment* significant.

→ Sign negative, as before.

Results - close price used in inferring cost of capital

	(1)	(2)	(3)
(Intercept)	0.06 (0.31)	0.07 (0.30)	0.11 (0.32)
ln(ESG Environment)	-0.02 (0.01)	-0.01 (0.01) ^{***}	
ln(ESG Brown)	0.00 (0.01)		-0.01 (0.00)
ln(MktCap)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Merkur	-0.06 (0.04)	-0.06 (0.04)	-0.04 (0.04)
ICB-10 (Tech)	-0.09 (0.05)	-0.10 (0.04) [*]	-0.12 (0.05) ^{**}
ICB-45 (Cons Stapl)	-0.04 (0.05)	-0.05 (0.05)	-0.09 (0.05)
ICB-50 (Indus)	-0.06 (0.04)	-0.06 (0.04)	-0.08 (0.04) [*]
ICB-60 (Energy)	-0.07 (0.04)	-0.07 (0.04)	-0.07 (0.04)
Adj. R ²	0.25	0.27	0.19
Num. obs.	42	42	42

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

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