

UNDERSTANDING FIRM RESPONSE TO ENVIRONMENTAL ISSUES: APPLICATION OF THE NATURAL RESOURCE BASE VIEW TO CLIMATE CHANGE

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Abstract: The natural based view of the firm using Hart (1995) is applied to firm responses in the Carbon Disclose Project (CDP) database. A large cross sectional sample (n=573) of North American and European firms is divided into 3 categories of proactivity to the climate change issue using 8 indicators of four resource domains. Results are presented along geographic and size dimensions.

Keywords: Carbon Disclosure Project; climate change; natural resource based view

The basis for good policy must be an in-depth understanding of what motivates firm-level adaptation to the climate change issue within Canada. Applying a conceptual framework that can explain firm behaviour a priori provides a better basis through which to develop policies rather than an ad hoc approach that relies on descriptive observations after the fact. Understanding especially what drives the defensive versus pro-active environmental strategies of multinational enterprises and non MNEs in Canada (versus the United States and Europe) will help guide policy makers in the policy formation process towards policies with minimal unintended consequences on business, and thereby on macro-level economic welfare. We address part of these issues by developing a conceptual framework through which to understand firm behaviour towards the climate change issue. We then apply this framework to firms active in Canada, the United States, together grouped as North America, and Continental Europe in order to better understand what might be motivating firms to adopt more defensive or more proactive strategies in regards to climate change.

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DEVELOPMENT OF A CONCEPTUAL FRAMEWORK

The heterogeneity of firm responses across sectors and across countries observed in response to other emerging environmental issues has been played out in terms of the most recent environmental issue, climate change (Levy and Egan, 1998; Levy, 1997). Global warming and climate change have grown in importance as a significant societal issue for all stakeholders as the global nature of the problem exceeded the capacity of any one nation or stakeholder group to solve. Differential regulatory regimes across countries and across sectors can lead to significant changes in competitiveness at a firm level (Griffiths et al, 2007). Thus understanding the forces which are acting on firms and reasons why firms respond can lead to a better policy formation process and outcome.

Three strands of literature emerge which can explain firm behaviour in the face of environmental pressures. The literature centers around corporate social performance, responsibility and responsiveness and stakeholder theory, institutional theory leading to isomorphism, and resource based view leading to competitive advantage.

The first strand of literature centers on corporate responsibility for social and environmental performance in addition to its traditional orientation towards economic performance for the benefit of shareholders. Stakeholder theory emerged to replace the traditional view of the firm as a nexus of contracts with stakeholders who were directly involved with the operation of the operation of the firm (Clarkson, 1995; Donaldson and Preston, 1995). The emergent nature of corporate social performance and responsibility evoked a literature stream which developed a classification scheme through which to judge firm performance (Carroll, 1979). It is through stakeholder theory that the origins of the forces acting on firms to adopt isomorphic behaviour to maintain social legitimacy can be understood.

The second strand, institutional theory, focuses on conformity to the rules and belief systems if the firm is to survive (DiMaggio and Powell, 1983; Meyer and Rowan, 1977; Scott, 1995), emphasizing the role of social and cultural pressures that influence organizational practices and structures (Scott, 1995). Through isomorphic mechanisms, institutions create and diffuse a common set of values, norms, and across organizations (DiMaggio and Powell, 1983) thus generating organizational legitimacy (Dacin, 1997; Deephouse, 1997; Suchman, 1995). The organizational field from which these forces in favour of conformity originate consists of a “community of organizations that partakes of a common meaning system and whose participants interact more frequently and faithfully with one another than with actors outside the field” (Scott, 1995). DiMaggio and Powell (1983) identify key suppliers, resource and product consumers and regulatory agencies and other organizations producing similar products or services as an example of a community. Firms are thus responding to the power which stakeholders who shape and enforce institutional rules and behaviour (Oliver, 1991). The linkage between institutional theory and stakeholder theory is thus clear.

While institutional theory provides a window for explaining conformity within similar organizational fields, it does less so in explaining why firms subjected to the same organizational field can pursue different strategies. Oliver (1991) examined firm heterogeneity in response to isomorphic forces by focusing on resource based view to explain how firms respond to market

forces and resource scarcity. Firms seeking competitive advantage and thus above normal returns strive to develop resources and capabilities which are valuable, rare, inimitable and non-substitutable (Barney, 1991). Power flows to those organizations which control scarce resources (Oliver, 1991). The heterogeneity of firm response is linked back to different bundles of resources and capabilities and the extent to which firms perceive opportunities or threats within the context of the organizational field that they are subjected to. Invoking a resource based view suggest that firms will adopt an increasingly proactive environmental management strategy if the firm links this to competitive advantage and therefore higher returns.

Hart (1995) integrated the literature stream that had focused on classification schemes to describe firm behaviour towards environmental and social issues with the resource based view thus developing typologies of environmental strategies which were grounded in theory. What differentiated Hart's (1995) approach from those underlying other typologies was the emergence of his based on the resource based view of competitive behaviour of the firm. Through increasing investment across five resource domains, an organization becomes much more proactive in terms of its environmental strategy (Buysse and Verbeke, 2003; Sharma and Vredenburg, 1998) and the extent to which it forms a significant part of its overall business strategy.

Thus the presence of a firm's bundle of investments in each of the resource domains provides an indication of the firm's choice of environmental strategy (Buysse and Verbeke, 2003; Verbeke, Bowen, and Sellers, 2006). Increasing degrees of proactiveness towards the environment would be reflected in environmental issues being part of the responsibilities of a member of the executive with Board oversight and an educated workforce. A well developed environmental managerial system to monitor firm performance along the environmental metric and a willingness to engage internal and external stakeholders in dialogue through a strong and verifiable reporting scheme would then link words to investments in green technologies. The reporting framework would communicate actions which the firm was taking with respect to managing its environmental responsibilities. Thus the metrics used to define behaviour across the resource domains would show increased performance across all measures as firms migrated from one category to the next.

The resource based view then can provide insight to firm heterogeneity within the context of an environment constrained by an organizational field. Climate change is an environmental issue and we would thus expect to see similar patterns.

We use the Carbon Disclosure Project (CDP) database (www.CDProject.net) of firm responses to climate change to illustrate the natural resource based view of the firm using Hart (1995) and Buysse and Verbeke (2003). Institutional theory we suggest can explain differences which emerge along locational and size dimensions of the firm.

METHODOLOGY

We discuss the CDP data base and the sample from the data base that is used in this study. We touch on the linkage between the CDP data base and the Hart (1995)/Buysse and Verbeke (2003) framework before concluding with the methods to conduct the analysis.

CDP Data Base

Data employed in the analysis originates from the CDP. Through a series of seven questionnaires CDP has developed quality information on how individual firms are responding to climate change. The company universe to which each questionnaire was sent has expanded from the 500 represented by the FT500 grouping in the first three requests for information to more than 2,100 in the fourth and 2,400 in the fifth. By the sixth request, the population to which the survey was sent had expanded to more than 3,000 of the largest publicly traded companies in the world. While the results for the seventh request for information are now in the public domain, this study relied on the sixth request for information.

Although all firms in the CDP universe were sent questionnaires, not all chose to respond. Response rates have varied across countries and sectors as well as the iteration of the questionnaire. The response rates for the iteration of questionnaire have been quite high, varying from a low of the mid fifties for some smaller geographic regions to a high of eighty percent for the FT500 firms (www.CDProject.net). However, not all responses completed by companies were used in this study. A small share of the total completed responses are not made available in the public domain although they were available in creating the CDP reports. Thus, it is this subset of the completed questionnaires for the sixth request for information that have been used in the analysis.

Sample selection

The focus of this study is differences between firms operating in North America and in Europe. Firm information was thus collected from the FT500, SP500 (USA), Canada 200 and German 200, the SBF120 (France) and Swiss 100, as well as the Ibex 35 (Spain), Nordic 190, Dutch 50 and MIB 40 (Italy). Definitions for company groupings are available from www.CDProject.net.

GROUPING	REGION						
	NORTH AMERICA			EUROPE			
	Canada	USA	Total	Central	Latin	Nordic	Total
FT 500	16	126	142	34	38	7	79
NON FT 500	61	124	185	79	34	54	167
TOTAL	77	250	327	113	72	61	246

Source: Backman, Etienne, and Matthews (2010)

Table A shows the distribution of firms by region of North America and Europe. North America accounts for almost three-fifths of the sample with Europe making up slightly more than forty percent. The FT500 firms account for nearly 40 percent of the firms involved in the study ranging from four-fifths in North America to slightly less than one-third in Europe.

Linkage Between the CDP Database and the Hart (1995)/Buysse and Verbeke (2003) Frame

The CDP data base for the sixth request for information contains data describing firm behaviour to climate change along four dimensions. The four dimensions are: (1) Risks and opportunities; (2) Greenhouse gas (GHG) emissions accounting; (3) Performance; and (4) Governance. The Risks and Opportunities section is designed to identify strategic risks and opportunities of climate change and their implications. The objective of the GHG accounting section is to determine actual absolute GHG emissions. The intent of Section 3: Performance is to determine performance against targets and plans to reduce GHG emissions. Section 4: Governance provides information on responsibility for and the management approach to the climate change issue.

Answers to questions under each of the four themes identified above capture the variability in how firms are approaching the climate change issue. Information then from the CDP questionnaire informs on the degree of proactivity which firms display by repackaging the information in terms of indicators of the five resource domains. It is variation in the indicators of the resource domains which then leads to different levels of proactivity to the climate change issue.

While five resource domains differentiate Hart (1995) strategies (Buysse and Verbeke, 2003), we use only four here. Resource Domain 2: employee skills are captured indirectly through Resource Domain 3: organizational capabilities. Domains we use in this analysis are presented below. Indicators of Resource Domain 1: Tools used by firms to address GHG footprint are the degree of process reversibility and the degree of product reversibility. Indicators of Resource Domain 3: Organizational capabilities with respect to climate change issue include the reporting mechanism through which climate change behaviour is reported and the type of system in place to verify the emissions performance. The indicators of Resource Domain 4: Climate change information system are the degree to which the direct and indirect GHG emissions are captured and the understanding of where in the firm operations GHG are generated. Finally, the indicators of Resource Domain 5: Opportunity for the Climate change issue to enter into strategy formation includes the degree to which risks and opportunities are realized and the level of the climate change file in the hierarchy.

Tools for the Analysis

Data was imported into SPSS 15.0. Cluster analysis technique after Hair et al (2006) was followed, starting first with a hierarchical method as a first step in identifying potential number of clusters to investigate for further consideration. Final cluster selection was then based on the initial cluster groupings formed under the hierarchical method subjected to the non hierarchical K cluster technique. Squared Euclidian distance measure was applied using the furthest neighbour algorithm.

Three and four cluster solutions were selected for further analysis using the K-cluster technique. Selection of a four cluster solution did not yield a stable solution. Changing the initial centroids for the items used to determine firm proactivity resulted in poor replication of members of the

four clusters. A three cluster solution yielded virtual one hundred percent stability across a number of starting centroids, a similar result as obtained by Buysse and Verbeke (2003). Differences among the clusters were analyzed using MANOVA option within SPSS.

RESULTS

Firm proactivity is discussed first in terms of the degree of proactiveness. The moderating impact of geography and membership in the FT500 is then presented.

Ranking

The firms which answered the CDP questionnaire in North America and Europe can be divided into three categories of proactiveness towards climate change issue. Shown in Table B, one quarter of the firms have seized the issue as a game changing event. Another 50 percent of the firms have taken steps to understand and change their routines in order to better accommodate the changes in their external environment. Another 25 percent of firms have yet to integrate this issue into their routines.

ITEM	PROACTIVENESS					
	1	2	3	TOTAL	F	sig.
Resource Domain 1 - Tools used by firms to address climate change						
1 - Process reversibility	2.70	2.39	1.26	2.23	154.914	0.000
2 - Product reversibility	2.28	1.34	0.67	1.45	103.871	0.000
Resource Domain 3 - Organizational capabilities of firm						
3 - Reporting mechanism	2.84	2.66	0.62	2.26	309.681	0.000
4 - Verification system	1.76	1.16	0.24	1.12	177.483	0.000
Resource Domain 4 - Climate change information system						
5 - Existence of system	2.27	1.87	0.33	1.64	168.892	0.000
6 - Breadth of data	1.77	1.31	0.43	1.24	128.307	0.000
Resource Domain 5 - Opportunity to incorporate climate change issue into strategy						
7 - Risks and opportunities	2.86	2.37	1.08	2.22	143.555	0.000
8 - Location of clim. chng. file	2.68	2.05	1.10	2.02	64.268	0.000
Number of firms	158	289	126	573		
Note: Proactive category "1" is higher than level "2" is higher than "3"; Scale for items 1, 2, 3, 5 and 6 is (0,3); Scale for item 4 is (0,2); Scale for items 7 and 8 is (0,4).						
A higher scale number means greater proactivity; The Hart (1995)/Buysse and Verbeke (2003) frame has five domains. Resource Domain 2: Employee skills is assumed to be incorporated in with Resource Domain 3: Organizational capabilities.						
Ordering of Resource Domains has been maintained according to the frame to maintain consistency in the literature.						

Source: Backman, Etienne, and Matthews (2010)

These firms are differentiated across the four resource domains of RD1: Tools used to address the consequences of climate change on the firm; RD3: Climate change organizational capabilities; RD4: Climate change information system; and RD5: Incorporation of climate change into strategy formation. Save for RD3 – Item 3: Reporting mechanism, these firms are unambiguously differentiated across the eight items used to inform on the four resource domains.

Top tier firms see both risks and opportunities in climate change (Item 7) and accordingly have placed responsibility for this file at an executive level (Item 8). There is a relatively robust climate change accounting system in place that is capturing both Scope 1 and 2 data and some Scope 3 (Item 5) while there is a good idea on where in the organization the GHG sources are located (Item 6). These firms are using both formal and informal avenues to reach out to external and internal stakeholders about climate change and their performance (Item 3) while are more likely to have external verification system in place to audit their GHG performance (Item 4). The high degree of importance attached to the climate change issue (Items 7 and 8) is reflected in the greater commitment of resources to changing the GHG footprint (Item 1) and the extent to which the firms are embarking on new products that require changes in their internal routines (Item 2).

Firms which recognize climate change as an emerging issue account for one-half of the overall sample of firms. Although seeing fewer opportunities and risks (Item 7), the issue is seen as emerging in importance and needs to be considered at least on a periodic basis by the Board (Item 8). These firms are developing their accounting system to monitor the discharge of GHG but are less likely to have moved beyond the capability to monitor direct and indirect sources (Item 5). Correspondingly, there is less capability to identify where within the boundaries of the firm the company's GHG are coming from (Item 6). A climate change ethos is being developed in these firms as they are relying generally on both formal and informal channels to communicate climate change activities to internal and external stakeholders (Item 3). These linkages across the organization are being fostered by the introduction of an internal verification system for their GHG performance (Item 4). These firms have moved beyond the talking stage in terms of changing their production process (Item 1) routines though are less likely to change internal routines and rather rely on purchasing of greener inputs from outside purveyors. Unlike top tier firms, these second tier firms are just beginning to explore market opportunities created by the climate change issue (Item 2).

The bottom tier firms are focused on the risks reflected by climate change (Item 7) and have yet to see its importance as a game changing event. The climate change issue is still firmly sequestered below the executive level in the organization (Item 8), where strategy is formed. They have an undeveloped climate change management system in place that neither captures depth of information (Item 5) nor breadth within the organization (Item 6). Little use is made of informal channels to communicate to external or internal stakeholders the climate change profile of these firms (Item 3) while the likelihood of an internal verification system let alone one that offers external verification is low (Item 4).

While three clusters are stable and are separated along the eight items (with the exception of item 3, noted above) and four resource domains, it is less clear the impact which geography and firm

size have on proactiveness. These two influences are discussed in the following sections. Sector influences are not discussed here due to space limitations.

Geographic

Although similarities between North American and European firms in the general orientation of firms to climate change (whether category 1, 2, or 3) are striking, differences begin to emerge when we examine behaviour along their resource domains (Table C). North American firms in aggregate are making slightly more non reversible investments to reduce their carbon foot print than their European counterparts and are also more likely to see both risks and opportunities than just opportunities. European firms however appear to have a better understanding of the sources of GHG emissions than their North American counterparts. Differences across other items and resource domains are muted.

RESOURCE DOMAIN & ITEM	N. A.	Europe	F	sig.
Resource Domain 1 - Tools used by firms to address climate change				
1 - Process reversibility	2.40	2.00	28.643	0.000
2 - Product reversibility	1.52	1.35	3.227	0.070
Resource Domain 3 - Organizational capabilities of firm				
3 - Reporting mechanism	2.28	2.24	0.093	0.760
4 - Verification system	1.08	1.18	1.986	0.159
Resource Domain 4 - Climate change information system				
5 - Existence of system	1.60	1.69	0.722	0.396
6 - Breadth of data	1.16	1.36	8.399	0.004
Resource Domain 5 - Opportunity to incorporate climate change issue into strategy				
7 - Risks and opportunities	2.37	2.03	13.039	0.000
8 - Location of clim. chng. file	2.02	2.01	0.003	0.935
Number of firms	327	246		

Note: Refer to Table B for comments on Resource Domains and scales of items
 Source: Adapted from Backman, Etienne, and Matthews (2010)

Size of Firms

The sample included firms from the FT500 index. Firms populating this index are the 500 largest firms by market capitalization in the world. These firms are multinational, have operations which span the globe and are likely to be impacted by a large number of organizational fields. This sub set of firms provides insight into the impact of size and multinational operations on climate change strategies, although this analysis cannot separate the two.

These firms on average are much more proactive in their stance to climate change and are so across all resource domains and items. While this outcome is generally replicated when we

compare FT500 and non FT500 firms across the four resource domains for North American and European firms (Table D), there are some differences.

Within North America, both FT500 and non FT500 firms have similar climate change information systems. While both see some risks and opportunities, it is in RD1 and RD3, as well as the level in the firm where the climate change file resides, an indicator of RD5, which separate the FT500 firms from the non FT500 firms. Within Europe, differences are more pronounced except for the level in the firm with responsibility for the climate change file.

There are some differences between FT500 firms in Europe and in North America. European FT500 firms have a more developed information system and are more likely to engage external and internal stakeholders in a climate change dialogue than their counterparts in North America.

RESOURCE DOMAIN AND ITEM	N. A.			Europe		
	FT	NON FT	F _{NA}	FT	NON FT	F _{EUR}
Resource Domain 1 - Tools used by firms to address climate change						
1 - Process reversibility	2.53	2.30	7.027	2.41	1.81	21.508
2 - Product reversibility	1.71	1.38	7.115	1.77	1.16	18.028
Resource Domain 3 - Organizational capabilities of firm						
3 - Reporting mechanism	2.57	2.05	15.679	2.86	1.95	33.442
4 - Verification system	1.22	0.97	7.393	1.72	0.92	51.659
Resource Domain 4 - Climate change information system						
5 - Existence of system	1.70	1.52	1.957	2.28	1.41	31.221
6 - Breadth of data	1.18	1.14	0.251	1.73	1.19	26.398
Resource Domain 5 - Opportunity to incorporate climate change issue into strategy						
7 - Risks and opportunities	2.38	2.36	0.043	2.42	1.85	12.522
8 - Location of clim. chng. file	2.23	1.85	8.724	2.23	1.91	2.592
Number of firms	167	185		54	167	

Note: Refer to Table B for comments on Resource Domains and scales of items

Source: Adapted from Backman, Etienne, and Matthews (2010)

Similarities exist across RD1 and RD5. Differences in non FT500 firms between North America and Europe are more muted and show up in RD1 and RD5. North American firms see more opportunities and are more likely to have moved beyond simply purchasing responsible inputs to manage their GHG commitments.

LIMITATIONS

We have demonstrated the application of the natural resource based view of the firm (Hart, 1995) using Buysse and Verbeke (2003) to the climate change issue. We have suggested that institutional theory may explain differences along geography and size though have not developed the conversation here. However, the CDP database and the firm questionnaires are the

foundation on which the analysis rests. The limitations of the database include (1) the second hand nature of the data (in that it was not collected with the specific research question in mind); (2) the changing nature of the survey instrument; (3) culture and language; (4) open-endedness of the questions, the last three impacting on reliability and validity issues; and (5) the scope of the sample limiting generalizability of the results.

On top of these five limitations of the data are the weaknesses created when translating from the CDP frame of reference to the Hart (1995)/Buysse and Verbeke (2003) frame of reference. What was fixed as the end point was the resource domains for which indicators needed to be found in the CDP questionnaire. The CDP questionnaire was the other fixed point. The selection of indicators was sometimes voluntaristic and somewhat arbitrary, and with the case of RD3 and RD4, considerable overlap exists. On top of the arbitrary selection of the indicators, another level of uncertainty was introduced with the creation of the scales for each item. While the scale was ordinal in nature, the analysis assumed that the variables were in fact continuous.

As a consequence, results should be seen as preliminary until in depth studies can be completed which delve deeper into firm motivation and behaviour. Furthermore, the results cannot be unilaterally transported to small and medium sized enterprises. Since only commercial firms were involved in the sample, the results or recommendations may have less relevance for governmental organizations at all levels, crown corporations, and nongovernmental organizations. These organizations are members of legitimate stakeholders in society though their motivations for adopting pro climate change routines and behaviour most likely will be different than those driving private sector firms with a profit motive.

Since the geographic focus of the study was North America and Europe, for the most countries from which are economically developed, the perspectives and usefulness to policy makers in other parts of the world such as Asia, Africa or South America may lack traction. To understand the degree to which the results and recommendations could be ported to these other regions would require further study focusing on firms from these regions.

FUTURE RESEARCH

This study has examined differences across firm strategies using a cross sectional data set. We have disaggregated the firms by geography though only at the North American and European level of detail here. Nor have we presented sectoral differences, both being due to space limitations in the proceedings. Our data set allows for sectoral differences and differences along smaller aggregates of countries however. These are planned for a future tome.

We have looked at the differences along membership in the FT500 or not. There are two influences which may be at work at this level of analysis. The first is size and thus amount of slack that the firm might deploy at new and emerging issues. Second, the degree of multinationalism and thus the number of fields that a firm might be subjected to. Further work is needed to unravel this aggregate of influences. Our data allows us to unbundled these effects with the analysis to be presented in future work.

This analysis has not included firms from the United Kingdom (UK). There may be differences between continental Europe and the UK given its historic separation from Europe. We have since expanded our data set to include firms from the United Kingdom (and Norway) which will be incorporated in future work.

Neither public sector, NGOs, private firms, nor SMEs have been included in the pool of firms considered. The results from this study are thus limited to large cap publicly traded firms which are traded on the major stock exchanges of their respected countries. Furthermore, it is only firms from North America and Europe which have been used in the study. These are developed mature economies which present a difference environment than firms that might predominantly haunt second or third world environments. Thus, the study needs to expand into firms from regions outside of North America and developed Europe to include second and third world countries as well as down into the SMEs of the developed and developing worlds. Furthermore, a greater understanding needs to be developed on the differences between private sector organizations and public sector and NGOs.

This analysis has focused on a cross sectional analysis of firm behaviour. It is thus difficult to develop a clear understanding of what is motivating firm behaviour over time. We have a longitudinal data set of firm responses which will support unravelling this dimension at a later date.

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