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MANAGEMENT & SUSTAINABILITY

Corporate Carbon and Financial Performance: A Meta-analysis

IEA workshop on Industry/business use of 'complementary measures' for decarbonisation

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Question: Are a firm's carbon emissions related to its financial performance?

Author(s) (Year)	*Data*	*Sample*	*CEP variable(s)*	*Scope*	*CFP variable(s)*	*Evidence …*
Pogutz and Russo (2009)	Own survey…	~117 firms (worldwide) (2002-2005)	*GHG emission ratio* (measured as …)	unspecified	ROA, ROS, ROE, Tobin's *q*	Increases all variables
Delmas and Nairn-Birch (2010)	Trucost	~1,100 US firms, (2004-2008)	Total CO_2e emissions	1, 2, 3	ROA, Tobin's *q*	Increases Tobin's *q*
Busch and Hoffmann (2011)	Own survey…	174 firms (worldwide) (2007)	*Carbon intensity* (measured as …)	1, 2	ROA, ROE, Tobin's *q*	Mixed results
…	…	…	…	…	…	…
Wang et al. (2013)	CDP	69 Australian firms (2010)	Total carbon emissions	1, 2	Tobin's *q*	Decreases Tobin's *q*

Research case

Motivation: Conflicting results across studies (typical for this research field)

Method: A meta-analytical review is useful as it…

1. synthesizes empirical findings across a variety of studies
2. allows paying attention to how environmental data (specifically CO_2 emissions) is operationalized across studies
3. can show which measurements of financial performance matter most

Questions:
- What is the overall effect?
- What matters: Emission ratios vs. absolute emissions?
- How does it matter: Accounting vs. market-based CFP?

Sample: 21 studies with 25,552 firm year observations

The over all effect

CFP	k	N	r	*95% CI*		Q
All indicators	43	25,552	–.047**	–.079	–.015	219.444***

Note: k = number of effect sizes; N = total sample size; r = summary effect; CI = confidence interval; Q = Q statistic for homogeneity; * p < 0.05; ** p < .01; *** p < .001.

Emission ratios vs. absolute emissions

Emission measurement	k	N	r	*95% CI*		Q	Q_B
Absolute emissions	13	8,387	–.017	–.077	.042	49.949***	
Emission ratios	30	17,165	–.058**	–.097	–.019	164.826***	4.669*

Note: k = number of effect sizes; N = total sample size; r = summary effect; CI = confidence interval; Q = Q statistic for homogeneity; * p < 0.05; ** p < .01; *** p < .001.

Accounting vs. market-based CFP (I/II)

CFP measurement	k	N	r	95% CI		Q	Q_B
Accounting	25	13,415	–.060*	–.106	–.014	138.294***	
Absolute emissions	5	3,653	.040*	.007	.072		
Emission ratios	20	9,762	–.081**	–.132	–.028		20.744***
ROA	10	6,072	–.066*	–.129	–.003	30.859***	
Absolute emissions	2	3,405	.036*	.003	.070		
Emission ratios	8	2,667	–.086***	–.133	–.038		21.656***
ROE	5	1,608	–.043	–.092	.006	1.553	
Absolute emissions	2	98	.014	–.188	.215		
Emission ratios	3	1,510	–.047	–.097	.004		.317

Note: k = number of effect sizes; N = total sample sizes; r = partial correlation (effect size); LL-CI = lower-level confidence interval; UL-IC = upper-level confidence interval; Q = Q statistic for homogeneity; * p < 0.05; ** p < .01; *** p < .001.

Accounting vs. market-based CFP (II/II)

CFP measurement	k	N	r	95% CI		Q	Q_B
Market	18	12,137	–.032	–.077	.014	80.963***	
Absolute emissions	8	4,734	–.055	–.140	.031		
Emission ratios	10	7,403	–.020	–.076	.037		2.037
Share Price	4	4,485	–.010	–.074	.054	11.768**	
Absolute emissions	2	1,156	–.067	–.189	.057		
Emission ratios	2	3,329	.031	–.023	.086		5.762*
Tobin's *q*	7	6,307	–.068**	–.113	–.023	13.323*	
Absolute emissions	2	2,747	.010	–.139	.159		
Emission ratios	5	3,560	–.092**	–.149	–.034		3.054

Note: k = number of effect sizes; N = total sample sizes; r = partial correlation (effect size); LL-CI = lower-level confidence interval; UL-IC = upper-level confidence interval; Q = Q statistic for homogeneity; * p < 0.05; ** p < .01; *** p < .001.

Messages to take home

- Across a variety of studies, corporate carbon performance is on average positively related to financial performance.
- This effect is most prominent for carbon emission ratios.
- When considering carbon emission ratios, corporate carbon performance has the most pronounced effect on RoA (accounting-based CFP) as wall as on Tobin's q (market-based CFP).