Environmental Performance, Economic Performance, and Environmental Disclosure

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Focus – insights provided by the academic literature regarding the relations among:

- environmental performance
- financial performance
- environmental disclosure

Interested parties (include):

- **analysts/fund managers** (e.g., 'trading rule', fundamental value)
- **accountants** (e.g., GAPP, disclosure)
- **management** (e.g., strategic plan)

Caution – seemingly "self-serving"

- illustrated using my own work **<u>'disproportionately'</u>**

The investor (e.g., ‘trading rule) –

To provide the foundation a trading rule, environmental performance data must:

1. be informative regarding a firm’s future financial performance and/or its risk profile

AND

2. not be fully within the public domain

Foundation (step #1) –

From a **'fundamental' perspective**, for environmental factors to have share price implications, the capital markets must believe that the extent of a firm's commitment to the environment will affect either, or both, its **future financial performance and its risk profile.**

Equally, under the assumed objective of 'shareholder wealth maximisation', for management to incorporate environmental factors into their strategic plans, they must believe that the share market prices these factors.

The accountant –

Absent a formalised regulatory framework or structure, answers to the questions such as ‘what to account for’, and ‘how to account for it’ (i.e., assets, liabilities, revenues, expenses) are relatively elusive notions

⇒ **General ‘environmental performance’ studies**

→ *disclosure issues predominantly*

Carbon (GHG) emissions studies

→ *disclosure and accounting issues*

‘Takeaways’ (in brief) –

Environmental Performance → Valuation

Environmental Performance ↔ Economic Performance

Environmental Performance → Cost of Equity Capital (risk)

Signalling role for Environmental Disclosure

"While these results do not directly speak to the question of whether investors can use environmental performance information as the basis for a trading strategy, they do suggest that **analysts would be negligent if they fail to consider a firm's environmental strategy in the conduct of a fundamental analysis.**

Certainly the documented **market decrements** ascribed to poor environmental performance firms in highly polluting industries of **approximately 20%** reveal the impact of environmental performance as economically meaningful.

Further, the strong and consistent evidence of a relation between environmental and financial performance, and between environmental performance and risk as manifest in cost of equity capital, indicates that a firm's environmental strategy has the potential to significantly impact firm performance and risk, and thereby represents an important consideration for a valuation exercise."

Baseline ('null hypothesis') –

Traditional economic theory suggests that firms should meet only the minimal environmental standards prescribed by law, with 'over-compliance' argued to divert financial resources from productive investments and thereby results in reduced profitability

For example, Milton Friedman has suggested that pollution is a cost borne by the public and that reducing the public cost amounts to philanthropy, not profit maximization *(1970, New York Times Magazine)*

Notwithstanding, studies consistently document considerable variation in corporate environmental performance, even in industries where stringent environmental regulations have existed for decades

e.g., Clarkson et al. (2004)

- 29 ‘pure play’ pulp & paper firms
- ***EP*** = lbs. TRI / $1000 sales

Min	0.019	
Median	1.447	
Max	14.210	
Mean	2.039	(≈ 6.865 million lbs)
Std Dev	1.936	

If one believes that, on average, managers act in a rational economic manner, and that in equilibrium, price = value, then **why / how do, or can, these disparities persist?**

Practical Foundations – Why should environmental performance "matter"?

"Positives" → value 'enhancing'

- √ production efficiencies / cost reduction
- √ "green goodwill"
- √ increasing rivals costs (best available technology)

"Negatives" → 'detrimental'

- X exposure to future environmental legislation
- X exposure to future remediation expenditures
- X "firms' reputations and long-term sales can suffer

⇒ ***Symmetrical argument***

'Good' EP ↑ **'Poor' EP ↓**

The Economist - "Why firms go green" (12 Nov 2011)

"Many companies have found that, even with little carbon regulation, some sorts of **green investment make commercial sense**. **Improved energy efficiency** and **waste management** are obvious examples. With oil prices so high, small changes can save a lot of money, which is why companies that adopted ambitious emissions-reduction targets around the time of Copenhagen have tended to stiffen, not slacken, them."

"According to the Carbon Disclosure Project (CDP), …. 59% of **emissions-reducing investments** made so far--mostly in energy efficiency or renewable energy--**will pay for themselves within three years."**

"BHP Billiton and Rio Tinto are both **investing in renewables**. So is Alcoa, an aluminium producer, which is also attempting to measure its environmental impacts. This **could provide a defense against future emissions regulations** or perhaps help it grab green subsidies."

Herald Sun, 14 Sept. 2011

"Superannuation funds are offloading share in companies that have high greenhouse gas outputs to help reduce the impact of the carbon tax on investment returns."

"Company profits can be dented by the carbon tax," Trucost chief executive Richard Mattison said.

"Profitability will be adversely affected by the impact of a carbon tax for a select number of companies and having knowledge of that will enable super funds to better manage their portfolios and returns."

A. General 'Environmental Performance –

$$\text{Valuation} = PV\left\{\frac{E(\text{cash flows})}{\text{Discount rate (risk)}}\right.$$

valuation ⟷ ? ⟷ EP

future cash flows ⟷ ? ⟷ EP

cost of equity capital ⟷ ? ⟷ EP

role for disclosure ?

Empirical Studies – 'stylized' facts

- ***market value*** inversely associated with ***environmental performance***

  ⇒ valuation primitives ≡ future CF, COEC

  - bi-directional relation between ***environmental performance*** and ***financial performance***
  - evidence on the relation between ***environmental performance*** **and** ***cost of equity capital (COEC)*** mixed

- incremental role for ***environmental disclosures*** in explaining ***market value***

→ retrospective (historical) versus prospective (inferred)

Valuation Relevance –

Hughes (2000) "The value relevance of nonfinancial measures of air pollution in the electric utility industry" (*TAR*)

Clarkson, Li, Richardson (2004) "The Market Valuation of Environmental Capital Expenditures by Pulp and Paper Companies" (*TAR*)

Hughes (*TAR*, 2000)

- ***EP*** ≡ SO_2 emissions

$$MVE = \alpha + \beta_1 BVE + \beta_2 EMIT + \beta_3 CLIM + \beta_4 NUCS + \beta_5 SITE + \beta_6 DIVERSE + e_t \quad (1)$$

- coef on ***EMIT*** for 1990 = -395.81 (*t* = -2.64)

$\Rightarrow$ 16.3% of market capitalization

Clarkson *et al.* (*TAR*, 2004)

RQ1: Is the capital market's assessment of environmental capital expenditures conditional on environmental performance?

RQ2: Does the market assess unbooked liabilities for high polluting firms?

- 'pure play' pulp & paper firms from 1989 to 2000 (256 firm-years involving 29 firms)
- **environmental performance** is assessed based on **actual TRI** normalized by COGS

Market Valuation Model Estimates

POLLUTE = 1 if poor environmental performer, 0 if good

Variable	Sign	Coef	*p*-value
ECE	+	2.706	*0.011*
ECE*POLLUTE	–	-2.227	*0.030*
NECE	+	3.439	< *0.001*
NECE*POLLUTE	?	-0.543	(0.372)
POLLUTE	-	-560.441	*0.005*

Primary Coefficient Tests

$\beta_3 = 1$ $p =$ ***0.057***

$\beta_3 + \beta_4 = 0$ $p = 0.354$

$(2.706 - 2.227)$

$\beta_7 =$ **- 560.441 (POLLUTE) → penalty = 16.6% of mkt cap**

⇒ from a strategic perspective –

For the good EP firms ('over-compliers')

- **Reduced latent liability**
  - reduced exposure to litigation?
  - reduced exposure to remediation costs?
  - enhanced reputation?
- **Benefits to environmental capital expenditures** (**asset = + NPV** vs abatement/compliance expenditure)
  - green goodwill
  - cost efficiencies
  - competitive advantage (raising rivals costs)

→ appears potentially both performance and risk implications

⇒ Valuation primitives

- **numerator**

  → expected future cash flows (earnings)

- **denominator**

  → discount rate ≡ cost of equity capital

Environmental Performance / Financial Performance

Hart and Ahuja (1996)

Δ Environmental Performance → Δ Financial Performance

Change in 'emission efficiency' from 1988 to 1989 using TRI data from the IRRC's 1993 Corporate Environmental Profile

Focus - <u>subsequent</u> *ROS, ROA, ROE*

		1989	1990	1991	1992
ROS	↑	X	√	<u>√√</u>	√
ROA	↑	X	√	<u>√√</u>	√
ROE	↑	X	√	√	<u>√√</u>

- improvements only for the (initially) high polluting firms

Table 1. Impact of emissions reduction on firm performance. Dependent variable: ROS.

	1989	1990	1991	1992
INTERCEPT	0.0150	0.0080	0.1000***	−0.0124
INDUSTRY	−0.0065***	−0.0087***	−0.0054**	−0.0082***
KAPSTRUCTURE	−0.0000	0.0011	0.0017	−0.0039
KAPSALES	0.0375**	0.0229**	−0.1111***	0.0231
ADSALES	−0.0415	0.1060	0.1452	0.2625
RDSALES	−0.0184	−0.1527	0.5016*	0.0161
EMRED	−0.0014	0.0122*	0.0204**	0.0122*

Table 2. Impact of emissions reduction on firm performance. Dependent variable: ROA.

	1989	1990	1991	1992
INTERCEPT	0.0439*	0.0184	0.0345	0.0094
INDUSTRY	0.0082	−0.0190	−0.0078	−0.0095
KAPSTRUCTURE	−0.0007	0.0004	−0.0006	−0.0053
KAPSALES	0.0012	0.0012	−0.0411*	−0.0067
ADSALES	0.4858**	0.8400***	0.7506***	0.8265***
RDSALES	−0.2524*	0.1425	0.5392**	0.3577*
EMRED	−0.0000	0.0143*	0.0168*	0.0138*

Table 3. Impact of emissions reduction on firm performance. Dependent variable: ROE.

	1989	1990	1991	1992
INTERCEPT	0.1025*	0.0471	0.0648	−0.0329
INDUSTRY	−0.0159	0.0084	−0.0227	−0.0633**
KAPSTRUCTURE	0.0522***	0.0113	−0.0523***	−0.0961***
KAPSALES	−0.0043	0.0021	−0.0729	0.0273
ADSALES	1.2714***	2.3046***	2.2542***	3.0306***
RDSALES	0.1357	0.0470	0.7794	0.3685
EMRED	−0.006	0.0250	0.0501*	0.0643*

Given such evidence that improvements in EP manifest in subsequent improvements in financial performance i.e.,

Δ Environmental Performance → Δ Financial Performance

why don't (can't) all firms adopt a proactive environmental strategy?

Clarkson, Li, Richardson, Vasvari *(2011)* "Does it Really Pay to be Green: Determinants and Consequences of Proactive Environmental Strategies"

Δ Environmental Performance ↔ Δ Economic Performance

RQ1: are sustained improvement in relative ***EP*** over time followed by **subsequent improvements in relative financial performance**?

RQ2: Do firms with sustained improvements in relative ***EP*** possess **superior relative resources in the prior periods**?

- four industries (pulp & paper, chemicals, oil & gas, and metals & mining) 1990 to 2003 (2,376 firm-years involving 242 firms)
- **environmental performance** is assessed based on **actual TRI** normalized by COGS, ranked within industry
- identify firms with **appreciable changes in relative *EP*** within industry during the study period; **compare with stable *EP*** firms

Measure		FY_{-3}	FY_{-2}	FY_{-1}	FY_{0}	FY_{+1}	FY_{+2}	FY_{+3}
Table 3 Panel A: Progressive (PRO) vs Stable Poor (SP) (41 matched pairs)								
ROA	*PRO*	57.258	**62.770**	66.116	68.705	70.389	**72.408**	73.856
	SP	51.167	**47.314**	48.785	49.857	47.260	**47.194**	46.486
	diff (+)	6.091	**15.456**	17.331	18.848	23.129	**25.214**	27.370
	p-value	0.186	*0.018*	*0.001*	*0.012*	*0.008*	*0.006*	*0.001*
CF	diff (+)	12.711	**14.410**	18.049	22.866	32.685	**35.187**	37.312
	p-value	*0.022*	*0.018*	*0.003*	*0.001*	*< 0.001*	*< 0.001*	*< 0.001*
Table 3 Panel B: Regressive (RE) versus Stable Good (SG) (23 matched pairs)								
ROA	*RE*	41.275	**39.824**	37.275	36.370	31.783	**28.944**	28.626
	SG	51.267	**53.866**	52.904	54.234	52.734	**52.961**	53.491
	diff (–)	-9.992	**-14.042**	-15.629	-17.864	-20.951	**-24.017**	-24.865
	p-value	*0.060*	*0.072*	*0.052*	*0.040*	*0.039*	*0.019*	*0.004*
CF	diff (–)	-12.025	**-14.721**	-17.267	-24.940	-28.330	**-30.210**	-30.759
	p-value	0.078	*0.053*	*0.033*	*0.012*	*0.007*	*0.002*	*< 0.001*

Table 4 Panel A: One-Year Changes in Mean Percentile Ranks For the Years ***Preceding*** *A Change in Environmental Performance*

Measure		***PRO* versus *SP***		***RE* versus *SG***	
		***FY*$_{-2}$**	***FY*$_{-1}$**	***FY*$_{-2}$**	***FY*$_{-1}$**
ROA	*PRO* or *RE*	**5.512**	3.346	**-1.451**	-2.549
	SP or *SG*	**-3.853**	1.471	**2.599**	-0.962
	difference	**9.365**	1.875	**-4.050**	-1.587
	p-value	***0.002***	*0.083*	***0.011***	0.112
CF	*PRO* or *RE*	3.314	-1.578	-3.214	-1.12
	SP or *SG*	0.615	-6.217	-0.518	1.426
	difference	**2.699**	4.639	**-2.696**	-2.546
	p-value	*0.052*	***0.040***	***0.038***	***0.049***

Summary –

Although a proactive environmental strategy may be associated with improved future economic performance (i.e., ‘‘it pays to be green”), not all firms can mimic such a strategy.

It appears that only firms with sufficient financial resources and management capabilities can pursue a proactive environmental strategy.

This finding helps to explain the continued variation in environmental performance within polluting industries even after three decades of increasingly stringent US environmental regulations.

Implications – policy makers

Acknowledging resource constraints may assist environmental policy makers in designing more effective pollution abatement policies.

To realize aggregate pollution abatement, effective environmental policies should provide **economic incentives** to encourage poor environmental performers to become ‘progressive’ firms, and to discourage good environmental performers from backsliding into becoming ‘regressive’ firms.

For instance, **voluntary environmental programs** may be more effective in industries where resource constraints vary significantly across firms.

In addition, **public recognition** of superior environmental performance may be a strong incentive since it could lead to real economic benefits in the form of consumer ‘‘green goodwill” in the marketplace.

Implications – Accounting Standards

Our research is directly relevant to accounting standards dealing with **valuation and impairment** (for example, standards addressing business combinations and asset impairment).

To the extent that a firm's environmental strategy is linked to its future financial performance, our results suggest that **proactive firms enjoy identifiable intangible assets** related to environment performance and **reactive firms face the prospect of negative future cash flows**.

Implications – Management Accounting Practice

There is a vast practitioner literature in management accounting focusing on environmental management systems in which environmental responsibility generates a major concern because of the cost magnitude and risk exposure

For instance, Figge *et al.* (2002) argue that firms must incorporate environmental and social aspects into the **four balanced scorecard perspectives** in order **to practice sustainability management.**

A maintained assumption of this literature is that pursing proactive environmental strategies is worthwhile. However, less than one-half of surveyed CFOs' and top environmental officers believe environmental performance enhances shareholder value (CICA)

Denominator effects → COEC

Relative EP and COEC

Sharman and Fernando (2008)

Connors and Silva-Gao (2009)

→ significant negative association

(*relative EP captures a dimension of firm risk*)

⇒ clear economic benefits to environmental risk management

"firms that develop a strategy that improves their total risk management through better environmental risk management are rewarded by the financial markets for their efforts" (Sharfman & Fernando)

Sharman and Fernando (2008)

- cost of equity capital – CAPM, Bloomberg
- environmental risk management – TRI, KLD

		CAPM		Bloomberg
(Constant)		9.428(***)		9.710(***)
Financial leverage	0.044	0.775	0.023	0.404
Log-market capitalization	−0.229	−3.975(***)	−0.210	−3.576(***)
Industry	−0.289	−4.907(***)	−0.226	−3.770(***)
Environmental risk management	−0.172	−2.887(**)	−0.170	−2.805(**)

→ predicted inverse relation between COEC estimates and environmental risk management measure

curiously, also document a positive relation with cost of debt (but also carry higher debt and have greater leverage)

Final Step – Role for Disclosure?

The studies discussed above all use an historically-based measures of environmental performance

⇒ **Retrospective versus Prospective**

Is there a role for voluntary environmental disclosures?

TRI data captures a firm's **historical** pollution performance, it **does not necessarily reflect** a firm's current environmental strategy and commitment for **future** environmental protection.

Voluntary environmental **disclosures may reveal** a firm's environmental commitment in areas such as environment-related governance structure, environmental management systems, and management's environmental vision and strategy

⇒ A Signalling Role for Disclosure?

Voluntary disclosure theory predicts a **positive association** between *environmental performance* and *discretionary environmental disclosure* – superior environmental performers will convey their ‘‘type’’ by pointing to objective environmental performance indicators which are difficult to mimic by inferior type firms

Socio-political theories alternatively predict a **negative association**; to the extent that poor environmental performers face more political and social pressures and threatened legitimacy, they will attempt to increase discretionary environmental disclosures to change stakeholder perceptions about their actual performance.

Clarkson, Li, Richardson, Vasvari (2008) "Revisiting the Relation between Environmental Performance and Environmental Disclosure: An Empirical Analysis"

RQ: the relation between **environmental performance** and **environmental disclosure**?

- 191 firms for 2003 with EPA TRI data
- the five most polluting industries
- **environmental disclosure** – GRI-based index developed in conjunction with a GRI steering committee member: 95 items
  - **Hard disclosure items ⇒ verifiable** (79 items)
  - **Soft disclosure items ⇒ non-verifiable** (16 items)

GRI-based Disclosure Index

A1 - Governance Structure and Management Systems

A2 - Credibility

A3 - Environmental Performance Indicators

A4 - Environmental Spending

A5 - Vision and Strategy Claims

A6 - Environmental Profile

A7 - Environmental Initiatives

Hard disclosure items	Map to GRI	Percentage of firms attaining the item (%)	Average score	
			Good EP firms ($N = 61$)	Poor EP firms ($N = 61$)
(A3) Environmental performance indicators (EPI) (max score is 60)[a]		**73.77**	**10.19**	**6.00*****
1. EPI on energy use and/or energy efficiency (0–6)	EN3, 4, 17	41.80	1.46	0.75***
2. EPI on water use and/or water use efficiency (0–6)	EN5, 17	30.33	1.07	0.49**
3. EPI on green house gas emissions (0–6)	EN8	31.97	1.10	0.59**
4. EPI on other air emissions (0–6)	EN9,10	43.44	1.45	1.08
5. EPI on TRI (land, water, air) (0–6)	EN11	33.61%	1.05	0.65*
6. EPI on other discharges, releases and/or spills (not TRI) (0–6)	EN12, 13	28.69	1.15	0.43***
7. EPI on waste generation and/or management (recycling, re-use, reducing, treatment and disposal) (0–6)	EN11	50.00	1.44	1.04
8. EPI on land and resources use, biodiversity and conservation (0–6)	EN6, 7	36.89	0.71	0.47
9. EPI on environmental impacts of products and services (0–6)	EN14	4.10	0.13	0.00*
10. EPI on compliance performance (e.g., exceedances, reportable incidents) (0–6)	EN16	25.41	0.64	0.48
(A4) Environmental spending (max score is 3)		**44.26**	**0.84**	**0.45****
1. Summary of dollar savings arising from environment initiatives to the company (0-1)		23.77	0.30	0.18*
2. Amount spent on technologies, R& D and/or innovations to enhance environ. perf. and/or efficiency (0–1)	EN35	20.49	0.21	0.19
3. Amount spent on fines related to environmental issues (0–1)	EN16	25.41	0.33	0.18**

Disclosure Category	Mapping to GRI	2006 % of firms attaining item	2006 Mean Score	2003 % of firms attaining item	2003 Mean Score
A3) Environmental Performance Indicators (EPI) (scale: 0-6) *		**68.93****	**9.04****	**52.17**	**6.27**
1. EPI on energy use and/or energy efficiency	**EN3,4,17**	**45.63**	**1.19**	**36.95**	**0.92**
1) Performance data is presented		45.63		35.87	
2) Performance data is presented relative to peers/rivals or industry		0.97		1.09	
3) Performance data is presented relative to previous periods (trend analysis)		34.95		26.09	
4) Performance data is presented relative to targets		11.65		7.61	
5) Performance data is presented both in absolute and normalized form		10.68		13.04	
6) Performance data is presented at disaggregate level (i.e. plant, business unit, geographic segment).		15.53		8.70	
2. EPI on water use and/or water use efficiency	**EN5,17**	**24.27**	**0.65**	**25.00**	**0.62**
1) Performance data is presented		24.27		25.00	
2) Performance data is presented relative to peers/rivals or industry		0.00		1.09	
3) Performance data is presented relative to previous periods (trend analysis)		18.45		17.39	
4) Performance data is presented relative to targets		6.80		5.43	
5) Performance data is presented both in absolute and normalized form		6.80		7.61	
6) Performance data is presented at disaggregate level (i.e. plant, business unit, geographic segment).		8.74		5.43	
3. EPI on green-house-gas emissions	**EN8**	**52.43*****	**1.62*****	**22.83**	**0.58**
1) Performance data is presented		51.46		20.65	
2) Performance data is presented relative to peers/rivals or industry		2.91		0.00	
3) Performance data is presented relative to previous periods (trend analysis)		46.60		19.57	
4) Performance data is presented relative to targets		25.24		9.78	
5) Performance data is presented both in absolute and normalized form		14.56		4.35	
6) Performance data is presented at disaggregate level (i.e. plant, business unit, geographic segment).		21.36		3.26	

Soft disclosure items	Map to GRI	Percentage of firms attaining the item (%)	Average score	
			Good EP firms ($N = 61$)	Poor EP firms ($N = 61$)
(A5) Vision and strategy claims (max score is 6)		**95.90**	**3.48**	**3.04**
1. CEO statement on environmental performance in letter to shareholders and/or stakeholders (0–1)	1.1, 1.2	61.48	0.69	0.54*
2. A statement of corporate environmental policy, values and principles, environ. codes of conduct (0–1)	1.1, 1.2, 3.7	87.70	0.85	0.90
3. A statement about formal management systems regarding environmental risk and performance (0–1)	3.19	58.20	0.57	0.59
4. A statement that the firm undertakes periodic *reviews and evaluations* of its environ. performance (0–1)	3.19	37.70	0.47	0.27**
5. A statement of *measurable goals* in terms of future env. performance (if not awarded under A3) (0–1)	1.1, 1.2	27.05	0.31	0.22
6. A statement about specific environmental innovations and/or new technologies (0–1)	1.1, 1.2	54.92	0.58	0.52

Table 5: Intra-Industry Rank Regressions

	Total	Hard	Soft
Intercept	11.08	16.20***	13.65***
	(1.48)	(2.18)	(3.41)
% Recycled (+/-)	**0.15*** **	**0.14*** **	**0.11** **
	(3.19)	**(2.98)**	**(2.24)**
- TRI/Sales (+/-)	**0.14*** **	**0.16*** **	**0.09***
	(2.93)	**(3.42)**	**(1.73)**

⇒ **Support for the 'signaling' (voluntary disclosure theory perspective)**

Table 6: Comparisons of Soft to Total Disclosure Scores (partitioned by % recycled)

	Average Score		
	Good EP Firms (N=61)	Poor EP Firms (N=61)	Difference (t-stat)
Soft / Total (%)	**34.23%**	**50.95%**	**-16.72%*** (3.99)**

"preliminary evidence that socio-political theories are robust in predicting what is being said; in particular, firms whose environmental legitimacy is threatened put greater emphasis on soft claims to be committed to the environment."

→ while the evidence supports a similar level of disclosure activity by both good and poor EP firms, the forms of disclosure differ

Clarkson, Fang, Li, Richardson (2012) "The Relevance of Environmental Disclosures: Are such Disclosures Incrementally Informative?"

RQ: Given knowledge of environmental performance, is voluntary environmental disclosure **incrementally** 'value relevant'?

"story" – EP data (e.g., TRI) reflect historical environmental performance; they do necessarily communicate a firm's environmental strategy going forward

→ potential for firms to use additional disclosures to communicate their future prospects and risks

Sample Data

- 92 firms for 2003 and 103 firms for 2006
- 5 most polluting industries: Pulp & Paper, Chemical, Oil & Gas, Metals & Mining, and Utilities
- **environmental disclosure** – GRI-based index developed by Clarkson *et al.* (2008) (*AOS*)
- **environmental performance** – intra-industry percentile rank **actual TRI** normalized by COGS

TABLE 4A Valuation Model Results

Variable	Sign	Coef	*p*-value
Intercept		14.064	< 0.001
BV	+	1.283	< 0.001
AE	+	4.327	< 0.001
TRI	**–**	**-5.936**	***0.070***
EnvDis	**+**	**13.089**	***< 0.001***
Regular	+	1.355	0.279
Adj R^2		0.637	

⇒ incremental to TRI, voluntary environmental disclosure provides **valuation relevant information**

TABLE 4B Cost of Equity Capital Model Results

Variable	Sign	Coef	*p*-value
Intercept		0.196	0.015
BETA	+	0.008	0.126
SIZE	–	-0.005	0.093
B_M	+	0.033	0.099
TRI	**+**	**0.022**	***0.037***
EnvDis	**–**	**0.022**	**0.121**
Regular	–	-0.028	< 0.001
Adj R^2		0.217	

⇒ COEC is associated with current TRI but voluntary environmental disclosure **plays no incremental role**

TABLE 4C Long-Term Financial Performance Results

		average 3-year ahead			
		ROA		***NCF***	
Variable	**Sign**	**Coef**	***p*-value**	***Coef***	***p-value***
Intercept		0.018	0.225	0.088	< 0.001
ROA /CFO	+	0.399	< 0.001	0.380	< 0.001
SIZE	–	-0.002	0.274	-0.002	0.189
EnvDis	**+**	***0.036***	***0.018***	**0.010**	**0.277**
TRI	**–**	**-0.011**	**0.187**	**-0.013**	**0.158**
Adjusted R^2		0.197		0.215	

⇒ incremental to TRI, voluntary environmental disclosure provides **relevant information about future financial performance**

Aside – Plumlee, Brown, Hayes, Marshall, 2010

- measure voluntary environmental disclosure quality using a GRI disclosure framework for a sample of US firms across five industries.
- in addition to overall disclosure quality, consider the type (hard/soft) and the nature (positive/neutral/negative) of the disclosure
- controls for both positive and negative environmental performance

(1) a positive association between some aspects of voluntary environmental disclosure quality and future expected cash flows

(2) both a negative & positive associations between some aspects of disclosure quality and cost of equity capital

"Our findings are consistent with increased voluntary environmental disclosure quality being associated with firm value through both the expected cash flow and cost of equity capital components"

Summary (re-iteration)

1. economic benefits to "over compliance" with environmental standards (and conversely, penalties to "reactive" firms)

- ✓ Δ Environmental Performance ↔ Δ Economic Performance
- ✓ Environmental Capital Expenditures (ECEs) viewed as value enhancing by the capital markets for firms with "best" environmental performance
- ✓ Firms with "worst" environmental performance assessed an unbooked (latent) liability by the capital markets

2. given knowledge of environmental performance, environmental disclosure is incrementally informative

⇒not only historical environmental performance but also expectations of future environmental performance

B. Carbon (GHG) Emissions Studies –

Valuation:

Matsumura, Prakash & Vera-Munoz

- S&P 500 firms; 2006 – 2008
- voluntary CDP disclosures

Griffin, Lont & Sun

- S&P 500 & TSX 200 firms; 2005/6 – 2009
- voluntary CDP disclosures & estimation model

Chapple, Clarkson & Gold

- 58 Australian firms; 2007
- voluntary CDP disclosures & VicSuper proprietary information

- - - - - - - - - - - -

Clarkson, Li, Pinnuck & Richardson

- listed EU firms, 2006 – 2009; 843 firm-year observations
- emissions data from EU *Community Independent Transactions Log* (CITL)

Matsumura, Prakash, Vera-Munoz, 2011 (working paper)

RQ: relationship between voluntarily disclosed carbon emissions levels and firm value?

- S&P 500 firms voluntarily disclosing carbon emissions data to CDP 2006 → 2008; final sample = 584 firm-yr observations (of 1,443)
- valuation model methodology; recognise 'self selection' bias
- assessed penalty of $202 US per ton of GHG emissions (argued to be the present value of both direct and indirect costs (potential litigation and remediation costs, and loss of reputation)

MKT_t	Pred	Full Sample	
		Coeff	Z
$TEMIT_t$	-	-0.202	-5.02 ***
$ASSET_t$	+	0.898	12.24 ***
$LIAB_t$	-	-0.919	-12.91 ***
$OPINC_t$	+	5.644	22.05 ***

Griffin, Lont, Sun, 2012 (working paper)

RQ: value relevance of climate change disclosures ?

- S&P 500 firms, 2006 – 2009; TSE 200 firms, 2005 – 2009
- with CDP disclosures – U.S., 824 firm-yrs; Canada, 259 firm-yrs
- estimate carbon emissions for non-disclosers; valuation model and event study methodologies

"**To summarize**, Table 3 shows three results:

(1) investors view greenhouse gas emissions as a significant negative valuation driver;

(2) the valuation effects are incrementally more negative for S&P 500 and GHGE-intensive companies; and,

(3) a negative valuation effect occurs regardless of whether or not the company discloses to the CDP."

"Thus, in line with our research expectation, this evidence indicates that investors price stocks as if higher GHG emissions impose an additional off-balance sheet liability not already reflected in the market's assessments of reported earnings and shareholders' equity."

"This off-balance sheet amount reflects investors' assessment of the additional net expenditures or uncertainties regarding company responsibilities for climate change and/or as increased net cash outflows from future compliance, abatement, regulatory, and tax costs not captured by the accounting statements."

For a hypothetical company with median GHG emissions, assuming a GHG cost of $20 per ton, and applying the coefficient estimates from regressions based on pooled observations,

Table 3 estimates (base valuation model) ⇒ investors factor 20% of the GHG cost cost into stock price as an unrecognized liability

→ **an unrecognized liability of $4.01 per ton of GHGE**

Table 5 estimates (self selection model) ⇒ investors factor 47.25% of the $20 cost into stock price as an unrecognized liability

→ **an off-balance liability of $9.45 per ton of GHGE**

Notwithstanding the qualifiers at the outset, these figures

"offer some practical guidance as to the cost per ton of GHG priced by equity investors as an off-balance sheet liability."

Chapple, Clarkson, Gold (forthcoming Abacus, 2011)

RQ: Is there a market valuation impact of the proposed Australian Emissions Trading Scheme?

- ☐ 58 listed Australian firms with carbon emissions data in 2007
- ☐ GHG (carbon emissions): CDP (40 firms); VicSuper (18 firms)
- ☐ Carbon intensity (CI) = Australian GHG emissions / $1m sales

- ➢ Valuation model estimated coefficients imply a 'future carbon permit price' of between $17 and $26 per tonne
- ➢ Assessed liability for top 20% CI firms = 6% → 10% of mkt cap based on median GHG emissions and coefficient estimates (high versus low CI partitions)

e.g., Table 5 Panel A – Primary Valuation Model Results

Scaled by Common Shares		Scaled by Book Value of Equity	
Variable	**Estimate**	**Variable**	**Estimate**
Intercept	0.280 (0.902)	**Intercept**	2.336 (< 0.001)
BVPS	***1.789*** ***(< 0.001)***	***1 / BV***	244.609 (0.442)
AEPS	***14.216*** ***(< 0.001)***	***AE / BV***	***7.249*** ***(0.002)***
EP	***-1.050*** ***(0.031)***	***EP***	***-0.389*** ***(0.040)***
EMIT	***-0.497*** ***(0.039)***	***EMIT***	***-0.232*** ***(0.048)***

+ 10 → 12%

Assessed penalty **6.57%** **10.08%**

(% market capitalization)

(high CI versus low CI partition)

Industry Reports – Australian context – include:

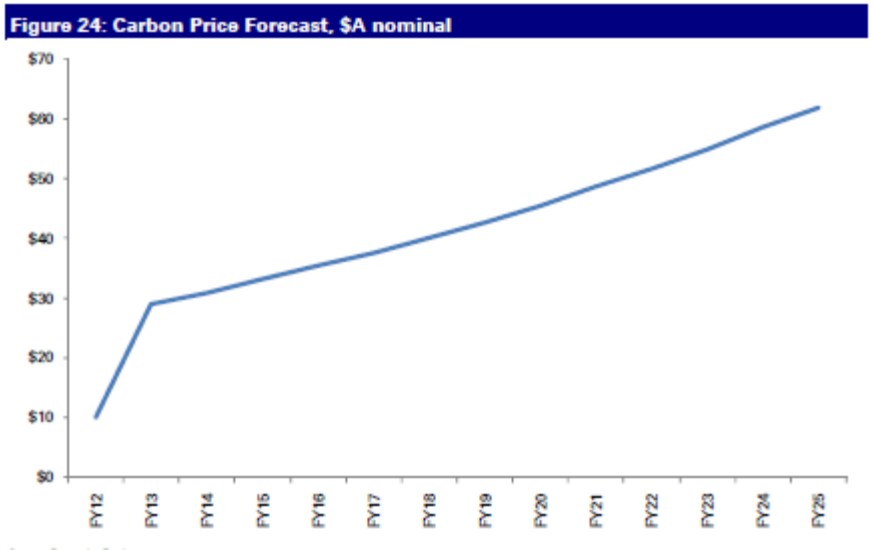
Citigroup (2008): for eight of Australia's highest carbon intensive firms, a *carbon cost of $20 per tonne* under the proposed ETS could create **a liability of between 20% and 40% of market capitalisation** *assuming zero price pass-though*

Port Jackson Partners (2008): analyse **fourteen** (undisclosed) TEEI firms, finding that with *carbon at $40 per tonne*, the proposed scheme would result in **four firms closing**, **three facing a high risk of future negative cash flows**, and annual profits being reduced by more than 10% for the remaining seven.

Deutsche Bank (2009): DCF analysis leads to a view that the impact of an ETS as **relatively "benign"** – however, the analysis was conducted near the end of 2009 by which time proposed changes suggested that *the allocation of free allowances* would be relatively more liberal

Deutsche Bank DCF analysis– key exogenous variables

- a common carbon price assumption, factoring in a $10 (2011/12) fixed price, and then increasing as per Figure 24
- unique emissions forecasts by company as a function of production and likely abatement opportunities
- EITE relief (free permits), if applicable
- unique assumptions regarding ‘pass through’ i.e., how much of the carbon cost, both direct and indirect, can be passed to customers?

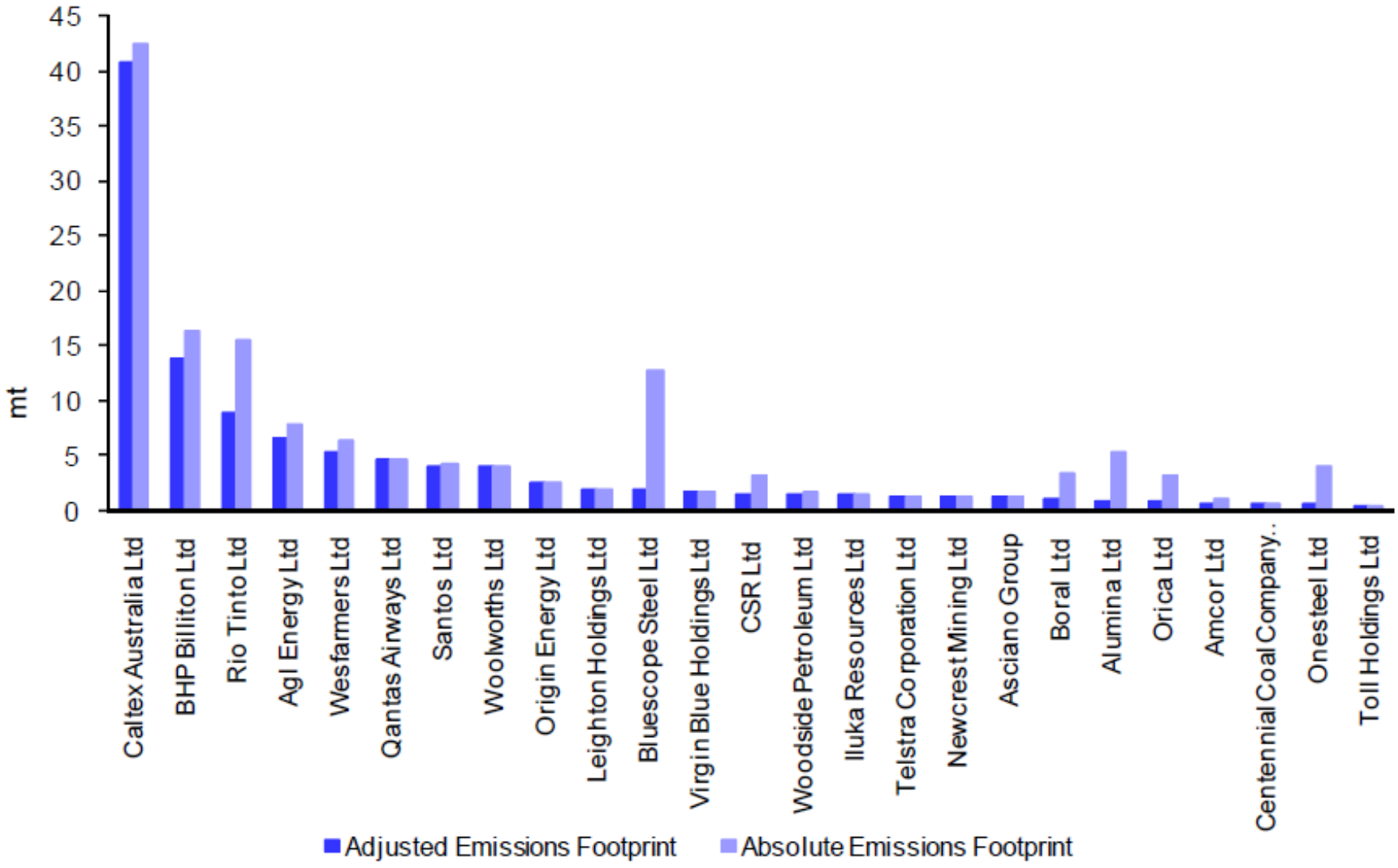


Emission footprints

Figure 23 shows the companies we have modeled, ranked by their adjusted emissions footprints (adjusted for free permits, where applicable). The key observations are:

- EITE relief significantly lowers the initial carbon liability for many of the larger emitting companies, particularly Bluescope, Onesteel, Alumina, Orica, Boral and CSR;
- Woolworths and Telstra are pushed up the rankings by the EITE relief enjoyed by some higher emitting companies;
- Adelaide Brighton and Incitec Pivot drop out of the Top 25 Emitters on an adjusted (post EITE relief) basis;
- The cumulative adjusted emissions for the Top 25 emitters are some 26% less than their cumulative absolute emissions. This is very consistent with the conclusion of the CPRS White Paper that allocations to EITE will be around 25% of permits[18].

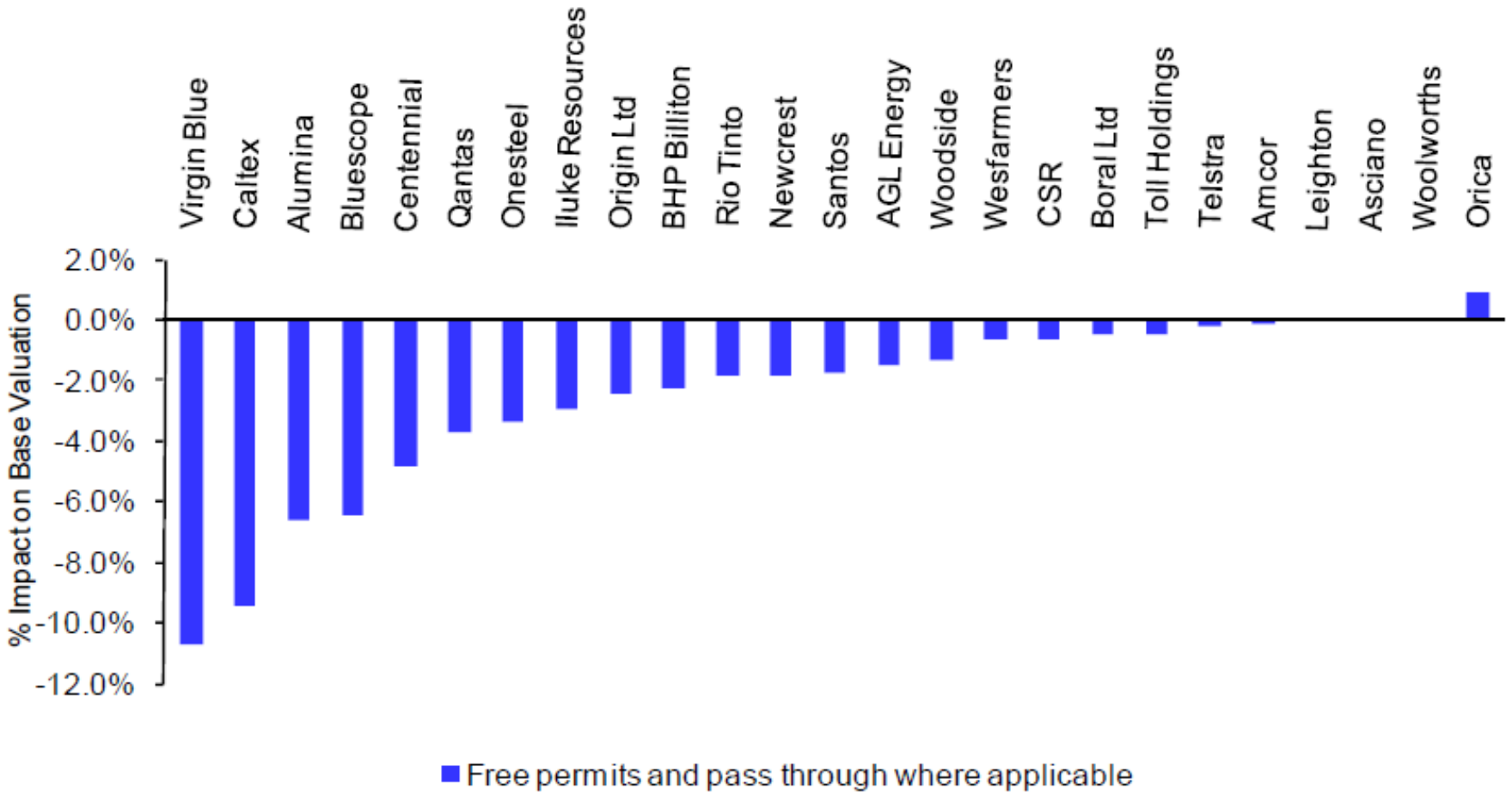
Figure 23: Top 25 Emitters Ranked by Adjusted Emissions Footprint (mt, pa, Scope 1 plus 2 Emissions)



Our valuation analysis indicates relatively benign, albeit negative, impacts

Figure 25 summarises the CPRS valuation impacts on the top 25 emitters:

Figure 25: DCF Valuation Impacts of the CPRS



Key messages –

- for 19 of the 25 firms, the valuation impacts are negative; for 5, the impact is zero due to their ability to pass on the additional carbon costs.
- the valuation impacts are relatively benign; for 17 of the 25, < 3%; and on a weighted average basis, -3% for the Top 25 emitters.
- in the hypothetical case of no cost pass through and no EITE relief, the weighted average impact is -8.8%.
- the allocation of free permits, mainly via EITE relief, in combination with cost pass through, materially reduces the valuation impact in many cases; in the extreme case, a 51% reduction.
- both AGL Energy and Origin Energy have relatively low carbon intensity in their generation assets; valuations are sensitive to their ability to pass through their higher generating costs to end customers, consequently, the CPRS could drive quite probably positive valuation outcomes for both.
- Virgin Blue highly exposed to the domestic revenue and limited ability to pass through incremental carbon costs

Clarkson, Li, Pinnuck, Richardson, 2012 (working paper)

- listed EU firms with carbon emissions and permit allocation data available over the period 2006 – 2009

⇒ participating installations; emissions data recorded by the European Commission in the *Community Independent Transaction Log (CITL)*

- installation data aggregated up to the listed entity level using the BVD Amadeus Database

Research Focus –

the valuation relevance of carbon emissions under the EU ETS

→ *free permit allocations*
cost pass on ability
jurisdictional differences

Results – Covered versus Uncovered Emissions

Variable	Pooled	Pooled
Intercept	1.194	1.212
	(< 0.001)	(< 0.001)
BV	1.116	0.522
	(< 0.001)	(< 0.001)
AE	7.048	7.038
	(< 0.001)	(< 0.001)
EmitTot	***-0.044***	- - -
	(<0.001)	
AllocShort	- - -	***-0.084***
		(0.038)
PerAlloc	- - -	0.019
		(0.475)
Adj R^2	0.809	0.809

assessed liability = €44 per ton

assessed liability = €84 per ton of uncovered emissions

assessed liability / asset (?) statistically zero for permit allocations

Results – Cost Pass On Ability

HH	***2.545***		-0.034	***Rank***
	(0.033)	baseline liability	(0.211)	
AllocShort	***-0.098***		***-0.119***	***AllocShort***
	(0.014)		***(0.017)***	
PerAlloc	0.013		0.016	***PerAlloc***
	(0.647)		(0.697)	
AllocShort*HH	*0.063*		***0.101***	***AllocShort*Rank***
	(0.052)	mitigation	***(0.037)***	
PerAlloc*HH	0.007		0.002	***PerAlloc *Rank***
	(0.443)		(0.773)	

⇒ significant assessed liability for firms with limited 'cost pass on ability'

greatly mitigated (or zero) for those with the greatest ability to pass on the costs -0.098 + 0.063 and -0.119 + 0.101

Results – EU versus Non-EU Emissions

Variable	Model 3	Model 4
Intercept	1.738	1.657
	(0.190)	(0.182)
BV	1.411	1.460
	(< 0.001)	(< 0.001)
AE	5.526	5.808
	(< 0.001)	(< 0.001)
CDP Global Emissions	***-0.053***	---
	(0.023)	
AllocShort	---	***-0.094***
	EU	***(0.008)***
PerAlloc	---	0.025
	non-EU	(0.169)
Non-EU Emissions	---	***-0.048***
		(0.041)

Disclosure vs Accounting

Disclosure

→ what information do various stakeholders "need"

Accounting

→ how to present the information

- - - - - - - - - - - - - - - - - -

Our results indicate that investors need the following information in order to refine their estimates of latent carbon liabilities:

(1) current carbon emissions at the corporate entity level, segregated by regions under different regulatory regimes;

(2) the firm's carbon efficiency relative to its sector peers for each sector the company operates in; and

(3) other information indicating the firm's ability to pass on increased carbon costs to consumers.

Accounting for carbon –

Basic issues include: **net** versus **gross** methods

cost versus **revaluation**

Proposed/adopted approaches include (but are certainly not limited to) –

- IFRIC 3 – cost model
- IFRIC 3 – revaluation model
- US GAAP

U.S. GAAP (net)

(1) an asset is only recorded for purchased emission certificates, at cost, and depreciated according to usage

(2) allowances which are allocated for free are not reflected in the financial accounting,

(3) if an entity does not hold the estimated required amount of emission certificates, a liability reflecting the number and current price of missing rights must be recognised

$\Rightarrow$ expense of I/S relates to using up of purchased certificates

risk of accounting mismatch $\equiv$ asset at cost; liability at current value (small, relates only difference between purchase and need)

IFRIC 3 – cost & revaluation models (gross)

Three separate B/S items:

(1) an intangible asset reflecting purchased and granted certificates,

(2) a liability equal to total emissions = monetary amount of allowances required to surrender

(3) a deferred income item for rights allocated for free

(4) the emissions rights asset is: (i) retained at historical cost (gains when disposed of) or (ii) re-valued with gains accruing in a revaluation reserve

$\Rightarrow$ risk of accounting mismatch $\equiv$ asset at cost or revalued; deferred income amortised at cost; liability at current value

Preliminary insights –

Veith, Werner, Zimmerman (2009) "Competing accounting treatments for emissions rights: A capital markets perspective"

Using return and price regressions for a sample of major European regulated firms, we present evidence that only US GAAP treatments report income components concerning exposure from the emission trade that are useful in valuation decisions.

Despite their increased complexity, models within the scope of IFRIC 3 only yield information in line with carbon price changes but not with regard to a firm-specific exposure toward the scheme

$\Rightarrow$ "We find that the cost-based net approach provides additional information while gross methods, even the full market-based disclosures, do not. We thus show that an increase in reporting complexity does not always yield superior information content."