

*Progress report on longitudinal and cross-sectional study of carbon disclosure strategies: evidence from UK listed companies*

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**Progress report on longitudinal and cross-sectional study of carbon disclosure strategies:  
evidence from UK listed companies**

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**Introduction**

Global warming has attracted attention from all over the world and led to the concern about carbon emission. Kyoto Protocol, as the first major international regulatory emission trading scheme, was introduced in 1997 and outlined the strategies for reducing carbon emission (Ratnatunga et al., 2011). As the increased interest in carbon reduction the Protocol came into force in 2005, currently there are already 191 nations ratifying the Protocol (UNFCCC, 2012). Under the cap-and-trade schemes, each company has its carbon emission target. When company's carbon emission exceeds the target the company will either face fines or buy emission allowance from other companies. Thus unlike most of the other social and environmental issues carbon emission could trigger cost for companies in introducing low-emission equipment and systems and also emission allowance cost when they emit more than their targets.

Despite the importance of carbon emission to companies, carbon emission reporting is still operating under unregulated environment and companies are only required to disclose when it is material either in value or in substances (Miller, 2005, Deegan and Rankin, 1997). Even though there is still an increase in the volume of carbon emission disclosures in company's financial reports and stand-alone social and environmental reports to show their concern of the environment and also their social responsibility (Peters and Romi, 2009), the motivations behind corporate carbon emission disclosures and whether carbon disclosures have impact on corporate environmental reputation and financial performance have not yet to explore.

The problems with carbon emission lie on both the financial side and non-financial side of corporate governance. On one hand corporate needs to spend money in reducing carbon

emission or paying penalties when they emit more than allowed. On the other hand as the public are more interested in environmental issues than before carbon emission could also impact on the image of corporate regarding to its environmental performance. The importance of carbon emission issue are beginning to be recognized by companies from different industries as one of the critical issues in supply chain management (Lee, 2011) and 80% of companies analysed are facing carbon risks resulting from emissions in the companies' supply chain as shown in a study conducted by the Investor Responsibility Research Centre Institute for Corporate Responsibility (IRRCI) and over 80% of the companies analysed found that the majority of greenhouse gas (GHG) emission are from electricity and other direct suppliers (Trucost, 2009).

The review of extant literature shows the increased importance of carbon emission issues and the gap in the study of carbon reporting and disclosures and also the study which links corporate environmental reputation and corporate financial performance with carbon reporting (Lohmann, 2009a, Ratnatunga and Balachandran, 2009, Bebbington and Larrinaga-Gonzalez, 2008). This study would focus on investigating the current status of UK carbon emission disclosures, the determinant factors of corporate carbon disclosure, and the relationship between carbon emission disclosures and corporate environmental reputation and financial performance of UK listed companies from 2004-2012 and explore the explanatory power of classical disclosure theories.

### **Research aim and objectives**

This study aims to investigate the development of corporate carbon disclosure practice, using self-developed carbon disclosure index and then investigate the determinant factors of corporate current carbon emission disclosure strategies and the inter-relationship between carbon disclosures, corporate financial performance and corporate reputation. The research objectives of this study are:

- To investigate the development of corporate carbon emission disclosure strategies in UK, from 2004-2012.
- To investigate the determinant factors of current corporate carbon emission disclosure strategies.
- To investigate the inter-relationship between corporate carbon emission disclosure, corporate financial performance and corporate reputation.

### **Theoretical framework**

There is currently no theoretical framework regarding carbon emission disclosures. But as part of CSR disclosures the classical disclosure theories could be of use to understand corporate motivation or demotivation of carbon emission disclosures from the theoretical view. Most of the extant environmental disclosure studies use legitimacy theory as their framework in their analysing (Campbell, 2000, Deegan et al., 2002, Patten, 1992, O'Donovan,

2002) . With no doubt legitimacy theory is most powerful as the explicator of the phenomenon of CSR disclosures and environmental disclosures. But it is suggested here to consider both the economic theories and social and political theories (Gray et al., 1995) in this study as carbon issues also have financial impact on corporate performance instead of serving as just purely philanthropy activities. Thus the users of carbon information could be divided into two groups: the financial community and the society. From the view of company it could be the case that they disclose carbon information not only to achieve or maintain their legitimacy but also to achieve financial purposes. Therefore the literature review follows this clue and both the economic theories and social and political theories will be reviewed and have the same weight.

### **Legitimacy theory**

Legitimacy is defined as the ‘appraisal of action in terms of shared or common values in the context of the involvement of the action in the social system’ (Parsons and Jones, 1960, p.175). According to legitimacy theory company value or actions need to be congruent with the value of the superordinate social system to get or maintain its right to operate in the environment. Legitimacy theory suggests that to achieve legitimacy an organization should be operating within the norms and expectations of the society within which it operates and implies that organizations make voluntary disclosures in order to gain legitimacy or maintain legitimacy with relevant stakeholders or publics (Dowling and Pfeffer, 1975).

Legitimacy theory is widely used to explain the main motivation of social and environmental disclosures (Dowling and Pfeffer, 1975, Deegan et al., 2002, O’Donovan, 2002, Cho and Patten, 2007, Lindblom, 1994, Mahadeo et al., 2011) it is still underdeveloped and its explanatory power of environmental disclosures is controversial. Hogner (1982) examines the social disclosures of 80 years from the annual reports of US Steel and finds that organizations use social disclosures as a response to social forces and events which reflects organization needs for legitimacy. Guthrie and Parker (1989) then examine the 100 year social disclosures from an Australian mining company BHP and do not find the match between the peak of social disclosures and social events and therefore fail to conclude the primary explanatory power of legitimacy theory of social disclosures. Patten (1992) conduct a study of the impact of Exxon Valdez oil spill on corporate social disclosures of petroleum firms other than Exxon and finds a significant increase in disclosures which is in support of the explanatory power of legitimacy theory. More recent studies of social disclosures notice the decrease of social disclosures in recent years and try to explain this from the lens of legitimacy theory. De Villiers and Van Staden (2006) argue that organization will adjust the extent (upwards or downwards) and the type (general or specific) of social and environmental disclosures to meet the changing needs of social expectations and keep its legitimacy. Their study contributes to legitimacy theory by adding this new dimension of reducing social disclosures as a legitimising strategy. However the perceived change of expectation is a rather subjective issue to measure and to compare between different organizations, even between organizations from the same industry and same country. And those studies focus on organization from

different and industries. And the methodologies employed in those studies and the focus of the content analysis of CSR reports are also varying. All of these reasons could lead to the inconclusive results of the explanatory power of legitimacy theory. Therefore testing legitimacy theory through the examination of certain content of CSR may yield a different result.

Chelli et al. (2014) argues that previous studies examine corporate environmental disclosures mainly from the lens of strategic legitimacy theory which focus on repairing legitimacy in response to various legitimacy threats, while the institutional view of legitimacy centres on the maintenance of legitimacy. Corporate legitimacy is easier to maintain than to obtain or repair (Suchman, 1995) and corporate response differs according to their appreciation of the legitimacy threats and whether disclosures are needed to gain, maintain, or repair their legitimacy to operate in the society (O'Donovan, 2002). If the social or environmental events/threats are not an emerging issue to the company or the whole industry, peak disclosure period probably will not happen as they are to some extent already in congruent with the expectations of the society and all they need to do is to maintain their current disclosure strategy or to imitate and adopt other companies' disclosure strategy for the reason of competitive advantages (DiMaggio and Powell, 1983, Meyer and Rowan, 1977, Chen and Roberts, 2010), which forms the cognitive perspective of institutional legitimacy. New legislation is also found to have a lasting impact on the quality and quantity of environmental disclosures from the institutional legitimacy perspective (Chelli et al., 2014). However, whether this lasting impact exists among other kinds of social events or threats is not covered in extant literature.

The concept of institutional isomorphism indicates that organizations must take into account other organizations' behaviours (Aldrich, 1979) which forms the institutional context of the organization in the long run and drives the organization to behave in similar ways as those other organizations do. Institution thus is formed when comparisons and imitations are made, based on individual organization's perception of its environment (d'Andrade, 1984). The pattern of the established institutions is viewed as the symbolic representation of the social value system from the lens of institutional legitimacy theory (Chen and Roberts, 2010) and environmental disclosure is claimed to become institutionalized over time as structures and practices that symbolizes the stakeholder concern of corporate environmental issues (Scott, 1995). In the testing of explanatory power of legitimacy theory, institutional legitimacy is more suitable to explain why companies behave in a particular way (Hall, 1977) while strategic legitimacy mainly explains companies behaviour in a given period (Cormier et al., 2005).

### **Agency theory**

Agency theory is widely used to explain corporate governance and accounting issues but it is rarely used in the study of CSR or corporate voluntary disclosures. The managers of the company run the business on behalf of the shareholders of the company and this agency and

principal relationship lead to the separation of ownership and control (Fama and Jensen, 1983). The essence assumptions of agency theory are ‘(a) the desires or goals of the principal and agent conflict and (b) that it is difficult or expensive for the principal to verify what the agent is doing’ (Eisenhardt, 1989. p. 58). In the case of carbon emission reporting whether there is agency problem depends on if carbon emission reporting could add value to the company. In the short term if the company is operating under its emission target, making effort in improving carbon emission policy and reducing carbon emission will increase the operation cost of the company and even the cost of detailed carbon accounting could be daunting (Brenton et al., 2009). Thus carbon issues will reduce the profit of the company which will influence the performance of the managers. However if companies carbon reduction activities and disclosures could endorse the function to attract institutional investors and satisfy their needs of SER disclosures to make SRI decisions then it reduces the conflicts between management and shareholders. In the long run if carbon reporting contributes to corporate reputation shareholders could also benefit from the increased value of their investment. Research in corporate reputation also finds there is positive relationship between social performance and financial performance (Orlitzky et al., 2003). They use a meta-analysis methodology reviewing the primary quantitative studies of corporate social performance and financial performance relationship. By using this method the result is more objective and representative of the previous research results. Although there is not enough extant literature in carbon emission reporting and corporate environmental reputation to Meta-analyse the samples quantitative study in this research area is still a preferential method. The result also shed some lights on my study. According to their result carbon emission performance as an important indicator of corporate social and environmental performance will have impact on corporate financial performance. This is quite reasonable result of carbon emission disclosures and reporting. The expected result of my study is that carbon disclosures and reporting could add value to corporate environmental reputation. It is also found that there is a positive relationship between corporate reputation and its financial performance (Roberts and Dowling, 2002). From this point of view, carbon performance could positively affect corporate financial performance indirectly. If this is the case for corporate carbon emission then it contributes to both corporate financial performance and non-financial performance of company and helps to align the interests of the management and the shareholders in the short and long run. This will also provide evidence that company could satisfy the needs of stakeholders without harming its financial performance and shareholder value and solve the conflicts between agency theory and stakeholder theory.

### **Research method**

To achieve the aim of this study, both qualitative content analysis and quantitative regression analysis are used, through the investigation of carbon emission disclosure indexing data of 62 of FTSE 100 companies. This study enables both longitudinal and cross-sectional analysis of data in this research. The research methodology consists of three inter-related studies of corporate carbon emission disclosures and is summarized as below.

## **Stage 1**

The purpose of stage one is to examine the longitudinal development of extant corporate carbon disclosure practice. This stage includes the investigation of carbon disclosure practice of 25 FTSE 100 companies from utility, mining and energy industries, which are the top three industries of UK carbon emissions (CDP, 2012a), over the period from 2004-2012. Currently, there is little study of corporate extant carbon disclosure practice (Freedman and Jaggi, 2005) and this motivates this stage to fill in the research gap in this area. Content analysis of corporate carbon disclosures from both corporate annual reports and standalone reports from 2004-2012 is done to examine corporate current carbon disclosure practice. In stage one a disclosure index is developed to examine the quality and extent of corporate carbon disclosures. The results will be analysed through trend analysis to explore how corporate carbon disclosure strategy has changed and developed over time.

## **Stage 2**

Stage 2 would examine the carbon disclosures from all the 62 FTSE 100 sample companies for a period of two years, 2011-2012. Corporate characters and other potential determinant factors will be regressed against corporate carbon disclosure levels to explore what factors could influence corporate disclosure strategy. In extant studies, firm size, country, industry, public pressure, BETA, debt/equity ratio, percentage of ownership, return on asset (ROA), membership of certain organizations (Freedman and Jaggi, 2005, Lund, 2007, Patten, 1992, Patten, 2002, Roberts, 1992, Gray et al., 1995, Elsayed, 2006) are found to be related to corporate environmental disclosures. There are no extant studies investigating the influential factors of corporate carbon disclosures, this stage of the study will fill in the gap in that topic.

## **Stage 3**

The aim of stage two is to investigate the association among corporate carbon disclosure quality, corporate financial performance and corporate environmental reputation. Extant literature shows mixed results of the impact of corporate CSR disclosure on corporate financial performance (Belkaoui, 1976, Bowman, 1978, Richardson and Welker, 2001, McWilliams and Siegel, 2000, Spicer, 1978). These studies focus on the association between CSR and financial performance and there is less study focus on the financial impact of one specific issues of CSR, especially the financial impact of carbon emission. This motivates this stage of study. As explained before carbon emission issue could trigger cost and carbon investment of companies, it is worth to explore the extent of impact of these carbon costs and carbon investments. The score rating results of the 62 sample companies for the period between 2011 and 2012 will be used in stage three as the measure of corporate carbon emission disclosure quality. The environmental reputation will be measured through using Britain's Most Admired Companies (BMAC)-Community and Environmental Responsibility list. There are around 200 UK companies on the list every year since 1994. BMAC is the only UK database collecting corporate environmental performance data directly from companies and offering continuous data of corporate social and environmental reputation (Elsayed, 2006). Designed, implemented and improved by an academic professor Mike Brown from



Birmingham City Business School for two decades (BMAC, 2012), BMAC provides relatively objective information of corporate reputation compared with those developed by individual researchers. Furthermore according to the intangible nature of corporate reputation it is also more complicated to measure than those tangible assets of companies. BMAC data is widely used in the extant research (Elsayed and Paton, 2005, Salama, 2005). BMAC ratings will be used as measurement of corporate environmental reputation. Corporate financial performance will be measured by accounting returns (i.e. ROA, ROE) and investor returns (i.e. stock price). Those data could be obtained from database e.g. Bloomberg database.

## **Results to date**

We have finished the first stage of this study, which is the longitudinal study of corporate carbon disclosure development.

### **Content analysis**

Content analysis is defined as:

‘a technique for gathering data that consists of codifying qualitative information in anecdotal and literary form into categories in order to derive quantitative scales of varying levels of complexity.’ (Abbott and Monsen, 1979, p.504).

Bowman (1984) claims that content analysis of corporate reports is capable to show relationships which are difficult to obtain otherwise and it can also be tested for validity and justifies. Content analysis is widely used in the studies of environmental disclosures, while they are mainly focus on environmental disclosures in general (Patten, 1992, Hackston and Milne, 1996, Deegan and Gordon, 1996, Kolk, 1999, Deegan et al., 2002, Patten, 2002, Cho and Patten, 2007, Clarkson et al., 2008, Haque and Deegan, 2010, Guthrie and Parker, 1989) and there is rare research into the subset of environmental issues, especially into global warming disclosures and carbon emission disclosures (Freedman and Jaggi, 2005, Haque and Deegan, 2010). There is a gap in the research of carbon disclosures within the literature, using content analysis. Freedman and Jaggi (2005) developed a unequal weight five-item disclosure index which includes: 1) mention of global warming or of the Kyoto Protocol; 2) firm’s plans to deal with global warming and the objective to control global warming; 3) potential costs to achieve the global-warming and the objective to control global warming; 4) current costs to reduce the greenhouse-gas emissions; 5) information on the extent of greenhouse-gas emissions. As the aim of their studies is to investigate the impact of Kyoto Protocol, the index they developed is Protocol-related and oriented.

To examine the extent of corporate carbon disclosure practice and carbon related corporate disclosure strategy, a more detailed and more technical index is needed in this study. besides the extant environmental disclosure and carbon emission studies, the index design follows closely of certain carbon accounting and reporting guidelines, which include GRI (2011),

GRI (2013), WBCSD and WRI (2004), DEFRA (2013), CDP (2012b), carbon accounting and reporting literature (Bebbington and Larrinaga-Gonzalez, 2008, Andrew and Cortese, 2011, Cook, 2009, Haque and Deegan, 2010, Burritt et al., 2011, Hopwood, 2009, Lohmann, 2009b, Kolk et al., 2008), and also with reference to research associations of corporate carbon emission accounting and reporting issues. It is believed that those documents present the mainstream requirements or expectations of corporate carbon disclosures from the society and stakeholders and represents the best practice of carbon emission disclosures.

Based on those documents and literature, I developed a 46-item carbon disclosure index under six categories: board and senior management engagement, carbon emission performance, accounting framework/ methodology of carbon emissions, carbon risk recognition, and carbon opportunity recognition. Extended of the methodology used by Haque and Deegan (2010) the selection criteria of those items is the issue is covered in at least two of the literature or covered by the literature and corporate reports.

## **Results and analysis**

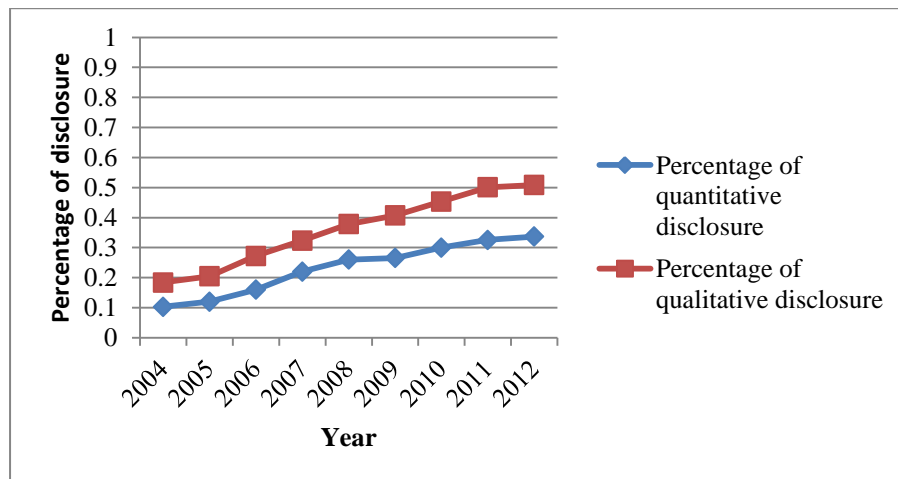
### Overall disclosures

*Table 1* provides an initial picture of the carbon disclosures of sample companies and the changes thereof during the period. There are fewer observations for the year 2004, 2005 and 2006 as the annual reports and/standalone reports are not available from the companies' websites. From the results, it is clear that there is an upward trend of corporate carbon disclosure since 2004. The mean score increases from 9.15 in 2004 to 21 in 2012, which is 130% higher than the score in 2004 and represents significant improvement of corporate carbon disclosure in the last nine years. Even though, the mean score is still at a relatively low level, 21 scores in 2012, compared with the full 46 scores a company could get. We also analyse what types of disclosures the companies made in their annual reports and standalone reports. We divide the 46 indexing items into quantitative and qualitative disclosures, monetary and non-monetary disclosures and calculate the percentage of these types of disclosures. The percentage is calculated by the actual type of disclosure made by the companies as a percentage of the total number of this type of disclosure the companies could get. *Figure 1* presents the percentage of quantitative and qualitative disclosures made by the sample companies. With the qualitative disclosure line above, companies prefer to disclose more qualitative carbon emission information than quantitative carbon performance and/or investment information. But overall, the two lines increase in parallel and companies are making improvement of both of their quantitative and qualitative reporting. But companies are very sensitive in disclosing their monetary carbon information as shown in *Figure 2*. The percentage of monetary carbon investment/expenditure information is very low and does not increase at the same percentage as that of non-monetary information does. Even in year 2012, the percentage of monetary disclosure is just above 20% of what the company could fully disclose. In the score rating process, we found that almost all of the companies say that they take carbon reduction as opportunity to their business development; while very few of them are willing to disclose how much exactly they invest in carbon reduction.

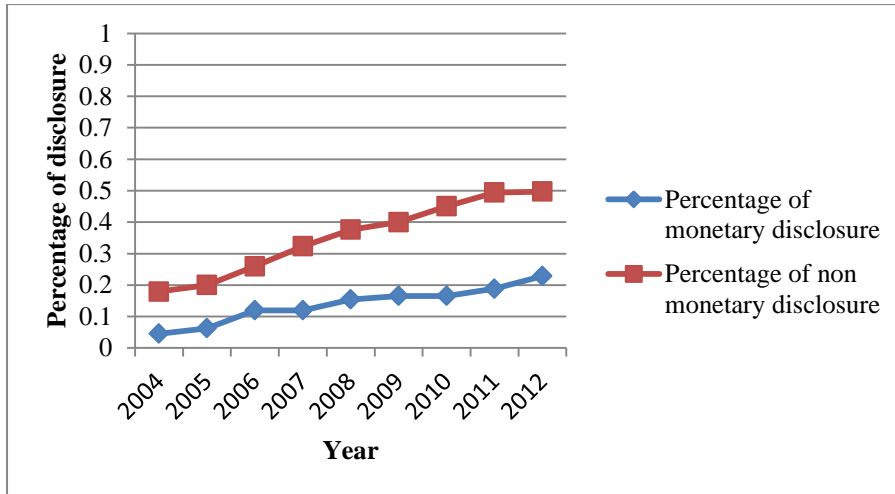
**Table 1** Descriptive statistics of the sample carbon disclosures

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Y2004	20	0	29	183	9.15	10.106
Y2005	21	0	31	206	9.81	10.642
Y2006	21	0	30	274	13.05	10.800
Y2007	22	0	35	336	15.27	11.302
Y2008	25	0	37	394	15.76	11.591
Y2009	25	0	37	419	16.76	10.978
Y2010	25	1	38	468	18.72	10.159
Y2011	25	0	36	515	20.60	9.018
Y2012	25	7	37	525	21.00	8.190
Valid N (listwise)	20					

Looking at the longitudinal development of the disclosure scores, the scores increase smoothly since 2004 and there is no significant improvement or peak of disclosures after the launch of EU ETS and/or the CCA. The average improvement rate is 11.3% (we calculate the improvement rate for each year and then calculate the average). The improvement rate is 7.2% following 2004 and 6.34% following 2008 which are both below the average improvement. This is controversial to the view of strategic legitimacy theory which predicts peak of disclosure after social and environmental threats occur. But we could notice the schemes have lasting impact on corporate carbon disclosures.



**Figure 1** Percentage of quantitative and qualitative disclosures made by sample companies from 2004 to 2012.



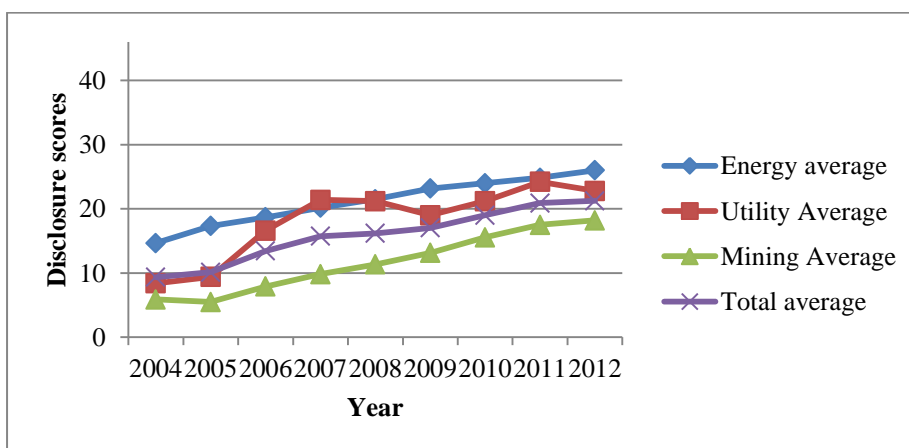
**Figure 2** Percentage of monetary and non-monetary disclosures made by sample companies from 2004 to 2012.

If we look into the details of the results, it is obvious to find that the quality of the disclosures increases dramatically two years after EU ETS and the CCA, 33% and 11.7% respectively. And these two improvement rate represent the top two improvement rates since 2004. Companies did not treat the scheme and the act as significant threat to their operation or reputation and therefore, there is no need to gain or repair their legitimacy to operate in the society, in which case they need to make significant improvement in their disclosures. On the opposite, companies made steady improvement after the carbon events to maintain their legitimacy and at the same time, waiting and observing how the other companies reacted to the events. This could be further approved from the standard deviation. The standard deviation declines 19% from 2004 to 2012, indicating that carbon disclosures converge over time. The results are in line with the view of institutional legitimacy.

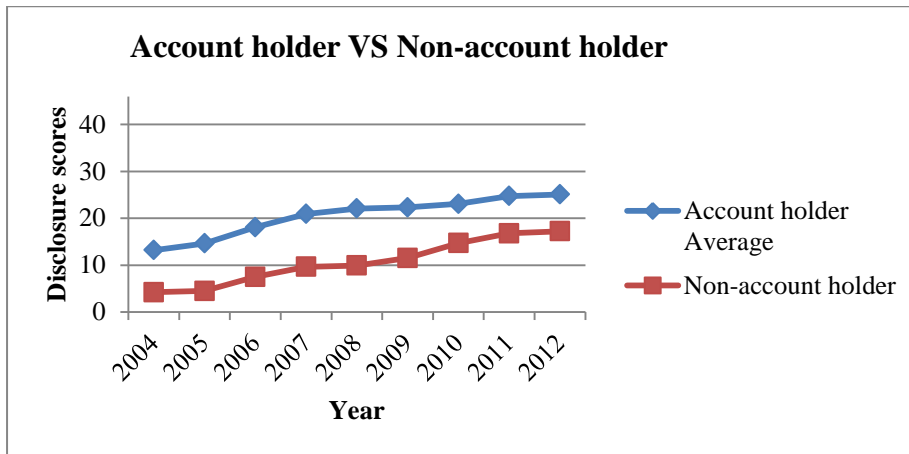
### Disclosures by carbon exposure distinctions

We observe significant difference among the disclosures from those three industries, even though these three industries are all carbon sensitive. The companies more likely to provide environmental information are those operating in environmental sensitive industries and have more environmental impact (Haque and Deegan, 2010, Chelli et al., 2014, Gray et al., 1995b, Deegan and Gordon, 1996). But the impact of industry is not conclusive (Freedman and Jaggi, 2005, Mahadeo et al., 2011, Branco and Rodrigues, 2008). In the results of this study, carbon disclosures among these three industries significantly differentiate among each other, and the disclosure average scores rank in the same order as the amount of carbon emissions from those these industries (*Figure 3*). Previous studies only differentiate environmental reporting between environmental sensitive and non-sensitive industries. In this study, we distinguish those industries by their corporate carbon exposure, which is a more detailed way to examine corporate carbon disclosure practice. From *Figure 3*, the disclosure score of utility industry slight went down in 2009, this is mainly caused by the missing carbon performance data of National Grid in its 2009 reports. If this data was available, the average disclosure score of utility industry would maintain the same level as previous year. In the process of content analysis, we found that corporate carbon reporting is not quite consistent with the type of information they disclosed before and companies randomly disclose some information, e.g. companies mentioned their participant status in Carbon Disclosure Project only in some years, although their participant status exists since their first disclosure. But this need further research to link corporate carbon disclosure with corporate carbon performance.

Furthermore, we also analyse carbon disclosures between carbon trading account holders and non-carbon-trading account holders as shown in *Figure 4*. The disclosures of these two groups have upward trend in parallel and follow the pattern of the overall disclosure trend, with steady upward trend during the period of 2004 to 2012, and more significant improvement two years after the launch of carbon reduction schemes. This result is in line with strategic legitimacy theory that companies with more social exposure and pressure tend to disclose more (Blacconiere and Patten, 1994, Patten, 2002, Gray et al., 1995b, Mahadeo et al., 2011). We could conclude that imitation exists for companies within similar carbon exposure groups.



**Figure 3** Mean disclosure score for Energy, Utility and Mining industries for the period of 2004-2012.



**Figure 4** Mean disclosure scores for carbon trading account holders and non-carbon-account holders for the period of 2004-2012.

### Encountered and expected challenges

The challenge we encountered until now is justifying the content analysis index we build. This is also the inherent limitation of qualitative content analysis. The selection of index units and categories could be criticised to be arbitrary. We reduced the subjectivity through making reference to extant environmental disclosure, carbon reporting literature, and also carbon reporting guidance and regulations. We believe our index provides a useful and objective basis to evaluating corporate carbon disclosure and an overview of best practice expected by stakeholders and the society. Future challenge mainly lies on testing the interrelationship between corporate carbon disclosures, corporate environmental reputation and financial performance using structural equation modelling method, which is within econometrics rather than accounting domain.

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