



Corporate Carbon and Financial Performance: A Meta-analysis

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

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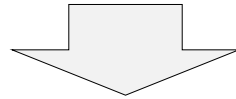


Question: Are a firm's carbon emissions related to its financial performance?

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

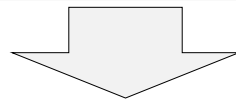
Research case

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



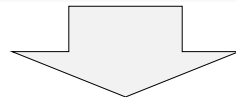
Method: A meta-analytical review is useful as it...

1. synthesizes empirical findings across a variety of studies
2. allows paying attention to how environmental data (specifically CO₂ 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

<i>CFP</i>	<i>k</i>	<i>N</i>	<i>r</i>	<i>95% CI</i>		<i>Q</i>
All indicators	43	25,552	-0.047**	-0.079	-0.015	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

<i>Emission measurement</i>	<i>k</i>	<i>N</i>	<i>r</i>	<i>95% CI</i>		<i>Q</i>	<i>Q_B</i>
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	<i>k</i>	<i>N</i>	<i>r</i>	95% CI		<i>Q</i>	<i>Q_B</i>
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	<i>k</i>	<i>N</i>	<i>r</i>	95% CI		<i>Q</i>	<i>Q_B</i>
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 <i>q</i>	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 well as on Tobin's q (market-based CFP).