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Company specific determinants of greenhouse gas disclosures

Purpose
The paper investigates the relationship between company specific factors and the extent of greenhouse gas (GHG) disclosures.

Design/Methodology/Approach
The study is based on a sample of 210 FTSE 350 companies and uses the disclosure index to quantify GHG disclosures made in the annual reports, sustainability reports and websites in 2011. Ordinary Least Squares (OLS) regression is employed to model the relationship between the company specific factors and the extent of GHG disclosures.

Findings
The results indicate that company size, gearing, financial slack and two industries (consumer services and industrials) are significantly associated with GHG disclosures while profitability, liquidity and capital expenditure are not. When we disaggregate GHG disclosures into qualitative and quantitative, our results suggest that the effect of some company factors differ depending on the type of GHG disclosures.

Research limitations/implications
The study is cross sectional. A longitudinal study is necessary to understand the dynamics of GHG disclosures as firms may change their disclosure policy as the importance of GHG increases. The results imply that policy makers need to take into account certain company specific factors when formulating policy aimed at improving GHG disclosures.

Originality/Value
The results add evidence to the growing body of research focussing on relationship between company specific factors and GHG disclosure. The study also provides evidence that the effect of some company specific factors on GHG disclosures differ depending on whether the GHG disclosures are quantitative or qualitative.

Keywords
Company specific, determinants, factors, greenhouse gas, disclosures

Article Classification: Research Paper

1. Introduction

There is growing evidence that firms are managing and reporting their greenhouse gas (GHG) emissions voluntarily in a bid to signal their green credentials (Rankin *et al.,* 2011; Peters and Romi, 2013). In view of such evidence, this paper investigates the extent to which UK listed companies disclose information relating to GHG gases. In addition the study examines whether company specific factors determine the extent of GHG disclosures. The research is mainly motivated by two reasons. The first reason is the need to add evidence on whether company specific factors determine the extent of GHG disclosures given the contradictory nature of existing research results. For example, gearing was found to be significant by Prado-Lorenzo and Garcia-Sanchez (2010) and Cotter and Najar (2011) but insignificant by Freedman and Jaggi (2005) and Rankin *et al.* (2011). Similarly, profitability was found to be insignificant by Prado-Lorenzo *et al.* (2009), Peters and Romi (2011), Rankin *et al.* (2011), and Cotter and Najar (2011) but significant by Prado-Lorenzo and Garcia-Sanchez (2010).

The second reason motivating our research is the need to respond to calls for more research in this area. For example, due to the conflicting nature of existing studies, Gray *et al.* (2001) and De Villiers and van Staden (2011), among others, suggested the need for more research on the factors influencing environmental reporting in general and GHG specifically. These studies indicate that the existing studies are inconclusive owing to many limitations and hence called for more research in this area. This study is therefore part of the response to those calls. The need for more understanding of company specific determinants of GHG

disclosure needs no emphasis as it can help shape or inform policy on promoting corporate transparency and accountability on GHG emissions.

Compared to previous studies, our study is different in that it evaluated GHG disclosures in annual, sustainability and website reports unlike the majority of studies which solely focussed on Carbon Disclosure Project (CDP) reports (Liao et al 2014; Peters and Romi 2013)**.** We argue that the motivation for disclosure through CDP or participation in CDP may not necessarily be the same as that for disclosure through annual and sustainability reports since the CDP is primarily driven by investors whereas the annual report is a legal document where disclosure priority is shaped by a diverse range of stakeholders. In addition, we have also extended our investigation to determine whether the disclosure differs depending on the type of GHG information disclosed i.e. qualitative or quantitative. By disaggregating the GHG disclosures into qualitative and qualitative we provide comprehensive and richer insights into disclosure quantity (see Beattie *et al.,* 2004) and this helps to profile different disclosure strategies employed by firms (Beretta and Bozzolan, 2004). Finally, our research is also different from previous GHG disclosure studies in that it is drawn from GHG disclosure items recommended for disclosure by a number of GHG voluntary frameworks. This evidence, to our knowledge, has not been documented before. Liao *et al.* (2014) notes that there is a general call within the academic and professional community to develop an appropriate framework or index which can be used to assess the extent of GHG information disclosure and our study is partly contributing to that.

The remainder of the paper is organised as follows: Section 2 is the literature review and hypotheses development. Section 3 discusses the research methodology. Section 4 presents and discusses the findings of research. Finally, there is a summary and conclusion.

2. Literature review and hypotheses development

2.1 Theoretical framework and prior studies

Voluntary disclosure of GHG information can be explained from theories focussing on information asymmetry (mostly agency and signalling theories) and social political perspective (mostly legitimacy and stakeholder theories) (Cho *et al.*, 2012; Gray *et al.*, 1995). At the heart of both agency and signalling theories is the information differentials that exist between two parties i.e. management and shareholders/investors with the latter possessing less information than the former (Mangena and Tauringana, 2007). In the circumstances, the former has the incentive to disclose more to the latter in a bid to narrow the differences since such information is vital for company valuation (Chen and Jaggi, 2000). However, disclosure of information comes with proprietary costs in the form of actual costs to disclosure as well as eventual consequences that accompany such disclosures (Guidry and Patten, 2012). Therefore, in accordance with these economics based theories, as they are also known (Cho *et al*., 2012), firms engage in voluntary disclosure when the potential benefits outweigh the costs and that such disclosures are made primarily for signalling purposes (Toms, 2002). In the circumstances, the information asymmetry based theories predict that those firms whose environmental performance and in this study GHG emissions reductions are superior to their counterparts would be motivated to disclose more as a way of setting themselves apart from the poor performers in the hope of gaining competitive mileage (Clarkson *et al*., 2008).

On the social political theories stream, legitimacy and stakeholders theories have been widely used to explain environmental and GHG disclosures. These theories argue that a firm's survival or continued existence is a matter that goes beyond the remit of the relationship between the owners and management (Gray *et al.*, 1995). Thus a firm's continued approval for existence is granted by the society and other stakeholders that control resources (O'Donovan, 2002; Cormier *et al.*, 2004). Therefore to ensure continued existence and good neighbourliness, firms are expected to operate within the bounds set by the society

otherwise they risk losing legitimacy. Wilmshurst and Frost (2000) explain that when activities are deemed environmentally sensitive and adverse then management will use disclosures to help redefine the public discourse on the subject matter and eventually change stakeholder opinion. However with respect to stakeholder theory, instead of just dealing with society as a whole, a firm is seen as having different negotiated contracts with various stakeholders so much so that its survival is dependent on it fulfilling its part of the bargain (Berthelot and Robert, 2012; Mitchell *et al.,* 1997). Therefore based on the social political theories it is predicted that disclosure is an attempt by a firm to repair, restore or enhance its reputation/legitimacy in its society and among its stakeholders so much so that those firms deemed as poor environmental performers are expected to disclosure more information in a bid restore their image. Thus disclosure is used as a tool to manage public and social pressure exerted on the firm as a result of its actions (Neu *et al.,* 1998; Cho and Patten, 2007).

Based on both the information asymmetry and social political perspective theories, some studies have investigated the influence of company specific factors on GHG disclosure. For example, Freedman and Jaggi (2005) investigated whether company specific factors determine global warming disclosures by global public firms from polluting industries. They found that size had a positive and significant relationship with global warming disclosures but both profitability and gearing had no significant influence. Prado-Lorenzo *et al.* (2009) similarly investigated the relationship between company specific factors and GHG voluntary disclosures and found that size was a significant determinant but gearing and profitability were not. A study by Berthelot and Robert (2012) found that company size and profitability (measured by return on assets) were both positively and negatively associated with GHG disclosure. However, profitability (measured by stock yield) was not significant. Finally, studies by Prado-Lorenzo and Garcia Sanchez (2010) and Peters and Romi (2012) also

reported that company size was a significant determinant of GHG disclosure while leverage, growth and profitability were not.

2.3 Hypotheses development

2.3.1Company size

Engagement in social and environmental activities and subsequent disclosures require substantial resources in terms of finance and skill. Large firms are deemed resource capable to meet the pollution abatement costs and related disclosure costs (Freedman and Jaggi, 2005). In this case the underlying assumption is that large firms will disclose more information than small firms. The availability of resources is paramount when dealing with climate related issues which in most cases necessitates significant changes to the way a firm conducts its business. All GHG disclosure studies have found a significant positive relationship between company size and GHG disclosures (e.g. Rankin *et al*., 2011; Berthelot and Robert, 2012; Stanny, 2011). Consistent with both social political and economic based theories and the findings of empirical studies on GHG disclosures, we hypothesise that:

H_1: There is a significant positive relationship between company size and GHG disclosures

2.3.2 Gearing

Based on the tenets of agency theory (Jensen and Meckling, 1976), managers in a highly geared company are expected to disclose more information in order to minimise the agency costs. In fact, leverage is considered a measure of risk exposure by both equity holders and debt holders. In highly geared company, creditors are worried that if a firm is not properly monitored then there might be wealth transfer from them to shareholders. In this case, if not provided with adequate information, creditors find their own means of monitoring management behaviour which results in increased agency costs (Depoers, 2000). According to Jensen and Meckling (1976), managers increase their levels of disclosures in a highly

geared company as a way of minimising agency costs. Empirical GHG disclosure literature has produced mixed evidence. For example, Freedman and Jaggi (2005) concluded that creditors had no role in determining climate change disclosures while Prado-Lorenzo *et al.* (2009) found a negative and insignificant relationship between GRI based climate change disclosures and leverage. Similarly Rankin *et al.* (2011) did not find any significant relationship between GHG disclosures and leverage. Given the contradiction between theoretical predictions and empirical findings, our hypothesis is non-directional. We hypothesise that:

H_2: There is a significant relationship between gearing and GHG disclosures

2.3.3 Profitability

Brammer and Pavelin (2008) noted that profitability provides managers with a pool of resources which can be used to absorb the costs of environmental disclosures. Others also argue that profitable firms are more exposed to the public than others and hence stakeholders may be interested in more disclosures as to how a firm is making its profits (Chithambo 2013; Berthelot and Robert 2012). Therefore faced with public pressure, profitable firms might use disclosures such as environmental disclosures to demonstrate their profitability case (Bewley and Li, 2000). Disclosures in this respect could be a means of gaining public trust and legitimacy regarding their ways of making profits. Empirical results on how profitability affects greenhouse gases disclosures are mixed. For example, Prado-Lorenzo *et al.* (2009) found evidence of a significant negative relationship between profitability and GHG disclosures in respect of one measure of profitability but no significant relationship in respect of their second measure of profitability. Freedman and Jaggi (2005) reported a non-significant relationship between profitability and pollution disclosures. Nevertheless other

studies found a significant positive relationship (Berthelot and Robert, 2012). Based on the conflicting evidence therefore a non-directional hypothesis is drawn as follows:

H_3: There is a significant relationship between profitability and GHG disclosures

2.3.4 Liquidity

Liquidity denotes the ability of a firm to meet its short term liabilities. Based on signalling theory argument, a company with a high liquidity ratio is expected to disclose more information to distinguish itself from other companies with less favourable liquidity positions (Aly *et al.*, 2010; Oyeler *et al.*, 2003). However, the opposite may also be true if seen from the information asymmetry propositions of agency theory where firms with low liquidity positions may provide more information to satisfy capital market players and creditor demands (Aly *et al.,* 2010). Prior evidence has been mixed. Oyeler *et al.* (2003) found that liquidity was a key determinant of internet financial reporting in New Zealand and that it had a positive significant relationship with voluntary disclosure. To the contrary, Aly *et al.* (2010) found that liquidity had no influence on internet reporting. Based on the assertion that environmental related activities including disclosures may necessitate adequate liquid resources, we hypothesise that:

H_4: There is a significant positive relationship between liquidity and GHG disclosures

2.3.5 Financial slack

The firm's financial slack is expected to affect GHG disclosures because such firms are expected to channel more financial resources into environmental or climate change initiatives including disclosure (Kock *et al.*, 2012). Financial slack has been found to enable firms to engage in new ventures which they could not engage in if no slack resources were available. Voss *et al.* (2008) found that as a firm's environment became more threatening, firms with more resource slack were able to explore other new products. In this case, as climate change

has rapidly become an issue of strategic importance, we argue that resource slack will facilitate engagement in emission control activities such as reporting which would require substantial investment in systems and personnel skill. Brammer and Pavelin (2006) argued that the availability of slack resources also enables a firm to meet administrative costs associated with voluntary disclosure related decisions. We there hypothesise that:

H_5: There is a significant positive relationship between financial slack and GHG disclosures

2.3.6 Capital expenditure

A firm's capital expenditure on property, plant and equipment may influence GHG disclosures since those with newer equipment are considered to have the capacity to manage their emissions well compared to those with older equipment (de Villiers and van Staden, 2011). Thus firms with high levels of capital expenditure are expected to have newer equipment which would enable them to manage emissions and would therefore be willing to make more disclosures. Gao (2011) found that firms with an aggressive environmental strategy leading to more environmental related disclosures often invest in newer and operationally and environmentally more efficient equipment. Since investment in newer and less polluting technologies makes a firm appear more green friendly, management are bound to disclose more information related to this as a way of informing their stakeholders (Clarkson *et al.*, 2011). We hypothesise that:

H_6: There is a significant positive relationship between capital expenditure and GHG disclosures

2.3.7 Firm age

Older firms are deemed well enough established to have resources to manage climate change issues compared to younger ones which might have other pressing issues. Besides, Roberts

(1992 p.605) argued that 'reputation and history of involvement in social responsibility activities can become entrenched' thereby making it hard for a firm to withdraw its commitment from these and or making stakeholders expect more from older firms based in previous experience. Others also argue that old firm have more time to establish extensive stakeholder networks such as research centers and other stakeholder who matter on various issues and hence can benefit from these networks to help set pace for disclosure (Alsaeed, 2006; Kang and Gray, 2011). We hypothesise that**:**

H_7: There is a significant positive relationship between firm age and GHG disclosures

2.3.8 Industry

Based on prior evidence, industries deemed as environmentally sensitive would disclose more information than those considered non-environmentally sensitive (Peters and Romi, 2013; Cho and Pattern 2007). Thus it is argued that environmentally sensitive industries are subjected to intense environmental regulation and scrutiny due to their high propensity to pollute and as such they are forced to comply with these regulations or act in a manner that will deter further stringent regulations. Consistent with stakeholder theory, the environmentally sensitive industries often come under pressure to demonstrate their green credentials from a diverse range of stakeholders. In this case, firms resort to more disclosure to manage these stakeholder expectations as non-disclosure may be interpreted as a signal of bad environmental performance (Clarkson *et al.,* 2008; Gao *et al.,* 2005). GHG disclosure studies that found positive and significant relationship include Rankin *et al.* (2011) and Freedman & Jaggi (2005). We therefore hypothesise that:

H_8: There is a significant relationship between a firm's industry and GHG disclosures

3. Research Methodology

3.1. Sample selection

The population for the study is the FTSE 350 London Stock Exchange listed companies as at 30th September, 2011. To arrive at our sample, 93 financial sector companies which include banks, insurance companies, investment trusts, unit trusts and real estate companies were excluded from the sample because they are subject to different disclosure and statutory requirements (Mangena and Tauringana, 2007) which can materially affect how other firm factors such as size and gearing are measured. Of the remaining companies, 257 firms, 47 firms were excluded on the basis of either undergoing significant restructuring in the year or had no corporate office in the UK. This meant that our sample consisted of 210 companies.

3.2. Quantifying GHGs disclosure

Unlike previous studies (e.g. Prado-Lorenzo *et al.*, 2009) which based their list of disclosure index items on a single GHG disclosure guidance, we included all relevant items from several GHG reporting frameworks such as GHG Protocol (2004), DEFRA (2009), and Global Framework for Climate Risk Disclosure (2006). The final index had 60 items consisting of 34 items relating to qualitative disclosures and 26 quantitative disclosures. To quantify the GHG disclosures made in the annual reports, sustainability reports and websites of the companies in 2011, content analysis technique was used. Literature suggests that the quantification of disclosure can either be done on a weighted or un-weighted basis. Gray *et al.* (1995) suggested that the adoption of either method does not materially alter the results. An un-weighted approach has been adopted for this study which is most appropriate when no importance is given to any specific user groups. A company is awarded a score of '1' for the disclosed item, and '0' if not disclosed. However, the company is not penalised if the item does not apply. The total disclosure index score is then calculated for each sample firm as a

ratio of the total disclosure score divided by the maximum possible disclosure for the company. The disclosure index for each company is then expressed as a percentage.

3.3.Econometric Modelling

We used Ordinary Least Squares (OLS) regression to model the relationship between company specific factors and GHG disclosures. The estimated models are as follows:

$$\text{GHG DIS}_x = \beta_0 + \beta_1\text{Size}_x + \beta_2\text{Gearing}_x + \beta_3\text{Profitability}_x + \beta_4\text{Liquidity}_x + \beta_5\text{Fslack}_x + \beta_6\text{Capex}_x + \beta_7\text{Firmage}_x + \beta_8\text{Industry}_x + \varepsilon$$

Where:

GHG DIS_x is the GHG disclosure index obtained after analysing company x's annual report, sustainability report and website.

Size_x is company x's variable related to size measured by total assets;

Gearing_x is gearing measured by dividing non-current liabilities by shareholders' equity.

Profitability_x is profitability measured by dividing operating profit by total assets;

Liquidity_x is liquidity measured by dividing current assets by current liabilities

Fslack_x is financial slack defined by cash and cash equivalents divided by total sales;

Capex_x is capital expenditure measured by dividing total capital expenditure by total sales;

Firmage_x is firm age measured as the natural log of the number of years a firm has been publicly listed on LSE.

Industry_x is an industry dummy with 1 denoting a company's industry otherwise 0

$B_{1\text{-}8}$ Coefficients

ε Residual

β_0 Constant

4. Results and discussion

4.1.1 Descriptive Statistics

The descriptive statistics for the extent of GHG disclosure and the independent variables are presented in Tables 1 and 2. Table 1 particularly focusses on the extent of disclosure with respect to the disclosure index used in this study. Overall, more qualitative disclosures are made compared to quantitative ones. On the qualitative disclosures, the most frequently reported item was the actions/measures taken to reduce/mitigate climate change impact with almost 95 per cent of the firms reporting this. This could suggest the desire on the part of the companies to shift focus of their target audience from their actual impact on climate change to intended actions. The least disclosed qualitative information was the supplier and the name of the purchased green tariff. The results also show that 71 per cent of firms disclosed their reporting framework guidelines while only 31 per cent disclosed that they had obtained assurance services on their GHG emissions reporting.

[INSERT TABLE 1 ABOUT HERE]

The most frequently reported quantitative item was the total GHG emissions in Co_2 metric tonnes which was reported by 84 per cent of the companies. However, evidence indicates low levels of GHG quantitative disclosure per scope. For example, only 29 per cent of the firms reported their GHG emissions per scope 1. Dragomir (2012) reported similar findings and noted that a sample of companies comprising BP, Total, Shell, BG Group and Eni had largely disclosed GHG emissions in total rather than in scopes. Overall there was lack of quantitative information relating to future estimates of emissions and quantifiable estimates of regulatory risks arising from climate change.

According to Table 2, the mean GHG disclosure is 38.5 per cent, with a minimum of 0 per cent and a maximum of 88.3 per cent, indicating a wide variation in the amount of GHG that companies disclose. Overall the mean disclosure of below 40.0 per cent also suggests that the extent of voluntary GHG disclosure by FTSE 350 is still low. When categorised into qualitative and quantitative disclosures, the results show that the means are 45.2 per cent and 29.7 per cent respectively, with a range of 0 per cent to 100 per cent in each case.

[TABLE 2 ABOUT HERE]

In respect of the independent variables, Table 2 shows that firms' size (measured by total assets) ranged from £51.5m to £345,257 million with a mean of £10,718.26 million which suggest that the firms are fairly large in terms of size. The average profitability (measured by return on assets) is 10.69% but the minimum is minus 16.13%. A mean gearing of 1.52 suggests that the sample is highly geared. It is also noticeable that with the exception of firm age, all the independent variables have high levels of kurtosis. However, Rankin *et al* (2011) argued that in large samples, the impact of skewedness and kurtosis values from normality is suppressed. In this case, therefore, the effect of the non-normal distribution in the independent variables is unlikely to affect the final outcome.

The correlation matrix for both independent and dependent variables is presented in Table 3. As expected, GHG disclosure is positively related with size, financial slack and capital expenditure. Gearing, profitability and liquidity are negatively correlated with GHG disclosures but none of them is significant.

[TABLE 3 ABOUT HERE]

There are no significant correlations between independent variables with the highest being that of capital expenditure and firm age at 0.20 and this is considered no threat to multicollinearity as it falls below the maximum threshold of 0.8 or 0.9 as recommended by Field (2009). However although our correlation matrix does not depict very high correlations among the independent variables, we also analysed the variance inflation factors. According to Field (2009), low values of VIF are expected if multicollinearity problem is to be under control. Our mean VIF was 1.05 and the highest VIF was 1.10 for capital expenditure. This then means that multicollinearity is not prevalent in our model.

4.2. Multiple regression results

4.2.1. Multiple regression results

Table 4 shows the results of our regression models of the relationship between the company specific factors and GHG disclosure. The R^2 adjusted is 29.0 per cent for the overall model and the model is highly significant (F=16.16, p=0.006). Our results indicate that out of all the variables, size, gearing and financial slack are significantly associated with the extent of overall GHG disclosure which suggests that our hypotheses $H_{1,}$ H_2 and H_5 are supported. However, our hypothesis H_8 is partially supported since only two industries (consumer services and industrials) are significantly associated with GHG disclosures. The rest of our hypotheses ($H_{3,}$ $H_{4,}$ H_6 and H_7) are not supported. In terms of the qualitative GHG disclosures, the results show a model explanatory power of 31%. In this case, out of all variables, only company size, gearing and two industries (industrials and consumer services) are significantly associated with GHG disclosures.

[TABLE 4 ABOUT HERE]

The results in Table 4 also show that when the company specific factors are regressed against quantitative GHG disclosure, the model explains 22% of the variation in GHG disclosures. With this model only size, gearing, financial slack, capital expenditure and two industries (industrials and consumer services) are significantly associated with GHG disclosures.

4.2.2 Discussion

The results of a positive and significant relationship between company size and GHG disclosures are consistent with prior literature (Rankin *et al.,* 2011; Berthelot and Robert, 2012). Being a large company implies that it is more visible and subject to intense public scrutiny which then might force it to make more disclosures as a way of deflating criticism. But being large is also synonymous with being resource rich which may enable managers to exercise more flexibility in their disclosure decisions unlike small firms where resources are deemed to be in short supply (Rupley *et al.,* 2012). The negative but significant coefficient in respect of gearing means that highly geared companies are likely to disclose less information on GHG emissions. While the result contradicts findings of prior studies on GHG disclosures (see Prado-Lorenzo *et al.,* 2009; Rankin *et al.,* 2011), it is consistent with the findings of Brammer and Pavelin (2008). This result could be seen in light of signalling theory in that low geared firms could be motivated to disclose more GHG information to signal to the market with the hope of tapping into the euphoria of attracting cheap capital through investors interested in socially and environmentally responsible firms. The non-significant results in respect of profitability are consistent with Freedman and Jaggi, (2005) and Rankin *et al.* (2011). The liquidity result, though not yet tested in GHG voluntary disclosure studies, is also comparable to other prior studies (e.g. Barako *et al.*, 2006) who reported that liquidity does not influence extent of voluntary disclosure. Our results also provide evidence that

availability of financial slack resources helps a firm to disclose more information on GHGs. This is consistent with Bowen (2001) who found that slack resources enable a firm to engage in some environmental initiatives. The finding on capital expenditure is particularly interesting in that when regressed with quantitative disclosures it is significant. This could suggest that for firms to make quantitative GHG disclosures there is need to invest in equipment and systems that will enable them to collect, measure and report GHG emissions (Ratnatunga and Balachandran, 2009).

Consistent with Guidry and Patten (2012), the non-significance of half of the company specific factors investigated in this study may imply that the primary reason for GHG disclosure is not the information asymmetry problem aimed at the capital markets participants. Luo *et al*. (2012) documented evidence that the market did not exert significant influence on firms to provide more GHG information and hence suggest that more disclosure could be related to other stakeholders such as the government. The need to manage other stakeholders or a firm's own legitimacy may take precedence over investors needs and this is corroborated by other studies that have surveyed practitioners on their motivation to provide more environmental information. For example, Cormier *et al.* (2004) through a survey found that the public were the highly ranked group seconded by investors/shareholders. The ranking of shareholders/investors as being second to other interest groups when it comes to environmental disclosures render support to the social political theories and suggest that the information asymmetry based theories are of secondary importance. This is consistent with the notion that the salience of shareholder demands relating to GHG emissions information is not as urgent as that of government, NGOs and public (Sprengel and Busch, 2011).

4.2.3 Robustness checks

The robustness of results was obtained through transformation of the industry variable. Prior studies (Rankin *et al.,* 2011) categorise the industries differently and in this study our classification is primarily based on Industry Benchmark Classification which resulted in nine industries after excluding financial sector. Cho *et al.* (2012) noted that variations in industry classification might affect the results hence called for careful scrutiny as to how industry variables are included in models. We reclassify the industry variable into just one dummy variable (i.e. 1 for environmentally sensitive industry otherwise 0) using Times 1000 industry categorisation and then run the main regression model again (see Thompson,1998). The results (not reported here but available on request) show that there is a minor change to the results in that the industry dummy becomes negative and non-significant. Apart from industry transformation, we also noticed that prior research proxied size and profitability with different measures hence we also re-ran our main model with different measures for size and profitability. Thus we use total revenue for size (instead of total assets) and return on equity for profitability (instead of ROA) and the results (not included here) are consistent with the main model.

5. Summary and Conclusion

The study investigated whether company specific factors (company size, gearing, profitability, liquidity, financial slack, capital expenditure, age and industry) determine the extent GHG disclosures. Overall, the results suggest that only company size, gearing, financial slack are associated with GHG disclosures. When we disaggregate the GHG disclosures into qualitative and quantitative, the results suggest that the effect of some of the company specific factors differ depending on GHG disclosures type. Our results should be interpreted in the light of the following limitations. First, we used multiple sources of disclosure medium to derive or determine the extent of GHG disclosure which makes it

difficult to understand whether GHG disclosures are indeed made for signalling purposes or with capital market players as the main target. In this case we recommend that future research investigate different models based on disclosure medium. Second, the study is also limited in terms of time period as it only investigates one year. Thus the extent to which our results can be generalised is limited.

Despite these limitations, our results contribute by providing further evidence on how company specific factors influence GHG disclosures. This is important because most disclosure studies form the basis of regulatory intervention hence it is prudent that policy based on research evidence should be grounded on. More importantly, our results contribute by providing evidence that the influence of some company specific factors on GHG disclosures differ depending on whether it is qualitative or quantitative. Finally, the study also contributes to the understanding of the extent of GHG voluntary disclosure practices by UK firms in the context of the requirements of a number of GHG disclosure guidance. Although there is growing research on GHG disclosures (Rankin *et al.*, 2011; Peters and Romi, 2012) most of it is based on other generic reporting frameworks like GRI (2006). It is therefore intimated that measuring GHG voluntary disclosures based on a number GHG disclosure guidance is more appropriate in that it will show the extent to which UK companies disclose internationally recommended GHG information on a voluntary basis.

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Table 1: Consolidated Disclosure Scores for all companies

	Disclosure item	Absolute Freq.	Relative (%)
	Qualitative Disclosures		
1	Institutional background	213	99%
2	Period covered by the report	212	98%
3	Statement on company position on climate change and related responsibilities	202	94%
4	Corporate governance on climate change	191	88%
5	Climate change opportunities and company strategies	137	63%
6	Climate change impact on business operations including supply chains	111	51%
7	Identification of regulatory risks as a result of climate change	67	31%
8	Identification of all other risks as a result of climate change	92	43%
9	Actions/measures taken to reduce/mitigate climate change impact	207	96%
10	Adaptation strategies to climate change effects	103	48%
11	Regulated Schemes to which a firm belongs	79	37%
12	Reporting Guidelines used in GHG reporting	135	63%
13	An assurance statement on disclosed information	58	27%
14	Contact or responsible person for GHG reporting	163	75%
15	Organisation boundary and consolidation approach	98	45%
16	Base Year	126	58%
17	Explanation for a change in base year	69	32%
18	GHGs covered including those not required by Kyoto protocol	68	31%
19	Sources and sinks used/excluded	88	41%
20	Conversion factors used/methodology used to measure or calculate emissions	83	38%
21	Explanation for any changes to methodology or conversion factors previously used	64	30%
22	A list of facilities included in the inventory for GHG emissions	37	17%
23	Information on the quality of the inventory e.g. causes and magnitude of uncertainties in estimates	13	6%
24	Information on any GHG sequestration	37	17%
25	Disclosure of the supplier and the name of the purchased green tariff	13	6%
26	Explanations for changes in performance of total GHG emissions in Co2 metric tonnes	154	71%
27	Explanation of any country excluded if global total is reported	111	51%
28	Explanations for changes in performance of scope 1 emissions	69	32%
29	Details of any specific exclusion of emissions from scope 1	55	25%
30	Explanation for the reason of any exclusion from scope 1	45	21%
31	Explanations for changes in performance of scope 2 emissions	65	30%
32	Details of any specific exclusion of emissions from scope 2	53	25%
33	Explanation for the reason of any exclusion from scope 2	44	20%
34	Explanations for changes in performance of scope 3 emissions	59	27%

	Quantitative Disclosures		
35	Total GHG emissions in Co2 metric tonnes	170	79%
36	Comparative data of Total GHG emissions in Co2 metric tonnes	159	74%
37	Future estimates of total GHG emissions in Co2 metric tonnes	15	7%
38	GHG emission by business unit/type/country	123	57%
39	GHG removals quantified in tonnes of Co2e	43	20%
40	Scope 1 emissions	63	29%
41	Comparative data on scope 1 emissions	56	26%
42	Future estimates of scope 1 emissions	3	1%
43	Scope 2 emissions	62	29%
44	Comparative data on scope 2 emissions	54	25%
45	Future estimates of scope 2 emissions	5	2%
46	Scope 3 emissions	50	23%
47	Comparative data on scope 3 emissions	45	21%
48	Future estimates of scope 3 emissions	3	1%
49	Emission of direct Co2 reported separately from scopes	95	44%
50	Emission not covered by Kyoto and reported separately from scopes	95	44%
51	Emission attributable to own generation of electricity/heat/steam sold or transferred to another organ.	116	54%
52	Emission attributable to own generation of electricity/heat/steam purchased for resale to end users	63	29%
53	For purchased green tariff state the reduction in tonnes of Co2e per year	17	8%
54	Additional carbon saving associated with the tariff as a percentage	5	2%
55	Quantitative data estimates of the regulatory risks as a result of climate change	1	0%
56	Quantitative data estimates of all other risks as a result of climate change	2	1%
57	GHG emission performance measurement against internal and external benchmarks including ratios	105	49%
58	GHG emission targets set and achieved	139	64%
59	GHG emission offsets information	48	22%
60	Comparative information on targets set and achieved	133	62%

Table 2: Descriptive Statistics

Variables	Mean	Std dev.	Min	Max	Skewness	Kurtosis
Disclosure - All	0.3851	0.2268	0.0000	0.8833	0.3992	2.079
Qualitative Disclosure	0.4521	0.2378	0.0000	1.0000	0.411	2.172
Quantitative Disclosure	0.2975	0.2336	0.0000	1.0000	0.4511	2.3998
Size (£m)	10718.26	35289.84	51.5	345257	6.9671	58.8583
Gearing	1.5328	12.0217	0.0338	173.9977	13.8651	198.2131
Profitability	10.6954	11.0904	-16.136	120.388	4.791	46.6767
Liquidity	1.6692	1.8633	0.2151	21.612	6.7751	65.9093
Financial Slack	0.5383	4.6157	0.0008	52.894	10.4103	110.5513
Capital Expenditure	0.1181	0.2494	0.0000	2.475	5.3127	41.9994
Firm Age (Yrs)	25.0935	20.6457	1.0000	80.0000	0.8549	2.4953

Table 3: Correlation among dependent and independent variables

	1	2	3	4	5	6	7	8	9	10
1.Disclosure - All	**1.000**									
2. Qualitative Disc.	0.971***	**1.000**								
3. Quantitative Disc.	0.948***	0.844***	**1.000**							
4.Size	0.226***	0.241***	0.186**	**1.000**						
5.Gearing	-0.056	-0.046	-0.065	-0.02	**1.000**					
6.Profitability	-0.107	-0.099	-0.109	0.044	-0.037	**1.000**				
7.Liquidity	-0.042	-0.036	-0.045	-0.07	-0.017	0.001	**1.000**			
8.Financial Slack	-0.119	-0.113	-0.115	-0.03	-0.009	0.04	-0.019	**1.000**		
9. Capital Expenditure	0.085	0.055	0.12	-0.05	0.033	0.017	-0.066	0.037	**1.000**	
10.Firm Age	0.086	0.049	0.128	0.024	0.141**	-0.07	-0.036	0.009	0.206***	**1.000**

****p<0.001, **p<0.05*

Table 4: Multiple Regression results

	Disclosure - All		***Qualitative disclosure***		***Quantitative disclosure***	
GHG Disclosure (DV)	*Coefficient*	*Robust Std. Err.*	*Coefficient*	*Robust Std. Err.*	*Coefficient*	*Robust Std. Err.*
Size	0.0846***	0.0089	0.0945***	0.0093	0.0718***	0.0099
Gearing	-0.002***	0.0002	-0.002***	0.0002	-0.002***	0.0002
Profitability	0.0002	0.0009	0.0005	0.0010	-0.0003	0.0010
Liquidity	0.0065	0.0085	0.0078	0.0091	0.0048	0.0080
Financial Slack	0.0033**	0.0013	0.003	0.0016	0.0036***	0.0009
Capital Expenditure	0.0907	0.0544	0.0633	0.0580	0.1264**	0.0529
Firm age	0.0072	0.0151	-0.0017	0.0158	0.0189	0.0156
Industrials	0.1832***	0.0552	0.1962***	0.0521	0.1665***	0.0628
Consumer Services	0.1427**	0.0594	0.1370**	0.0566	0.1502**	0.0659
Oil & Gas	0.0622	0.0757	0.059	0.0789	0.0664	0.0766
Basic Materials	0.0855	0.0673	0.0604	0.0653	0.1183	0.0744
Consumer Goods	0.0854	0.0618	0.0837	0.0614	0.0877	0.0738
Telecommunications	0.0358	0.0950	-0.0427	0.0756	0.1386	0.1329
Utilities	0.1034	0.0780	0.0969	0.0717	0.1119	0.0890
Technology	0.0570	0.0621	0.068	0.0623	0.0427	0.0684
R-Squared	*0.34*		*0.36*		*0.28*	
Adj. R-Squared	*0.29*		*0.31*		*0.22*	

****p<0.001, **p<0.05*