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corporate GHG emissions reporting?  
Empirical evidence from Europe*

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# **Does Stakeholder Pressure Influence Corporate GHG Emissions Reporting? Empirical Evidence from Europe**

## **Abstract**

**Purpose** – The paper seeks to shed light on the practice of incomplete corporate disclosure of quantitative Greenhouse gas (GHG) emissions and investigates whether external stakeholder pressure influences the existence, and separately, the completeness of voluntary GHG emissions disclosures by 431 European companies.

**Design/methodology/approach** – A classification of reporting completeness is developed with respect to the scope, type and reporting boundary of GHG emissions based on the guidelines of the GHG-Protocol, GRI and the CDP. Logistic regression analysis is applied to examine whether proxies for exposure to climate change concerns from different stakeholder groups influence the existence and/or completeness of quantitative GHG emissions disclosure.

**Findings** – From 2005 to 2009, on average only 15% of companies that disclose GHG emissions report them in a manner that we consider complete. Results of regression analyses suggest that external stakeholder pressure is a determinant of the existence but not the completeness of emissions disclosure. Findings are consistent with stakeholder theory arguments that companies respond to external stakeholder pressure to report GHG emissions, but also with legitimacy theory claims that firms can use carbon disclosure, in this case the incomplete reporting of emissions, as a symbolic act to address legitimacy exposures.

**Practical implications** – Bringing corporate GHG emissions disclosure in line with recommended guidelines will require either more direct stakeholder pressure or, perhaps, a mandated disclosure regime. In the meantime, users of the data will need to carefully consider the relevance of the reported data and develop the necessary competencies to detect and control for its incompleteness. A more troubling concern is that stakeholders may instead grow to accept less than complete disclosure.

**Originality/value** – The paper represents the first large-scale empirical study into the completeness of companies' disclosure of quantitative GHG emissions and is the first to analyse these disclosures in the context of stakeholder pressure and its relation to legitimation.

## Introduction

Climate change presents one of the greatest challenges for society (Solomon et al., 2011), and over the past decade a growing number of companies have begun reporting intensively on their climate change performance. While information on corporate strategies for the reduction of contributions to global warming and relative emission reduction targets can be valuable in this context, stakeholders increasingly require data on absolute levels of GHG emissions to be able to judge corporate performance on climate change. As argued by Clarkson et al. (2008, p. 309), environmental stakeholders demand hard and objective indicators of environmental performance (EP) “so that poor EP performers cannot mimic good EP performers by soft, unverifiable claims to be committed to the environment.”

The reporting of GHG emissions is not standardized and exists, largely, as a voluntary activity (Federation of European Accountants, 2009). Some scholars even argue that “climate change disclosure is still in a primitive stage of development” (Smith et al., 2008, p. 470). This is potentially troubling as it can result in companies reporting emissions information that is not comparable across firms, thus limiting the ability of stakeholders to accurately assess differences in climate change performance. However, despite an apparent stakeholder demand for environmental performance information, academic research analyzing the completeness of such data provision, in general - and more specifically, quantitative corporate GHG emissions disclosures - is sparse (see, e.g., Solomon et al., 2011, Rankin et al., 2011).

In this paper, we aim to partially fill this gap in existing research by developing a classification for the completeness of corporate GHG emissions disclosure and analyzing what factors appear to influence reporting practice. We classify corporate disclosure of GHG emissions with regard to the scope, type, and reporting boundary based on the guidelines of three dominant voluntary reporting initiatives, i.e. the GHG Protocol, the Carbon Disclosure

Project (CDP) and the Global Reporting Initiative (GRI). We argue that in order for users of data to be able to compare corporate GHG emissions performance across firms, the data must be complete with respect to the (i) scope, including emissions resulting from both internal corporate activities and electricity purchases, (ii) type, including both CO<sub>2</sub> and other GHGs, and (iii) reporting boundary, including emissions on group-wide activities. This classification enables us to subsequently investigate whether external stakeholder pressure on climate change concerns influences the existence, and separately, the completeness of voluntary GHG emissions disclosures by a sample of European companies. In doing so, we aim to respond to Hopwood's call for critical research on corporate environmental reporting (Hopwood, 2009) and Ascui and Lovell's (2011) assessment that many different facets of carbon accounting are in need of further research.

Our descriptive findings of disclosures over a five year period by a sample of 431 European Union companies show that, while a substantial percentage of firms provide quantitative GHG emissions information, the vast majority of the reporting is incomplete. For example, by 2009, the last year included in our analysis, over 70 percent of sample companies disclosed GHG emissions, but only about 23 percent of the disclosing firms provided information considered complete with respect to scope, type and reporting boundary. Results of our logistic regression analyses, controlling for resource factors and differences in legal systems potentially impacting firms' reporting environments, reveal that proxies for stakeholder pressure from the state, Non-Governmental Organizations (NGOs), and the public appear to influence, at least to some extent, corporate choice to report GHG emissions. We fail to find evidence that pressure from providers of capital impacts the choice to disclose. Importantly, our results also indicate that stakeholder factors have little impact on the completeness of the disclosure. These findings are consistent with stakeholder theory arguments that companies respond to external stakeholder pressure to report GHG emissions,

but also suggest that, in the presence of information asymmetry with respect to sustainability information (see Comyns et al., 2013), the voluntary nature of the reporting regime allows firms to respond in an incomplete way. As such, the incomplete disclosures may serve a symbolic legitimating function in that they allow companies to appear to be responding to stakeholder pressures without really providing information that will allow for meaningful accountability. This is consistent with findings from other social and environmental disclosure research (e.g., Collison, 2003; Cho et al., 2010) that firms, while providing certain disclosures, use biased language in an apparent attempt to enhance corporate legitimacy.

Importantly, our finding that the majority of corporate GHG emissions disclosures are incomplete suggests that it is unlikely the information can allow for meaningful benchmarking and comparison across firms. As such, the potential for the disclosure to induce improved corporate climate change performance is at best, questionable. Further, based on the finding that existing stakeholder pressure for the disclosure of corporate climate change performance information does not result in complete and comparable reporting, it would appear that, either more direct stakeholder pressure, or perhaps a mandated disclosure regime, will be needed to bring GHG emissions disclosure in line with the dominant reporting guidelines.

Our analysis contributes to existing literature in three ways: First, ours is the first large-scale empirical study to systematically examine the degree to which corporations' quantitative disclosure of GHG emissions is incomplete. Second, while prior studies document that corporate non-financial reporting practices appear to be influenced by variables such as size, industry, or country affiliation (Belkaoui and Karpik, 1989; Gray et al., 1995; Hackston and Milne, 1996; Patten, 2002), we find that our stakeholder proxies relate only to the choice to disclose GHG emissions data, not its completeness, thus opening an interesting avenue for future research. Finally, we respond to Spence et al.'s (2010) criticism

of social and environmental research by more explicitly relating stakeholder concerns to attempts at legitimation.

The remainder of this paper is organised as follows: The next section provides background on corporate GHG emissions disclosure and establishes our hypotheses as couched in terms of stakeholder theory and legitimacy theory. We then present the methods employed in our study and follow that with the presentation of results. In the paper's final section we discuss our results and present our conclusions as well as their implications.

### **Background and hypothesis development**

Considerable scientific evidence over the past thirty years supports the argument that GHG emissions are a major contributing factor to global warming and climate change, but early corporate responses towards climate change were somewhat troubling. Levy and Egan (2003) note that both the automobile and oil and gas industries in the United States viewed climate change concerns as a major threat and through groups such as the Global Climate Coalition, formed in 1990, worked to prevent mandatory emissions controls and effectively helped to prevent the U.S. from joining the Kyoto Protocol several years later. Further, even as industries in both the U.S. and Europe began to acknowledge the importance of GHG emissions for climate change (Kolk et al., 2008) and increasingly developed market responses to climate change (Kolk and Pinkse, 2004), corporate actions in North America, according to Jones and Levy (2007) remained largely ineffective. They note (p. 436) that while heterogeneous in nature the responses tended "to be directed at organizational changes rather than emissions reductions per se". In Europe, Sullivan (2009, p. 301) similarly summarizes that the majority of the 125 large companies included in his analysis "have yet to significantly reduce their emissions, and just one-third expect their emissions to reduce over time". This lack of meaningful progress, paired with uncertainties in political decision making, led to the development of several voluntary initiatives to grasp corporate climate

change performance and to spur corporate action with respect to climate change (Kolk et al., 2008).

A common bond across three of the most dominant climate change programs – the GHG Protocol, the CDP, and the GRI – is the reporting of corporate GHG emissions[1]. As explained by David Schatsky, founder and principal analyst for GreenResearch, a US-based sustainability consulting firm, the primary goal of the CDP, for example, is to encourage companies to disclose their GHG performance because if emissions are being measured, firms are in a better position to manage and reduce them (Schatsky 2009). However, making emissions data publicly available also can lead to public pressure for better performance, and Konar and Cohen (1997) refer to this use of disclosure as a quasi-regulatory device as ‘information as regulation’. With information on GHG emissions available, stakeholders are better able to assess the achievements of specific companies and, presumably, reward better performers and increase pressures on firms not meeting their expectations. Other ‘information as regulation’ initiatives, such as the US’s Toxics Release Inventory, have been successful at improving corporate pollution performance (see, e.g., Fung and O’Rourke, 2000). Unfortunately, at least as of yet, the GHG disclosure programs have not led to substantial improvements in corporate GHG emissions (see, e.g., AtKisson Group, 2013).

One potential reason for the lack of GHG disclosure impacts to date may be the quality and comparability of the information being provided. To illustrate, Dingwerth and Eichinger (2010) examined the GHG emissions disclosures for a sample of ten international auto manufacturers, and while all ten claimed to be in conformance with GRI reporting guidelines, the variability in the way the data were aggregated made comparisons across companies virtually impossible. Sullivan (2009) similarly reported that his investigation of GHG emissions disclosures by a sample of 125 large European companies indicated firms were not transparent with regard to the scope of their reporting and that many companies



included emissions only on a geographic subset of their operations. Unfortunately, while prior studies investigate broader aspects of climate change disclosure (e.g., Freedman and Jaggi, 2005; Rankin et al., 2011) and participation in the CDP (e.g., Reid and Toffel, 2009; Dawkins and Fraas, 2010), we are aware of no examinations that systematically analyze corporate quantitative GHG emissions disclosure in terms of its completeness. As such, one objective of our investigation is to do so. However, beyond just providing descriptive information on the existence and the completeness of corporate GHG emissions data, we attempt to identify whether external stakeholder exposures appear to influence company choices regarding that disclosure.

Because a major goal of our investigation is to determine the role that external stakeholder pressures play with respect to corporate quantitative GHG emissions disclosure, it can be seen as having its foundation in stakeholder theory. A stakeholder, as defined by Freeman (1984), is “any group or individual who can affect or is affected by the achievement of the firm’s objectives,” and, according to Roberts (1992), can include stockholders, creditors, public interest groups, and governmental bodies, among others. Because external stakeholder groups can have positions that deviate from, or are adversarial to, a corporation’s agenda, particularly regarding social responsibility issues (Roberts, 1992), firms may face the need to respond to the concerns of the stakeholder groups, and one of the primary ways they can do this is through the use of disclosure (Ullmann, 1985; Roberts, 1992). As summarized by Gray et al. (1996, p. 46), “information [...] is a major element that can be employed by the organisation to manage (or manipulate) the stakeholder in order to gain their support and approval, or to distract their opposition or disapproval”. In this respect, stakeholder theory is very similar to legitimacy theory, an alternative, although highly overlapping, theoretical lens (see, e.g., Gray et al., 1995; Deegan, 2007). Under legitimacy theory arguments, organizations must demonstrate that their activities “are desirable, proper, or appropriate

within some socially constructed system of norms, values, beliefs and definitions” (Suchman, 1995, p. 574) and thus companies have an incentive to use disclosure as a tool to reduce their exposures to the social and political environment that monitors the social legitimacy of the firms (Patten, 1991; 1992). One of the primary differences between the two constructs is stakeholder theory’s more explicit focus on those groups and individuals who bring the social and political pressures to bear on corporations (van der Laan, 2009).

A number of prior studies document that specific stakeholder groups appear to influence corporate social and environmental disclosure. For example, Deegan and Blomquist (2006) document that pressures on Australian mining companies through the publication of an environmental scorecard by the NGO the World Wildlife Fund led to changes in firms’ environmental disclosures. Focusing on a different source of exposure, Freedman and Jaggi (2005) argue that regulatory pressures from the state induce greater disclosure and they find that companies from countries that have ratified the Kyoto Protocol report in more detail on climate change issues. Similarly, Reid and Toffel’s (2009) investigation of company participation in the CDP, which they argue is a voluntary disclosure choice, was positively associated with greater state-level pressure regarding climate change concerns. Additionally, Roberts (1992) shows that companies from high profile industries, his proxy for stakeholder pressure from the public, was positively associated with the extensiveness of annual report social and environmental disclosure in the US, while Brammer and Pavelin (2006) present evidence that corporate environmental disclosures in the UK differed across firm ownership patterns, a factor they suggest represents potential stockholder pressures. In sum, considerable evidence indicates that specific stakeholder groups influence corporate disclosure choice, but none of these studies explores how the disclosure, in turn, might be related to attempts at legitimation.

From a slightly different perspective, and closer to tying stakeholder and legitimacy theory arguments together, Rodrigue (2014) focuses on the Canadian firm Abitibi Consolidated (AC) and examines the interplay between the corporation, its stakeholders, and the differing disclosure of information. She shows that the environmental disclosures of the firm, vis-à-vis the information provided by four of its major stakeholder groups [2], while exhibiting a high level of accountability for environmental management and recycling issues, in other areas was often incomplete and unreliable. Rodrigue (2014, p. 125) thus argues that “AC adopts mostly a strategic stance on accountability”, and she further suggests that, because AC “concentrates on reporting positive information across all” areas, it seems the firm is trying to legitimate its activities. However, Rodrigue also demonstrates that, in contrast to some of the stakeholder groups, AC exhibited little interaction with respect to the timing of information flows, and argues this was potentially due to the firm not considering those groups as particularly relevant for its legitimacy. Thus, Rodrigue begins to unpack some of the relations between responses to stakeholder concerns and attempts at legitimation.

Rodrigue’s (2014) exploration of the relations between stakeholder exposures and corporate environmental disclosure appears, in contrast to prior stakeholder-based investigations, to support Spence et al.’s (2010, p. 81) argument that, by explicitly recognizing what Lindblom (1993) had referred to as ‘relevant publics’ within the legitimacy theory domain as ‘stakeholders,’ the two theories can become “conflated and used successfully to guide the [social and environmental reporting] literature towards a more sophisticated understanding of firm-stakeholder relations”. We similarly focus on stakeholder exposures and the use of disclosure in a legitimating fashion but do so across a broader sample of firms and with respect to the more specific issue of the provision of GHG emissions information.

Given the importance of GHG emission for climate change, it is not surprising that corporations are being subjected to pressures for information specifically related to their emissions. Indeed, Kolk et al. (2008, pp. 720-721) stress that “business is under increasing pressure from investors and environmental non-governmental organizations (NGOs) to disclose information related to their GHG emissions”. With respect to former, high profile initiatives such as the Principles for Responsible Investment (Principles for Responsible Investment Initiative, 2012), The Carbon Principles Banks (The Carbon Principles Banks, 2008), and the CDP all illustrate the importance of corporate climate change performance to providers of capital. NGOs are also playing a major role in the climate change debate (Gough and Shackley, 2001) and are taking a variety of actions to influence corporate actions (see, e.g., Carpenter, 2001; Gough and Shackley, 2001). Of course, as identified by both Freedman and Jaggi (2005) and Reid and Toffel (2009), governmental units, too, are exerting pressures on corporations for information on GHG performance, at least in part because society continues to be concerned with climate change issues (Kolk et al., 2008). Given these stakeholder exposures and the prior results with respect to other corporate environmental disclosures, we expect companies facing greater pressure from stakeholder concerns regarding GHG performance to be more likely to disclose quantitative GHG emissions information. We formally state this hypothesis as:

*Hypothesis 1: Stakeholder exposure is positively associated with companies’ choice to disclose quantitative GHG emissions data.*

While we expect stakeholder exposures to influence the corporate choice to disclose GHG emissions information, we believe that stakeholder pressure with respect to climate change concerns may not be sufficient to induce complete and comparable disclosure. The problem is that the provision of GHG emissions information exists as a largely voluntary activity, and, as argued by Gray and Bebbington (2000), such voluntary reporting will reflect only those aspects of performance that organizations are willing to release. More specifically,

for example, Archel et al. (2008) claim some firms might actively decide to present a biased picture of their environmental performance by excluding the more emissions-intensive parts of their business. Similarly, Stanny (2010, p. 4), argues with regard to incomplete answers to the CDP, that “if a firm is primarily interested in conforming with social and environmental expectations it would disclose enough to avoid scrutiny”. In this regard, the voluntary nature of the reporting allows companies to use their GHG emissions disclosure as a legitimating tool rather than as a mechanism of accountability (Gray and Bebbington, 2000) [3].

Numerous studies (e.g., Cho and Patten, 2007; Deegan and Rankin, 1996; Patten, 2002; 2005) provide evidence that companies use environmental disclosure in a legitimating way, and as such, we do not expect stakeholder pressures to lead to the provision of complete GHG emissions information. We state this hypothesis as:

*Hypothesis 2: Stakeholder exposure is not associated with the completeness of companies' quantitative GHG emissions data.*

To summarize, drawing on the frameworks of stakeholder theory and legitimacy theory, we hypothesize that stakeholder exposure determines the existence, but not the completeness of corporate GHG emissions reporting. As we discuss in more detail below, we focus on four important corporate stakeholders - the state, NGOs, providers of capital, and the public - and we classify the completeness of GHG emissions reporting by companies in terms of the scope, type and reporting boundary of emissions reported. To account for the fact that establishing and maintaining reporting mechanisms for GHG emissions disclosure is not costless and cross-country differences in legal systems may influence corporate disclosure, we control for companies' resources and differences in legal systems in our analysis.

## Methods

### Sample

The Financial Times Stock Exchange (FTSE) All-World Index over the period from 2005 through 2009, inclusive, served as the starting point for the creation of our data base of corporate disclosures of quantitative GHG emissions. Index constituents were included in the primary sample if they (a) were domiciled in the European Union, (b) did not belong to the financial services industry as classified by FTSE Industry Classification Benchmark 8000[4], and (c) had complete financial performance data available on Thomson Reuters Datastream. The index constituents were updated at the beginning of each year, so that our sample is survivorship bias adjusted, i.e. companies entering the index were added to our sample and firms leaving the index were dropped. A total of 431 different companies fulfilled our search criteria in at least one year, resulting in 1,756 firm-year observations for our primary sample, and this is used to test our hypothesis concerning the existence of GHG emissions disclosure.

In order to examine the completeness of the GHG emissions information being provided, we focus on only those sample firms that report GHG emissions on at least the majority of corporate activities[5]. Again based on disclosure from 2005 through 2009, inclusive, our secondary sample, the completeness sample, consists of 1,108 firm-year observations.

### GHG emissions disclosure measures

**Existence of emissions disclosure.** To determine the existence of GHG emissions disclosure, we focused on the corporate reports and websites of the 431 primary sample firms for each of the years 2005 through 2009[6]. Data was hand-collected from companies' reports and websites. The CDP was used as a secondary data source. A dichotomous dependent variable (DISC) was coded one in tests of reporting existence for years in which a company

reported absolute levels of GHG emissions on at least the majority of corporate activities, and zero otherwise.

**Completeness of emission disclosure.** To identify the completeness of corporate disclosures of GHG emissions, we classified the reported data in terms of both scope and type of the emissions information provided, as well as the reporting boundary applied[7]. Our classification of reporting completeness draws from the three dominant guidelines for GHG reporting, namely the GHG Protocol (WBCSD, 2004), the CDP (Carbon Disclosure Project, 2011) and the GRI (Global Reporting Initiative, 2006), whose positions are summarized in Table 1. We argue that for stakeholders to be able to meaningfully assess the climate change performance of different companies, firms need to report complete emissions, i.e. in accordance with these reporting guidelines.

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Table 1 around here

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***Classification of scope of emissions.*** The standard mutually recommended by the CDP and the GRI to define the scope of an emission is the GHG Protocol which states that scope 1 GHG emissions arise from “sources that are owned or controlled by the company” and scope 2 emissions “from the generation of purchased electricity consumed by the company” (WBCSD, 2004, p. 25). Taken together, scope 1 and scope 2 emissions give a fair summary of emissions arising as a direct result of a company’s activity and are required as a minimum by all three dominant reporting guidelines. For the classification of reporting completeness, we therefore distinguish between companies reporting scope 1 and scope 2 emissions, i.e. complete reporting, as opposed to companies not reporting both scope 1 and scope 2 emissions[8].

***Classification of type of emissions.*** Acknowledging the comparatively high global warming potential of Greenhouse gases other than carbon dioxide, all three dominant reporting guidelines note that a comprehensive analysis of corporate climate change performance cannot be limited to CO<sub>2</sub> emissions, but must include other GHGs. As such, they all recommend the reporting of not just CO<sub>2</sub>, but other GHGs as well. For the classification of the type of emissions reported by our sample firms, we distinguish between companies reporting on both CO<sub>2</sub> and other GHGs, i.e. complete reporting, as opposed to firms only disclosing CO<sub>2</sub> emissions.

***Classification of reporting boundary.*** GRI, CDP and the GHG Protocol are vaguer with respect to the activities that are to be included within the boundary of emissions reporting (see Table 1). The GRI suggests that the indicator direct and indirect GHG emissions should at a minimum cover all entities that “generate significant sustainability impacts” (Global Reporting Initiative, 2005, p. 7) and specifies that “[g]enerally speaking, significant impacts are those that change a performance measured under a quantitative indicator by a noticeable amount” (Global Reporting Initiative, 2005, p. 11). In contrast to the GRI, the CDP and GHG Protocol both require reporting on all corporate activities and ask companies to specify any exclusion made to the reporting boundary in terms of sources, facilities, and/or activities. For this study, we distinguish between companies reporting on group-wide corporate activities and companies who report on less than group-wide corporate activities within the accounting approach chosen. To make this classification, we relied on the percentage figures or key words utilized by companies to describe the boundary of their emissions reporting. For companies providing a percentage figure, we classified companies that report emissions on more than 90% of manufacturing activities and more than 90% of all other activities as reporting group-wide. Where percentages were not provided, we considered the phrases “group-wide”, “all consolidated business”, “extrapolated to cover



100% of group operations”, “excluding small subsidiaries” or “including all sites and major offices” as indicators of group-wide reporting.

***Disclosure Completeness.*** Finally, we measure the overall completeness of reporting based on an assessment of the disclosure completeness with respect to scope, type and reporting boundary. We consider only companies classified as complete disclosers in all three areas as having complete GHG emissions disclosure. A dichotomous dependent variable (DISC) was coded one in tests of reporting completeness for years in which a company reported complete emissions across the scope, type, and reporting boundary, and zero otherwise. Table 2 displays descriptive statistics related to the disclosure dimensions.

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Table 2 around here

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### **Logistic regression models**

The primary intent of our analytic investigation is to identify whether the existence and the completeness of GHG emissions disclosure is influenced by external stakeholder pressures. However, because establishing and maintaining reporting mechanisms is not costless and cross-country differences in the legal systems may influence corporate disclosure, we expect differences in reporting resources and legal systems to also impact GHG emissions disclosure, and we control for those factors in our analysis. We use binary logistic regression to identify the relation between proxies for external stakeholder exposures and our sample companies’ GHG emissions reporting. The full model specification is stated as:

$$\begin{aligned}
\text{DISC} = & \beta_0 + \beta_1 (\text{EN\_TAX}) + \beta_2 (\text{NGO}) + \beta_3 (\text{OWN\_PF}) + \beta_4 (\text{LEV}) + \beta_5 (\text{IND}) \\
& + \beta_6 (\text{SIZE}) + \beta_7 (\text{ROA}) + \beta_8 (\text{ETS}) + \beta_9 (\text{UNGC}) + \beta_{10} (\text{FREN\_LO}) \\
& + \beta_{11} (\text{GER\_LO}) + \beta_{12} (\text{SCAN\_LO}) + \Sigma \text{YEAR} + \varepsilon
\end{aligned} \tag{1}$$

Where the dependent variable is:

**DISC** is a binary dummy variable coded ‘1’ for companies disclosing GHG emissions on at least the majority of activities, ‘0’ otherwise, in tests of reporting existence, and a binary variable coded ‘1’ for companies with complete disclosure, ‘0’ otherwise, in tests of reporting completeness

Where stakeholder proxy variables are:

**EN\_TAX** is a dummy variable coded ‘1’ for companies whose home country’s implicit energy tax level is above the sample average at t-1, ‘0’ otherwise

**NGO** is a binary dummy variable coded ‘1’ for companies mentioned in negative climate change-related NGO press releases at t-1, ‘0’ otherwise

**OWN\_PF** is a binary dummy variable coded ‘1’ for companies in which pension fund holdings at t-1 surpass 5%, ‘0’ otherwise

**LEV** is a continuous variable representing the ratio of total debt to common equity at t-1

**IND** is a binary dummy variable coded ‘1’ for companies belonging to high carbon industries, ‘0’ otherwise

Where control variables are:

**SIZE** is a continuous variable representing the logarithm of each company’s total assets in million € at t-1

**ROA** is a continuous variable representing each company’s ratio of return to total assets at t-1

**ETS** is a binary dummy variable coded ‘1’ for companies that have installations in the European Union Emissions Trading Scheme, ‘0’ otherwise

**UNGC** is a binary dummy variable coded ‘1’ for firm-years where the sample company is a member of the UN Global Compact, ‘0’ otherwise

**FREN\_LO** is a binary dummy variable coded ‘1’ for companies from countries whose legal system is of French origin, ‘0’ otherwise

**GER\_LO** is a binary dummy variable coded ‘1’ for companies from countries whose legal system is of German origin, ‘0’ otherwise

SCAN\_LO is a binary dummy variable coded '1' for companies from countries whose legal system is of Scandinavian origin, '0' otherwise

YEAR represents binary dummy variables controlling for potential year effects.

$\varepsilon$  is the error term.

### **Stakeholder proxy variables**

We included proxy variables to capture potential stakeholder pressures from four external groups – the state, NGOs, providers of capital, and the public. Our proxy for pressure from the state takes the form of the implicit energy tax level, which is calculated by Eurostat as the energy tax revenues of a country in relation to its final energy consumption in Euro per ton oil equivalent (Eurostat, 2011). Harper (2007) argues that governments can use energy taxes as a tool to motivate corporate actions, and she notes that countries including Sweden, Denmark, and The Netherlands, among others, specifically implemented energy taxes to shift the tax burden away from labour and capital to the use of environmental resources. Jeffrey and Perkins (2012), focusing on a sample of EU countries, find that higher implicit energy tax levels are related to lower carbon emission intensity. As such, we take the level of the implicit energy tax level of a country as a proxy for state pressure. We expect that companies from countries with comparatively higher implicit energy taxes are more likely to report their (incomplete) GHG emissions to the public in their corporate reporting to respond to this state pressure. We extracted the implicit tax rate on energy from the publications of the European Commission (Eurostat, 2011) and implement our stakeholder variable EN\_TAX to identify companies whose home country's implicit energy tax level is above the sample average.

Our proxy for pressure from NGO stakeholders concerning climate change concerns is whether a company was mentioned in negative climate change-related NGO press releases and featured news articles. Gough and Shackley (2001) note that a substantial number of

NGOs participate in the climate change debate and Azzone et al. (1997, p. 703) argue that for NGOs “[t]here is an obvious need for performance data to be published on a frequent and consistent basis, along with details of emissions”, while Kolk et al. (2008, p. 724) more explicitly claim that “environmental groups have been exerting pressure on firms to track and report their emissions”. One of the ways NGOs bring pressure is by publicly criticising companies on climate change-related issues. Accordingly, as a proxy for pressure from these NGOs, we gathered information on whether a company was mentioned in negative climate change-related NGO press releases and featured news articles by the World Wide Fund for Nature, Corp Watch, Greenpeace International, Friends of the Earth International, and Friends of the Earth Europe[9]. This proxy for NGO pressure is similar to indicators of media coverage used as a determinant of the existence and quality of environmental disclosure in prior studies (see, e.g., Brammer and Pavelin, 2008; Clarkson et al., 2008; Cormier and Magnan, 2005). In alignment with our theoretical framework, we argue that companies that have been publicly targeted by NGOs on climate change-related issues are more likely to report (incompletely) on their climate change performance in an effort to respond to stakeholder pressures.

We apply two proxies for pressure from providers of capital in our research, one related to equity investors, and one focusing on lenders. With respect to the former, Tilt (2007, p. 105) notes that “shareholders have long been considered an important target group for environmental disclosure”, and cites Heard’s (1990) finding that large institutional investors such as pension funds became increasingly active in exerting pressure on corporate boards over the 1980s. More recently, large institutional investors have begun placing pressures on corporations with respect to climate change issues (Cotter and Najah, 2012). Finseth (2010), for example, notes that CalPERS, the state of California’s public pension fund, has in place a policy urging companies to disclose a strategic analysis of their climate

risks including information on their emissions management. Further, Kolk et al. (2008, p. 731) note that “the main way by which the CDP has tried to help institutionalize carbon disclosure as a routine practice is by using institutional investors as a key point of leverage,” and they note particular success relative to prominent investment banks and pension funds. Accordingly, we argue that companies with a more concentrated ownership of institutional investors likely face greater pressures for GHG emissions disclosure, and we implement the proxy OWN\_PF to identify sample companies owned by pension funds to the extent of 5 percent or more[10].

Our second proxy for pressure from providers of capital is leverage (LEV). Roberts (1992, pp. 602-603) notes that the larger the extent of external borrowing, “the greater the degree to which corporate management would be expected to respond to creditor expectations concerning a corporation’s role in social responsibility activities”. Further, Dawkins and Fraas (2010) argue that financial institutions may demand a risk premium from companies they perceive as being poorer environmental performers, and as such, companies relying on external borrowing have an incentive to make environmental disclosures. This is consistent with the arguments of Clarkson et al. (2008, p. 314) who claim that “the monitoring demand for information increases as firm debt increases” leading managers to be more forthcoming. Although prior research offers mixed empirical results with respect to the relation between leverage and various measures of environmental disclosure[11], we posit that the importance of the climate change debate will lead to creditor pressure for corporate GHG emissions information. We measure leverage as the ratio of total debt to common equity.

Our final stakeholder proxy variable relates to pressure from the public concerning climate change concerns. From a stakeholder theory perspective, companies from industries with large impacts on global warming fall under a higher degree of public scrutiny and would consequently be more likely to disclose their climate change performance to answer to

stakeholder pressure. Numerous studies document that industry affiliation is a determinant of differences in environmental disclosure (e.g. Brammer and Pavelin, 2006; Dawkins and Fraas, 2010; Prado-Lorenzo et al., 2009). With respect to the climate change issue, Stanny and Ely (2008) argue that companies from industries generating higher levels of carbon emissions likely face greater public pressures, although they failed to find a significant relation between membership in high carbon industries and disclosure on climate change issues in the US. We use the FTSE Industry Classification Benchmark to allocate companies to their primary industry and rely on the classification scheme of Stanny and Ely (2008) whereby companies from the Utilities, Basic Materials, Industrials, and Oil and Gas sectors are designated as belonging to high carbon industries (IND) and coded '1' accordingly.

### **Resource control variables**

Because reporting resources vary across companies and are likely to impact disclosure decisions, we include four measures to control for these effects. The control variables capture firm size, company profitability, involvement with the European Union Emissions Trading Scheme (ETS), and firm membership in the UN Global Compact. Clarkson et al. (2008) argue that larger companies benefit from economies of scale in reporting, and numerous studies find that the extent and quality of environmental disclosure depends on company size (Brammer and Pavelin, 2006; Gray et al., 1995; Luo et al., 2010; Patten, 2002). Prado-Lorenzo et al. (2009) and Freedman and Jaggi (2005) confirm this relationship for the volume of disclosures on GHG emissions. We therefore control for company size, measured as the natural logarithm of total assets, as we expect larger firms to have the necessary resources for implementing a GHG reporting scheme[12].

Following Roberts (1992), we also argue that firm profitability can be expected to impact companies' commitments to social responsibility activities and reporting. Roberts (1992, p. 604) argues that "in periods of low profitability economic demands take priority

over discretionary social responsibility activities,” and that financial performance thus influences corporate commitment to social and environmental initiatives. Further, Li et al. (1997, p. 441) argue that the disclosure of environmental information can potentially increase proprietary costs in that “governmental agencies could use such information as a pretext for investigations that would increase compliance costs”. They also claim the disclosure could potentially provide “ammunition for environmental groups, such as Greenpeace, to press for stricter legislation or boycotts of the company’s products” (Li et al., 1997, p. 441). As such, firms not performing well financially may be less inclined to risk the increase in proprietary costs and therefore would be less likely to disclose GHG emissions information. As such, we control for financial performance using companies’ return on assets (ROA). Financial data for pension fund ownership, leverage, company size, and return on assets were collected from Thomson Reuters Datastream.

Two additional resource control variables center on the likelihood of companies having established GHG emissions reporting mechanisms in place. First, we identify companies with operations subject to the ETS, currently the world’s largest cap-and-trade system for corporate carbon dioxide emissions (European Commission, 2007). The ETS requires participating companies to implement the necessary systems for carbon accounting (Engels, 2009), and we argue that, therefore, these companies are more likely to have assessment and reporting mechanisms in place, and accordingly, are also more likely to report their GHG emissions to the public in their voluntary corporate reporting. We relied on the Carbon Market Data data base (Carbon Market Data, 2011) to determine which companies own installations that are part of the ETS.

Similarly, we follow Lim and Tsutsui (2012) and use corporate membership in the UN Global Compact (UNGC) as an indication of corporate participation in CSR. The UNGC is a voluntary initiative and lists the consequences of climate change as an important

environmental challenge to overcome, and the adoption of “an established and globally recognized policy framework for the [...] disclosure of environmental, social, and governance policies and practices” as one of the benefits of engagement (UNGC, 2011). We argue that companies which entered the UNGC are those that are committed to reduce their negative social and environmental impacts, and as such, are more likely to have mechanisms in place for GHG emissions disclosure[13]. We used Barkemeyer’s (2009) data base to determine which companies are members of the UNGC.

### **Legal system control variables**

Finally, we control for the circumstance that disclosure levels may be influenced by cross-country differences in the legal systems among the 17 countries included in the sample (see panel B in Table 3). La Porta et al. (1997, p. 1149) showed that “civil law, and particularly French civil law countries, have [...] the weakest investor protection”. Peters and Romi (2009, p. 13) summarize related literature in that weak investor protection results in lower quality financial accounting and that the “decreased creditability and less benefit from disclosure results in decreased corporate voluntary disclosure”. With regard to levels of corporate carbon disclosure, Peters and Romi (2009) however find that it is impacted by the environmental regulatory stringency but not the legal system of a country. Nevertheless, to control for cross-country effects in our analysis, we use La Porta legal system categories (La Porta et al., 1997) with the variables ENG\_LO, FREN\_LO, GER\_LO and SCAN\_LO representing countries whose legal system is of English, French, German and Scandinavian legal origin respectively.

Descriptive statistics on independent variables are summarized in Panel A of Table 3, whereas Panel C of Table 3 presents Pearson product-moment correlations[14].



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Table 3 around here  
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## **Results**

### **Disclosure**

The disclosure data summarized in Table 2 provides the first comprehensive overview of the completeness of quantitative corporate GHG emissions reporting in Europe. As shown in the table, the percentage of firms making GHG emissions disclosures has risen from 52 percent in 2005 to 71 percent by 2009. However, while also showing an increasing trend, the percentage of disclosing companies providing complete GHG emissions information based on our scale remains quite low. Across the five-year period of analysis, only 15 percent of the disclosures were classified as complete, i.e. reported scope 1 and 2 GHG emissions for a group-wide reporting boundary, and even in 2009, the year with the highest level of complete disclosure, only 57 companies met our standard, i.e. reported their emissions in line with the guidelines of the GHG-Protocol, GRI and CDP. Regarding the elements of completeness, sample companies' best performance was with respect to the scope of emissions being reported. Across the five year period, 84 percent of the GHG emissions-reporting companies disclosed on both scope 1 and scope 2 emissions, with 88 percent doing so in the last year of analysis. In contrast, even by the end of the time frame examined, only about half of the disclosing firms included information on both CO<sub>2</sub> and other GHG emissions, and only about half of the companies reported emissions on what is considered group-wide corporate activities. Positively, both completeness factors exhibit increasing percentages of company compliance over the period of examination.

## Results of logistic regression analyses

Table 4 displays the results of the logistic regression model estimations for both the existence and completeness analyses. With respect to the former, we find, as expected, that our resource control variables SIZE, ROA, ETS and UNGC are all positively and significantly (at  $p < .01$ )[15] related to the choice to disclose GHG emissions data[16]. Also consistent with expectations from financial literature, we find our cross-country legal system control variables FREN\_LO and GER\_LO to be negatively and significantly related to disclosure (at  $p < .10$  and  $p < .01$  respectively). We also find at least partial support for our first hypothesis. The implicit energy tax (EN\_TAX) and high carbon industry (IND) variables are both positively and significantly (at  $p < .05$  and  $p < .01$  respectively) associated with disclosure choice. In contrast to our expectations, NGO, LEV[17] and OWN\_PF are negatively signed while not statistically significant at conventional levels. The McFadden R-squared of the model is reasonable at 0.20. Finally, comparison to a regression model with only the resource and year controls indicates that the stakeholder variables significantly improve the explanatory power of the model as measured by the McFadden R-squared and Log likelihood.

In order to better understand the unexpected lack of significant results with respect to NGO pressure, we examined the observations in more detail across the separate years of our analysis. We identified that some of the companies, including, for example, the automobile manufacturers Volvo AB and Porsche AG, while targeted in NGO press releases did not initiate disclosure of absolute levels of GHG emissions amounts until after our period of data analysis. In contrast, for both 2006 and 2007, we identified that all companies having been targeted by NGOs in the prior year provided disclosures in the subsequent period. Based on Fisher's exact test, the likelihood of reporting GHG emissions significantly increases in the years 2006 and 2007 (at  $p < 0.01$  and  $p < 0.10$ , respectively) if a company was targeted by an

NGO in negative climate change-related news the prior year. Although only univariate in nature, we believe this additional analysis, and the overall results summarized above, suggest that, with the exception of exposures to providers of capital, stakeholder pressures appear to have influenced corporate choice to make GHG emissions disclosures.

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Table 4 around here  
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In contrast to the results supporting a stakeholder influence on the choice to provide GHG emissions disclosure, the results of the logistic regression related to the completeness of disclosure, also provided in Table 4, suggest stakeholder pressures have less influence on the disclosure of complete GHG emissions data. Only one stakeholder proxy variable, IND, is statistically significant, and that only at the  $p < .10$ , level. Interestingly, also only one of the resource control measures, ROA, is positively and significantly related to disclosure completeness (at  $p < .05$ )[18], while ETS is negatively signed and significant (at  $p < .05$ ). Given that the ETS requires companies to report only Scope 1 carbon dioxide emissions from specific installations (DEFRA, 2011) these results are plausible. Finally, two of our cross-country legal system control variables, GER\_LO and SCAN\_LO, are negatively and significantly related to the completeness of disclosure (at  $p < .01$ ).

The McFadden R-squared for this model, 0.07, is much lower than for the model focusing on the existence of GHG disclosure, and in contrast to the results for that estimation, inclusion of the stakeholder variables does not significantly improve model explanatory power relative to completeness.

## Disaggregated analysis

Although the primary focus of our investigation into the completeness of GHG emissions disclosure is on overall completeness, we also examined whether stakeholder pressures were related to more complete disclosure across the three sub-components of scope, type and reporting boundary. For these disaggregated analyses, we used binary dependent variables separately coded one for completeness with respect to each sub-component, and the results of the subsequent model estimations are presented in Table 5. As highlighted in the table, there is at least some evidence of a stakeholder impact regarding completeness of disclosure with respect to the scope and type of emissions[19]. Two stakeholder variables are positively and significantly associated with completeness in terms of the scope and type of emissions disclosed. For complete reporting with regard to the scope of emissions, we find the implicit energy tax (EN\_TAX) and a concentrated ownership of institutional investors (OWN\_PF) to be positively related and significant at the  $p < .05$  and  $p < .10$  level respectively. Concerning complete reporting with regard to the type of emissions, the implicit energy tax (EN\_TAX) and affiliation to high carbon industries (IND) are positively related and significant at the  $p < .01$  level. In contrast, and similar to the overall completeness model, none of the stakeholder variables is significantly related to having complete disclosure with respect to the reporting boundary. These additional analyses suggest that stakeholder pressures are not leading to complete GHG emissions disclosure with regard to the reporting boundary.

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Table 5 around here  
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As reported above in our descriptive results, the level of reporting completeness is slowly improving. As such, in an additional analysis, we attempt to determine whether

movement toward complete disclosure is a function of stakeholder pressures. For this analysis, we compare sample companies' disclosure to the immediately preceding year and code as '1' all observations in years 2006 to 2009 where the scope, type, or reporting boundary improved. All other observations are coded zero, and we again use logistic regression to explore whether stakeholder factors relate to the improved reporting. As also presented in Table 5, we find no evidence of a stakeholder effect. None of the stakeholder proxy variables is significant at conventional levels. Results also indicate no significance for the resource control variables.

### **Robustness tests**

Finally, we conduct two robustness tests[20]. The first robustness test controls for the possibility that the characteristics of firms disclosing GHG emissions are significantly different from those that do not. This heterogeneity in firm characteristics might lead to unobserved self-selection biases in our completeness regressions, given that the effects of independent variables on completeness might be impacted by unobserved and uncontrolled effects of the same independent variable on disclosure itself. To control for this possibility, we follow standard procedure (see, e.g., Collier and Gregory, 1999; Gupta et al, 2008) and compute and Inverse Mills Ratio using Heckmann's (1979) procedure, which we add as additional control variable to our completeness regressions. Results of this robustness test show no changes in the significance of any stakeholder variables and only one change in significance among the resource control variables. The negative coefficient of the ETS resource control variable becomes insignificant, which is reasonable given that, as explained above, the European Emissions Trading Scheme requires companies to report, but only on scope 1 carbon dioxide emissions from specific installations (DEFRA, 2011). This is likely a function of self-selection bias.

The second robustness tests examines if interactions among the three sub-components of disclosure completeness (i.e. scope, type and reporting boundary) and/or movement toward complete disclosure affect our results. To investigate the possibility that individual combinations of these four binary components represent the overwhelming force behind our results, we run a multinomial regression for the years 2006 to 2009. For this multinomial regression each possible combination of the four binary variables mentioned above is coded as one outcome category[21]. The results of this multinomial regression are consistent with our completeness of disclosure results presented in Table 4, which indicates that none of the individual combinations of the four binary components substantially biases our results.

### **Conclusion**

The primary intent of this investigation was to examine corporate quantitative GHG emissions disclosure and to identify whether stakeholder pressures influence that reporting. Focusing on a sample of 431 European Union companies over the period from 2005 through 2009, inclusive, we find that a substantial proportion of the firms are disclosing at least some quantitative GHG emissions information. However, our assessment of the completeness of that reporting relative to scope (emissions resulting from both internal corporate activities and electricity purchases), type (both CO<sub>2</sub> and other GHGs), and reporting boundary (reporting on group-wide activities), indicates that only 15 percent of the sample disclosures were complete in these respects. Based on results from logistic regression estimations controlling for differences in reporting resources, we provide evidence that proxies for stakeholder pressure appear to influence the choice to disclose GHG emissions, but that they appear to have much less impact with regard to reporting completeness. These results are consistent with stakeholder theory arguments that pressures from stakeholder groups impact environmental reporting. However, the findings also suggest that companies may be using incomplete

disclosure – possible because the reporting exists as a voluntary activity – as a symbolic gesture to reduce their exposures, and ultimately, this could be a major concern.

Makela and Laine (2011, pp. 218-219) assert that “the basic argument for social accounting” (of which GHG emissions disclosure is a part) is “the need for increased accountability,” and that “information beyond traditional financial disclosures . . . [can] provide corporate stakeholders further opportunities to monitor the organization’s activities.” But, owing to the voluntary nature of the reporting, this may not be the case. Makela and Laine (2011, p. 219) specifically note that recent literature including, for example, Collison (2003), highlights “how corporations use certain kinds of phrases, expressions, symbols and metaphors (that is, language in general) to convey a favorable representation.” Similarly, Cho et al. (2010) document that the language of environmental disclosures of worse performing companies in the U.S. exhibit more optimism and less certainty than better performing counterparts. As such, this body of work suggests that while companies may be responding to stakeholder pressures for increased provision of social and environmental information, the language of the disclosure is being used in a manipulative way to enhance corporate legitimacy. From a different, but related, perspective, our results suggest that companies may similarly be using incomplete disclosure of GHG emissions as a way of appearing to be responding to stakeholder demands.

Our finding that such a low percentage of GHG emissions disclosures are complete with respect to scope, type, and reporting boundary would appear to have implications for the value of the information, and more importantly, its potential to ultimately improve corporations’ climate change performance. Kolk et al. (2008, p. 726) note that carbon disclosure is a form of civil regulation whereby “civil society actors employ information disclosure mechanisms to exert pressure on business to establish and comply with environmental and social norms and standards.” They further assert “standardized information disclosure is a key element of these governance systems, because it provides a channel for accountability to stakeholders, it enables them to demand certain performance levels,” and to exert pressure on poor performers for improvement. But where disclosure is incomplete, it does not allow for benchmarking and comparison in any meaningful way, and as such, hinders stakeholders’ ability to assess performance differences across firms. Accordingly, it seems unlikely that GHG emissions reporting as it currently exists will ultimately lead to improved corporate climate change performance.

We concede that, given the currently still relatively undeveloped stage of GHG emissions reporting, it is possible that stakeholders may be content just to have companies engaging in the process at this point, and ultimately they may bring more pressure to bear on firms for better quality reporting. Certainly, the results of Rodrigue's (2014) case study suggest that stakeholder groups seem to respond to what they consider incomplete or misleading disclosure. However, an alternative and more troubling possibility is that stakeholders may instead acquiesce to the corporate actions. Archel et al. (2011), for example, document that heretic social actors, although included in the policy deliberations over CSR in Spain, ultimately grew to accept the dominant discourse. Our concern is that stakeholder groups bringing pressure for corporate GHG emissions disclosure may similarly resign themselves to acceptance of less than complete disclosure. Only future research can determine if that will be the case. However, given the apparent ability of companies to use voluntary disclosure as a legitimating tool, even in the face of stakeholder pressures, it appears that bringing corporate GHG emissions disclosure in line with the dominant reporting guidelines may instead require a mandated reporting regime.



## Notes

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[1] The latter initiatives address more than the reporting of GHG emissions. For example, Reid and Toffel (2009, p. 1158) point out that the CDP also solicits company information on “the risks and opportunities posed by climate change [and] the strategies being pursued to address them”. The Global Reporting Initiative (2005) addresses a wide set sustainability issues.

[2] The stakeholder groups examined by Rodrigue (2014) were governments, the public, environmental NGOs, and investors.

[3] Such an argument is in line with O’Dwyer’s (2002, p. 411) claim that companies may use “‘low effort’ symbolic gestures, such as the provision of elementary environmental disclosures [...] to demonstrate minimal appeasement to stakeholder demands”.

[4] We apply the common practise to exclude financial service companies from the sample as their specific characteristics make them incomparable with companies from other industries (Fama and French, 1992; Foerster and Sapp, 2005).

[5] We take the reporting of emissions of at least the majority of corporate activities to be the minimum level useful for any stakeholder purpose.

[6] Information published exclusively web-based, i.e. only on company websites, during the years 2005 and 2009 was only included in the data collection activities if emissions data had not been corrected in retrospect. Also, companies publishing only relative levels of emissions, i.e. tons of emissions per product, tons of emissions per sales or tons of emissions per square meter, were excluded from this study as relative indicators are usually calculated in company-specific manners and do not allow for a standardized performance assessment across company borders.

[7] Note that we do not classify the accounting approaches chosen for our measure of the completeness of GHG emissions reporting, as there is no consensus among the dominant reporting guidelines concerning the correctness of e.g. financial control, operational control, equity share or other accounting approaches. Arguing for the validity of one accounting approach over the other goes beyond the scope of this paper.

[8] In some cases the scope or type of the emissions data was not stated clearly by the reporting company. In these cases, the CDP data base was consulted and usually allowed for a clear classification of the emissions. In few cases a company did not report to the CDP and the classification had to be derived from key words and key phrases in the report. With regard to the scope of emissions, the terms “total emissions” and “Total” were classified as reporting scope 1 and 2 emissions. With regard to the type of emissions the terms “CO<sub>2</sub>-equivalents” and “GHG” were classified as reporting also on Greenhouse gas emissions, while the terms “Carbon dioxide” and “CO<sub>2</sub>” were classified as reporting only carbon dioxide emissions.

[9] These press releases and featured news articles were gathered from the respective websites of World Wide Fund for Nature (WWF International 2011), Corp Watch (2011), Greenpeace International (2011), Friends of the Earth International (2011), and Friends of the Earth Europe (2011).

[10] The five percent classification is consistent with Roberts’ (1992) shareholder power measure.

[11] While Clarkson et al. (2008) and Brammer and Pavelin (2006) both report significant positive relations between leverage and the extensiveness of environmental disclosure, Aerts et al. (2008) and Cormier and Magnan (1999) find significant negative associations. Some studies, e.g., Cormier and Magnan (2005) and Freedman and Jaggi (2005) indicate no significant relation between leverage and environmental disclosure.

[12] Firm size is often included as a measure of social exposure in social and environmental disclosure research (see, e.g., Hackston and Milne, 1996; Patten, 1991; 1992; 2002). To be conservative, we include it as a resource control variable, but note that if interpreted as a stakeholder proxy for pressure from the public, it provides further support for our results and argumentation. We find size significantly related to the existence, but not the completeness of GHG emissions disclosure.

[13] As noted by Janney, Dess, and Folami (2009), member firms are required to publish commentaries on progress.

[14] In order to detect potential problems with multicollinearity, we performed Variance Inflation Factor (VIF) analyses for all correlations of independent variables with coefficients above 0.30. Given a maximum VIF of 2.34 for our control variable FREN\_LO, we did not detect any serious problems of multicollinearity (Marquardt, 1970; Neter et al., 1985). In a sensitivity analysis FREN\_LO served as a base category in the logistic regressions performed with no effect on results, thus supporting the assessment that there is no problem of multicollinearity.

[15] All reported significance levels are two-tailed.

[16] In sensitivity tests using an alternative measures for firm size, i.e. the logarithm of the number of employees, and a firm's financial condition, i.e. free cash flow, results remain qualitatively the same. Both measures are positively and significant (at  $p < .01$ ) related to the existence of disclosure.

[17] In sensitivity tests using an alternative measure for leverage, i.e. the ratio of total debt to assets, results remain qualitatively the same. The ratio of total debt to assets is not statistically significant at conventional levels.

[18] In sensitivity tests using alternative measures for firm size, i.e. the logarithm of the number of employees, a firm's financial condition, i.e. free cash flow, and for leverage, i.e. the ratio of total debt to assets, none of the alternative measures is significantly related to the completeness of disclosure at conventional levels.

[19] We also find, as shown in Table 5, that the resource control variables are more strongly positively associated with completeness with respect to the type of emissions as opposed to the lack of relation for overall completeness.

[20] Results are available upon request.

[21] We are very grateful to an anonymous referee for the suggestion of this multinomial regression. Please note that our movement toward complete disclosure variable cannot be combined with the combinations of type, scope and reporting boundary in cases where all of the three latter variables carry the value 0. Furthermore, our sample has insufficient observations for combinations of the movement toward complete disclosure component and the other three components, unless the sum of these components is either 2 or 3.

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