Journal of Applied Sciences

ISSN 1812-5654

science alert

ANSInet
an open access publisher
http://ansinet.com

Journal of Applied Sciences 13 (20): 4261-4269, 2013
ISSN 1812-5654 / DOI: 10.3923/jas.2013.4261.4269

Empirical Analysis on Disclosure Willingness of Carbon Information in Chinese Enterprises

Li Li and Yang Yuanhua
School of Shenzhen Graduate, Harbin Institute of Technology,
Shenzhen, 518055, People Republic of China

Abstract: Based on the listed top 500 Chinese enterprises, this study, firstly, investigates the status of carbon disclosure via the 2011 annual reports, secondly, it analyzes the specific situation of carbon management in those enterprises that have disclosed carbon information, as well as the common characteristics shared by those enterprises that have adopted carbon management strategy; finally, this study conducts empirical analysis on the factors influencing enterprises' willingness to disclose carbon information. This study initially reveals the current situation of Chinese enterprises in an all-round way and further deepens the understanding of Chinese enterprises' willingness to disclose carbon information. Findings discover a relatively low willingness for disclosure and summary three common characteristics shared by those enterprises that have adopted carbon management strategy. The results further find the positive correlation between the willingness of carbon disclosure and enterprise size, between the willingness of carbon disclosure and ISO environmental management system authentication and between the willingness and industry classification, respectively; however, no significant correlations are revealed between the willingness to disclose and institutional ownership rate, as well as between the willingness and profitability.

Key words: Carbon information disclosure, carbon management strategy, willingness, impact factor, Chinese enterprise

INTRODUCTION

Recently, climate change and energy crisis have been conceived as the main factor threatening global environment and sustainable development of humanbeings (Stern, 2007). As climate change becoming a global issue, carbon emission turns into a threat to the legality of enterprise, even to that of the whole industry (Pellegrino and Lodhia, 2012). Legal though the pollution emission is, high pollution enterprises are still facing rigid regulation. With the expectation of mitigating public pressure and earning favorable comments from stakeholders on enterprise image and value, enterprises often choose to disclosure more environmental information (e.g., carbon emission) to facilitate communicate with stakeholders. Hence, number of enterprises participating in CDP and conducting voluntary disclosure increases rapidly: In 2010, 82% of global top 500 enterprises takes part in CDP, while the total number of enterprises involved in CDP grows from 235 in 2003 to 3050 in 2010 (Zheng, 2011).

However, CDP launched an investigation on the top 100 enterprises listed in China in 2011, among which only 11 enterprises filled out the questionnaire, 35 provided information related, while 54 did no response or refuse to participate (Tian *et al*., 2012). In this context, exploration into questions, such as the status of disclosure, factors influencing disclosure and so on, can not only facilitate the implementation of carbon information disclosure in Chinese enterprise, but also deepen and expand the theory research on environmental information disclosure. Therefore, based on Chinese top 500 enterprises in 2011, this study discussed the disclosure status of carbon information through annual report and conducted empirical analysis on the common characteristics to those enterprises having adopted carbon management strategy and the factors impacting the willingness to disclose. Therefore, firstly, it reveals the current situation of Chinese enterprises in an all-round way, which is an emerging problem for government and investors. Secondly, for the sake of getting an in-depth understanding of the disclosure willingness for Chinese enterprises, it analyzes the factors influencing enterprises' willingness to disclose carbon information. Finally, this study targets at helping government to make new and effective policies, in order to raise the relatively low

Corresponding Author: Yang Yuanhua, School of Shenzhen Graduate, Harbin Institute of Technology, Shenzhen, 518055, People Republic of China

enthusiasm in Chinese enterprises. What is more, the models in this study are statistically robust and are confirmed basically.

LITERATURE REVIEW

Analysis on the carbon management strategy of enterprise: Carbon management means the management on GHG emission with the aim of reducing, in a low cost and effective manner, carbon emission during the life circle of product and service (Sun *et al*., 2011). About research on strategy of carbon management in enterprise, a number of scholars conducted study in this field from the perspective of specific carbon management measures. Dunn (2002) summarized five kinds of carbon management measures: Energy efficiency enhancement, fuel switch, application of new technologies, emission trading and investment in project-based emission offsetting. Kolk and Pinkse (2005) suggested that carbon management measures in enterprise mainly consisted of process improvement, product development, new market/product combination, internal transfer of emission reduction, supply chain measures and acquisition of emission credits. In addition, scholars such as Schultz and Williamson (2005), Boiral (2006), Hoffman (2006) and Jeswani *et al*. (2008) have also carried out research in this area. From the above mentioned findings, Weinhofer and Hoffman (2006) generalized three kinds of strategies of carbon management: CO_2 compensation, CO_2 reduction and carbon independence. CO_2 compensation describes the enterprise action of offsetting the CO_2 emitted during productive process by the purchase of carbon credit. Nonetheless, this strategy serves merely as a short-term measure. CO_2 reduction is defined as the emission reduction behavior from long-term development perspective, which is usually achieved through product improvement, production process transformation or technological innovation. Carbon independence means to get rid of the dependence on carbon from a longer-term and strategic vision. Though studies regarding strategy of carbon management in enterprises involves several aspects, strategies generalized by Weinhofer and Hoffmann (2010), obviously contain the previous studies and are of great guiding significance for further study.

Analysis on the characteristics of strategy selection of carbon management in enterprise: A series of factors can impose influence on the strategy selecting process and those very factors also contribute to the common features shared by those enterprises having launched carbon management practice. Throughout the existing literature, the common features mainly concern the following aspects: The first one is geographical distribution (Gonzalez-Benito and Gonzalez-Benito, 2006). The second one is enterprise size (Delmas and Toffel, 2004; Clemens *et al*., 2008). The third one denotes the extent to which the enterprise's current business operation relies on carbon resource. Moreover, some scholars deemed that those enterprises actively implementing carbon management have a relatively high proportion of institutional investors (Gonzalez-Benito and Gonzalez-Benito, 2006) and that emission reduction practice is somehow impeded in the areas lacking carbon regulation and policy.

Analysis on the impact factors of carbon information disclosure: From the standpoint of theory, three theories are well applied to explain enterprise's behavior of carbon information disclosure: Stakeholder theory (Roberts, 1992; Tilt, 1994; Da Silva Monteiro and Aibar-Guzman, 2010), legality theory (Ahmad *et al*., 2003; De Villiers and van Staden, 2006; Llena *et al*., 2007; Branco and Rodrigues, 2008; Aerts *et al*., 2008; Da Silva Monteiro and Aibar-Guzman, 2010 etc.) and information asymmetry theory (Botosan, 1997; Healy *et al*., 1999; Leuz and Verrecchia, 2000; Hail, 2002; Schrand and Verrecchia, 2004). There are also many research about factors influencing carbon information disclosure from empirical analysis perspective. Stanny and Ely (2008) revealed that FT500 members are more disposed to support CDP and more likely to disclose information; proportion of sales abroad is positively related with information disclosure, while, direct correlation between information disclosure and proprietary rights, Tobin Q, yield rate or lever effect are barely obvious. Plumlee *et al*. (2009) learnt that the higher institutional ownership rate accounts for, the more carbon information is disclosed. Stanny (2010) revealed positive correlation between enterprise feature and the willingness to participate in CDP and to disclose information. Lan *et al*. (2010) got the evidence to the dominant role economic factor plays in enterprises' willingness to disclose carbon. Matsumura *et al*. (2011) pointed out the positive correlations existing in industrial feature, enterprise size and the disclosure willingness of emission reduction information, as well as the low disclosure willingness displayed by enterprises with high debt. So far, only Qi (2012) has carried out investigation on the disclosure condition in enterprises and influencing factors of Chinese enterprises, however, the conclusion disagrees with that of many other scholars' (Brammer and Pavelin, 2008; Matsumura *et al*., 2011). Therefore, further research is necessary.

RESEARCH METHOD AND THEORETICAL MODEL

Sample selection This research selects the top 500 enterprises listed in China, in term of market value, as research sample and makes use of the carbon management information disclosed through 2011 annual report as data source, taking into account the fact that those enterprises can well demonstrate the development status of Chinese enterprises, as well as the disclosing level of carbon management. For the sake of data consistency, given the period of data selection, between 1st Jan 2011 and 31st Dec 2011, there are altogether 365 enterprises up to the research standard. Annual reports are derived from websites of sample enterprises'; industries are classified according to "guidance on industry for public enterprises" issued in Apr 2001 by CSRC; carbon information disclosed in annual report are collected and settled manually and data source for other variables are obtained from Juling financial database.

Research method: Since content analysis is widely applied on analyzing the data and information from annual report in environmental management field (Pinkse, 2007), this study firstly carried out content analysis on analyzing the 2011annual report of the top 500 enterprises listed in China. Then, through drawing the research practice from Weinhofer and Hoffmann (2010), explored the selection and implementation of carbon management strategy. Secondly, this study conducted classification analysis on the common features shared by those enterprises having adopted carbon management strategy. Thirdly, this research conducted empirical studies on the factors influencing Prob (CLOSE). Research steps are shown in Fig. 1.

Research hypothesis: This investigation mainly centers around the influences imposed on the willingness of carbon disclosure by the following variables related with enterprise characteristic and industrial feature, in terms of enterprise size, period since adopting ISO14001, industry classification, profitability, institutional ownership rate:

Enterprise size: Previous studies have proved the significant influence of enterprise size on the disclosure level of environmental information (Patten, 1992; Gray *et al*., 1995). Brammer and Pavelin (2008) further discovered that high-quality and high-frequency disclosure behaviour of carbon information usually occurs in enterprises with large size. Hence, this research puts forward.

Hypothesis 1: The larger the enterprise is, the higher probably carbon disclosure happens.

ISO environmental management system authentication (ISO): Some scholars learned that adoption of ISO14001 contributes to better environmental performance. So, this study considers that enterprises certified by ISO14001 are well experienced in disclosing environmental information. Thus, this study comes up with:

Hypothesis 2: Enterprises approved by ISO are more likely to disclose carbon information.

Industry classification/INC: The industry category where enterprise belongs can make difference to the disclosure level of environmental information (Campbell, 2003; Brammer and Pavelin, 2008). They arrived at the conclusion that enterprises pertaining to environmentally sensitive industry are more willing to disclose information, compared with those under insensitive industry. Thus, this study proposes:

Hypothesis 3: Enterprises of environmentally sensitive industry are more likely to disclose carbon information.

Profitability (PROF): Da Silva Monteiro and Aibar-Guzman (2010) found that enterprises with

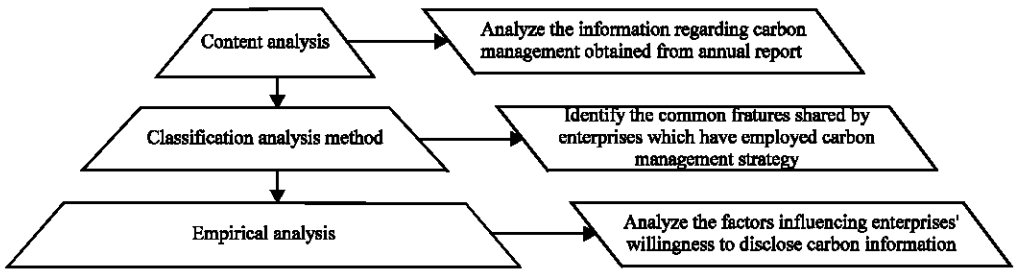

Fig. 1: Diagram of research steps

sufficient cash flow are more willing to actively conduct carbon disclosure, by comparison with those lacking funds. Hence, a healthy finance acts to underpin and sustain the development of disclosure practice. So, this research presents the following hypothesis.

Hypothesis 4: The stronger profitability enterprise possess, the higher probably enterprise will disclose carbon information.

Institutional Ownership: In line with Stanny and Ely (2008), in the context of great threat brought by climate change, enterprises, having more institutional ownerships, are more incline to information disclosure regarding climate change. Hence, this research obtains the hypothesis below.

Hypothesis 5: The higher proportion institutional ownership is, the more enterprises are likely to disclose carbon information.

Multivariate model: We test our hypotheses using the following multivariate regression model:

$$\text{Prob (Disclose)} = \alpha+\beta_1\text{SIZE}+\beta_2\text{ISO}+\beta_3\text{INC} +\beta_4\text{PROF}+_5\text{IOR}+\varepsilon \quad (1)$$

where, α indicates constant, β_1, β_2, β_3, β_4, β_5, mean regression coefficient and å represents random error.

Prob (Disclose) is one if enterprise did carbon disclosure through annual report and zero otherwise; SIZE is the natural logarithm of work force at the end of fiscal year 2011; ISO is one if enterprise has certified by ISO14001 and zero otherwise; INC is one if enterprise belongs to highly sensitive industry and zero otherwise; PROF is the return on assets/ROA of the enterprise at the end of fiscal year 2011; IOR is the institutional ownership rate of institutional ownership investors at the end of fiscal year 2011.

EMPIRICAL ANALYSIS

Status of information disclosure in enterprise: This research conducted analysis on the 2011 fiscal annual reports of the 365 enterprises, aiming at acquiring a better understanding of the disclosure status. Only 161 out of 365 enterprises, accounting for 44.1%, carried out carbon information disclosure. Due to the different pollution degree in various industy, the disclosure level of carbon information also varies as enterprise changes. Seen from the table above, enterprises under electric and gas industry head the 161 enterprises in disclosure proportion, with 77.78%; behind comes mining and manufacture with 56.25 and 55.19%, respectively.

Based on Weinhofer and Hoffmann's strategy framework of carbon management in enterprise, this study found that among the 161enterprises which have adopted strategy, 37 used CO_2 compensation strategy, 134 adopted CO_2 reduction strategy and 72 employed carbon independence strategy, while 26 enterprises combined CO_2 compensation and CO_2 reduction strategy, 54 ones selected CO_2 reduction and carbon independence strategy and 20 simultaneously applied those three strategies. What is more, according to Table 2, CO_2 reduction appears as the major carbon management strategy being currently implemented in enterprises, for its two measures are being carried out by 49.25 and 41.79% enterprises, respectively. While carbon independence and CO_2 compensation strategy exist mostly in the probably future planning of enterprises rather than being in progress, showing a relatively low implementation proportion.

Analysis on the common characteristics to those enterprises having adopted carbon management strategy distribution characteristics of geographic location: According to the division of Chinese economic area, this study performed classification analysis on the enterprises which have taken those three kinds of strategies[1]. It is not hard to find from Fig. 2 below that, from the perspective of strategy type enterprises selected, for any strategy type, more than half of the enterprises taking the very strategy concentrate at the eastern region. This phenomenon indicates that the development level of regional economy can exert significant influence on the process of strategy selecting pertaining to carbon management.

Degree of dependence on carbon resource: In light with the study of Campbell (2003), when it comes to carbon emission reduction, oil, mining and other industries which highly depend on fossil fuel are borne the brunt, as well as should firstly implement carbon management. Hence, based on the Industry Classification (INC) information provided by China Securities Regulatory Commission (CSRC), this study classified enterprises into two kinds, namely, high and low dependence on fossil fuel. There into, enterprises of high dependence indicate those ones that primarily operate oil and minerals and belong to oil exploitation, coal mining or nonferrous metals mining industry; other enterprises come under low dependence kind. The result of classification analysis (Fig. 3) illustrates that enterprises conducting CO_2 compensation

Table 1: Proportion of sample enterprises in terms of carbon information disclosure

INC	Total samples	Samples without information disclosure	Samples with information disclosure	Percent of samples with information disclosure (%)
Manufacture	183	82	101	55.19
Wholesale and retail trade	45	42	3	6.67
Mining	32	14	18	56.25
Finance, insurance	22	16	6	27.27
Electricity, gas	18	4	14	77.78
Transportation, storage	15	8	7	46.67
Architecture	15	8	7	46.67
Real estate	12	12	0	0.00
IT	9	7	2	22.22
Social service	8	8	0	0.00
Others	6	3	3	50.00

Table 2: Carbon management strategies and measures

CO_2 management strategy	CO_2 compensation		CO_2 reduction		Carbon independence	
Measure	Acquisition of additional CO_2 emission capacity through emission trading	Investment in CO_2 emission offsetting projects	Addition of enhanced or improvement of existing CO_2 emitting production processes	Design of new improvement of existing products that have lower CO_2 emissions during production and use	Addition of new and improvement of existing carbon free production processes	Design of new or improvement of existing products that are carbon free during production and use
Measure taken						
Recently/currently (%)	35.14	29.73	49.25	41.79	23.53	23.53
Definitely planned for future (%)	16.22	16.22	14.18	18.66	17.65	15.69
Probably in future (%)	43.24	16.22	21.64	20.90	39.22	31.37
Not mentioned (%)	5.41	37.84	14.93	18.66	19.61	29.41

According to the division method of National Bureau of Statistics in 2011 June 13th, Chinese economic area is divided into four regions, namely eastern, central, western and northeast region. Eastern China includes: Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan. Central China includes: Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan. Weastern China includes: Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shanxi, Gansu, Qinghai, Ningxia and Xinjiang. Northeastern China includes: Liaoning, Jilin and Heilongjiang

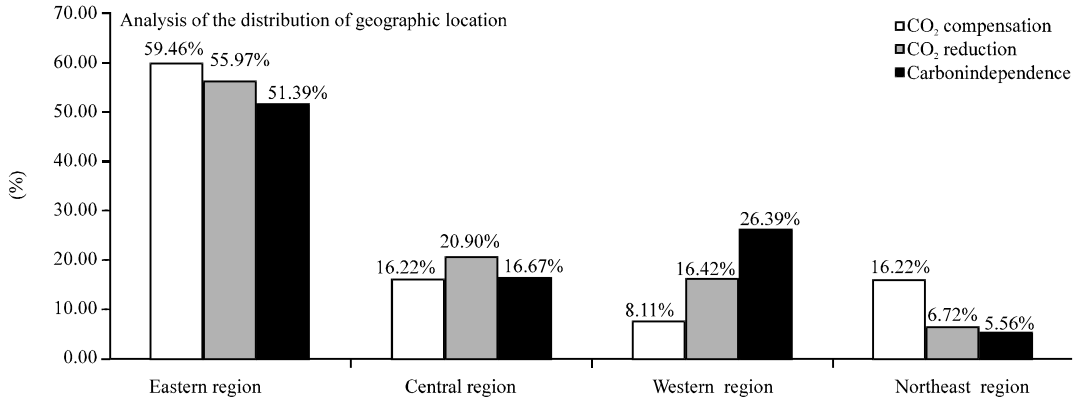

Fig. 2: Regional distribution of enterprise according to carbon management strategy

strategy exhibit the highest proportion of high dependence on fossil fuel and behind follows enterprises adopting carbon independence and CO_2 reduction strategy, sequentially.

Analysis of enterprise size and listed years: Clemens *et al.* (2008) pointed out that enterprises actively participating in carbon management are always those ones with large size. And that the public age positively stimulates the motivation of conducting management on carbon. This study carried out descriptive statistics on the size and public age of those enterprises having performed these three kinds of strategy, there into, enterprise size is measured by its total number of employees. From the Table 3, it is clear that enterprises which have employed theses three strategies all display a relative longer public age, with the average outnumbering 11 years and the maximum appearing as 22 years. In reference with enterprise size, all those involved enterprises are kind of lager size, with the average size exceeding 10,000.

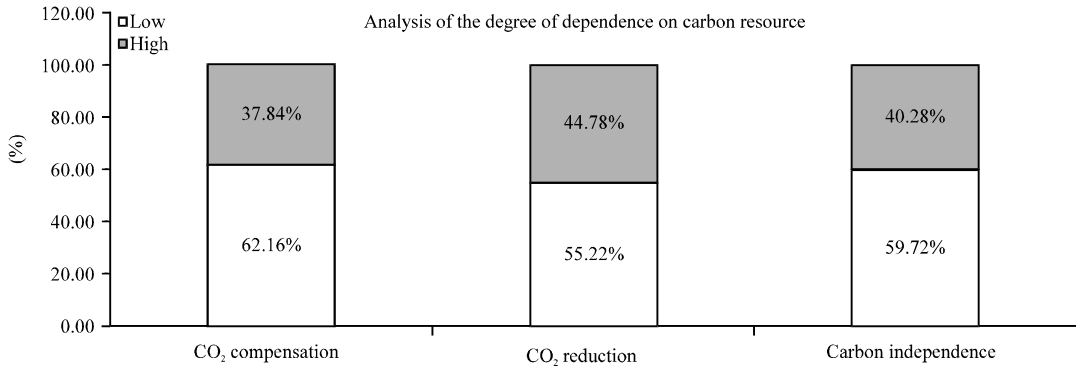

Fig. 3: Distribution of dependence degree (low and high) in term of specific strategy

Table 3: Descriptive statistics of public age and No. of employees

CO_2 management strategy types	Variable	Observed value	Minimum	Maximum	Mean	Standard deviation
CO_2 compensation	Public age	37	2	19	11.73	5.373
CO_2 reduction	Public age	134	2	22	11.34	5.241
Carbon independence	Public age	72	2	22	12.25	5.218
CO_2 compensation	No. of employees	37	995	552810	46102.92	114042.800
CO_2 reduction	No. of employees	134	146	447401	36182.91	70729.310
Carbon independence	No. of employees	72	146	66497	16552.44	17085.260

Table 4: Basic descriptive statistics of variables

Variables	Observation	Minimum	Maximum	Average	Standard deviation
Prob (Disclose)	365	0.00	1.00	0.4411	0.49720
Size	365	0.22	1.15	0.8076	0.11813
ISO	365	0.00	1.00	0.6055	0.48942
INC	365	0.00	1.00	0.3671	0.48268
ROA	365	-0.13	0.48	0.0539	0.05826
IOR	365	0.05	0.99	0.6001	0.22076

Table 5: Correlation analysis on variables

Variables	Prob (Disclos)	Size	ISO	INC	ROA	IOR
Prob (Disclose)	1.000	0.148**	0.164**	0.365**	-0.043	0.091*
Size	0.148**	1.000	-0.052	0.081	-0.032	0.184**
ISO	0.164**	-0.052	1.000	0.208**	0.153**	-0.115*
INC	0.365**	0.081	0.208**	1.000	0.017	0.043
ROA	-0.043	-0.032	0.153**	0.017	1.000	0.149**
IOR	0.091*	0.184**	-0.115*	0.043	0.149**	1.000

**Represents the significant correlation at level 1%, *Means significant correlation at level 5%

Probability of carbon information disclosure in enterprise

Basic descriptive statistics: In order to identify the factors deciding whether or not to disclose carbon information in annual report, this research carried out empirical study on the factors affecting the willingness of carbon disclosure. Behind shows the basic descriptive statistics of variables.

Note from Table 4 that 44.1% of sample enterprises conduct carbon information disclosure, 60% get certified by ISO and 36.73% belong to environmentally sensitive industry. The indicator of enterprise profitability, ROA, for which the average is 5.39%, while the maximum is 48% and minimum -13%, implying the wide gap between profitability. When it comes to IOR, the average is 60% and maximum appears 99%, while minimum 5%, demonstrating the relatively high average IOR, as well as the great disparity in IOR among enterprises.

Table 6: Significance test of integral regression equation

R	R^2	Adjusted R^2	Standard deviation	F value	Significant level
0.409	0.167	0.156	0.45687	14.418	0.000

Table 7: Regression coefficients and their significance degree

				Colinearity statistic	
Model	Coefficient	t-value	p-value	Allowance	Variance increase factor
(Constant)	-0.210	-1.199	0.231		
Size	0.465	2.244	0.025	0.955	1.047
ISO	0.124	2.429	0.016	0.911	1.097
INC	0.338	6.631	0.000	0.945	1.058
ROA	-0.653	-1.544	0.123	0.945	1.058
IOR	0.185	1.637	0.102	0.922	1.085

Correlation analysis: Table 5 suggests the significantly positive correlation of SIZE, ISO, INC and Prob (Disclose) at the level of 1% and that of IOR and Prob (Disclose) at the level of 5%; however, displays no significant correlation between ROA and Prob (Disclose).

Regression analysis: In line with those hypotheses proposed, the research carries out regression analysis on the model and the result is as shown in Table 6-7.

As shown in Table 6 and 7, the F-value of model seems highly significant; nevertheless, the adjusted R^2 is merely 0.157, suggesting that some other dependent factors with explaining power may exist, besides those included within the model. All the VIF generated by

independent variables are less than 10, while the value of allowance and VIF all come close to 1, indicating the relatively weak multi-colinearity between explanatory variables, as well as the conformity of sample data to the requirement by multivariate linear regression. Based on the result of regression analysis, coefficient symbols for size, ISO, INC and IOR are as expected, moreover, the first three variables all get through significance test at level 1%, which offers empirical support for hypotheses 1, 2 and 3. Coefficient of profitability gets the opposite symbol against expectation, plus it dose not pass significance test, which gives no empirical evidence to hypothesis 4. Positive coefficient though IOR gets, it fails in t-test, suggesting the insignificant correlation with Prob (Disclose), as well as the failure in supporting hypothesis 5.

CONCLUSION

This research, through investigation on the disclosure condition of carbon information in the Chinese top 500 listed enterprises in 2011, analyzed the disclosure status and the common characteristics to those enterprises, as well as conducted empirical studies on the factors influencing Prob (CLOSE) and finally came into the following conclusions:

- Seen from the disclosure proportion in annual reports, sample enterprises display a relatively low willingness to disclose carbon information. In view of the analysis on 2011 annual report, only 44.1% of all qualified samples, 161enterprises, engaged in carbon disclosure, among which electricity and gas industry shows the highest disclosure proportion and behind follows mining and manufacture
- In enterprises where carbon management strategy has been conducted, CO_2 reduction strategy turns out to be the major selection and the combination of those three strategies of CO_2 compensation, CO_2 reduction and carbon independence, are also well applied. Such phenomenon discloses the fact that in China, carbon management and carbon emission reduction are still at initial stage and that enterprises mainly focus on the short-term effect of emission reduction, rather than on achieving carbon independence in the long run
- Enterprises having adopted carbon management strategy share some significant characteristics. Firstly, the distribution characteristics of geographical location: Such enterprises are mostly concentrated in the eastern region, while few in northeastern region. Secondly, high dependence on fossil fuel: Enterprises employing CO_2 compensation strategy display the highest proportion of high-dependence degree, then comes enterprises adopting carbon independence and CO_2 reduction strategy, in order. Thirdly, large enterprise size: Enterprises practicing carbon management are always those ones with large size and longer public age
- This research conducted empirical studies on the factors influencing Prob(CLOSE) and found that SIZE, ISO and INC all can impose significant influence on the willingness of carbon disclosure. This conclusion also confirms the point of Matsumura *et al*. (2011) that the larger the enterprise is, the higher probably it conducts carbon disclosure; meanwhile, the conclusion accords with that of Dhaliwal *et al*. (2011) that in the context of global warming, enterprises having adopted ISO14001 are disposed to disclose more information regarding carbon emission reduction. Correlation between IOR and Prob (Disclose) appears to be insignificant, which needs further study. Enterprise profitability can hardly affect the willingness of carbon disclosure significantly, which, to some extent, underpins the finding of Stanny and Ely (2008)

There also exist some limitations. Firstly, when identifying the features shared by enterprise involved in carbon management, this study only takes into account factors related with enterprise, such as distribution of geographic location, enterprise size and the degree of dependence on carbon resource, ignoring other factors besides enterprise, e.g., pattern of ownership. Secondly, as to the paradox correlations of IOR and Prob (Disclose) arrived by correlation analysis and regression analysis, this research fails to provide a scientific explanation. Finally, considering the relatively small value of R^2, the model may need to incorporate some major variables, such as liability and sales volume abroad etc. Therefore, further study may be carried out from multiple point of views and conduct full-scale analysis on the factors influencing the disclosure willingness of carbon information.

ACKNOWLEDGMENTS

Research works in this study are financially supported by General Project on Humanities and Social Sciences by Ministry of Education in China (Grant No. 13YJAZH044).

REFERENCES

Aerts, W., D. Cormier and M. Magnan, 2008. Corporate environmental disclosure, financial markets and the media: An international perspective. Ecol. Econ., 64: 643-659.

Ahmad, Z., S. Hassan and J. Mohammad, 2003. Determinants of environmental reporting in Malaysia. Int. J. Bus. Stud., 11: 69-90.

Boiral, O., 2006. Global warming: Should companies adopt a proactive strategy? Long Range Plann., 39: 315-330.

Botosan, C.A., 1997. Disclosure level and the cost of equity capital. Accounting Rev., 72: 323-349.

Brammer, S. and S. Pavelin, 2008. Factors influencing the quality of corporate environmental disclosure. Bus. Strategy Environ., 17: 120-136.

Branco, M.C. and L.L. Rodrigues, 2008. Factors influencing social responsibility disclosure by Portuguese companies. J. Bus. Ethics, 83: 685-701.

Campbell, D., 2003. Intra- and intersectoral effects in environmental disclosures: Evidence for legitimacy theory? Bus. Strategy Environ., 22: 357-371.

Clemens, B., C.E. Bamford and T.J. Douglas, 2008. Choosing strategic responses to address emerging environmental regulations: Size, perceived influence and uncertainty. Bus. Strategy Environ., 17: 493-511.

Da Silva Monteiro, S.M. and B. Aibar-Guzman, 2010. Determinants of environmental disclosure in the annual reports of large companies operating in Portugal. Corporate Social Responsibility Environ. Manage., 17: 185-204.

De Villiers, C. and C. van Staden, 2006. Can less environmental disclosure have a legitimising effect? Evidence from Africa. Account. Organiz. Soc., 31: 763-781.

Delmas, M. and M.W. Toffel, 2004. Stakeholders and environmental management practices: An institutional framework. Bus. Strategy Environ., 13: 209-222.

Dhaliwal, D.S., O.Z. Li, A. Tsang and Y.G. Yang, 2011. Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. Accounting Rev., 86: 59-100.

Dunn, S., 2002. Down to business on climate change: An overview of corporate strategies. Greener Manage. Int., 39: 27-41.

Gonzalez-Benito, J. and O. Gonzalez-Benito, 2006. A review of determinant factors of environmental proactivity. Bus. Strategy Environ., 15: 87-102.

Gray, R., R. Kouhy and S. Lavers, 1995. Corporate social and environmental reporting: A review of the literature and a longitudinal study of UK disclosure. Accounting Auditing Accountability J., 8: 47-77.

Hail, L., 2002. The impact of voluntary corporate disclosure on the ex-ante cost of capital for Swiss Firms. Eur. Accounting Rev., 11: 741-773.

Healy, P.M., A.P. Hutton and K.G. Palepu, 1999. Stock performance and intermediation changes surrounding sustained increases in disclosure. Contemporary Accounting Res., 16: 485-520.

Hoffman, A.J., 2006. Getting ahead of the curve: Corporate strategies that address climate change. Pew Center on Global Climate Change, Arlington, pp: 49-51. http://www.c2es.org/docUploads/PEW_CorpStrategies.pdf

Jeswani, H.K., W. Wehrmeyer and Y. Mulugetta, 2008. How warm is the corporate response to climate change? Evidence from Pakistan and the UK. Bus. Strategy Environ., 17: 46-60.

Kolk, A. and J. Pinkse, 2005. Business responses to climate change: Identifying emergent strategies. California Manage. Rev., 47: 6-20.

Lan, L.L., Y. Chen and Q.L. Tang, 2010. Corporate incentives to disclose carbon information: Evidence from global 500. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1725106.

Leuz, C. and R. Verrecchia, 2000. The economic consequences of increased disclosure. J. Account. Res., 38: 91-124.

Llena, F., J.M. Moneva and B. Hernandez, 2007. Environmental disclosures and compulsory accounting standards: The case of Spanish annual reports. Bus. Strategy Environ., 16: 50-63.

Matsumura, E.M., R. Prakash and S.C. Vera-Munoz, 2011. Firm-value effects of carbon emissions and carbon disclosures. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1921809.

Patten, D., 1992. Intra-industry environmental disclosures in response to the Alaskan oil spill: A note on legitimacy theory. Accounting Org. Soc., 17: 471-475.

Pellegrino, C. and S. Lodhia, 2012. Climate change accounting and the Australian mining industry: Exploring the links between corporate disclosure and the generation of legitimacy. J. Cleaner Prod., 36: 68-82.

Pinkse, J., 2007. Corporate intentions to participate in emission trading. Bus. Strategy Environ., 16: 12-25.

Plumlee, M., D. Brown and R.S. Marshall, 2009. Voluntary environmental disclosure quality and firm value: Roles of venue and industry type. Working Paper, University of Utah and Portland State University. http://www2.business.umt.edu/seminar/draft_Montana.pdf

Qi, X.Y., 2012. Research on influencing factors of carbon information disclosures in listed enterprise-analysis based on the panel data of CDP. Xuehai, 3: 49-53.

Roberts, R.W., 1992. Determinants of corporate social responsibility disclosure: An application of stakeholder theory. Account. Org. Soc., 17: 595-612.

Schrand, C. and R.E. Verrecchia, 2004. Disclosure choice and cost of capital: Evidence from underpricing in initial public offerings. Working Paper, University of Pennsylvania. http://credit.wharton.upenn.edu /faculty/schrand/SV.08.13.04.pdf

Schultz, K. and P. Williamson, 2005. Gaining competitive advantage in a carbon-constrained world: Strategies for European business. Eur. Manage. J., 23: 383-391.

Stanny, E. and K. Ely, 2008. Corporate environmental disclosures about the effects of climate change. Corporate Social Responsibility Environ. Manage., 15: 338-348.

Stanny, E., 2010. Voluntary disclosure of emissions by US firms. Working Paper, Sonoma State University, USA.

Stern, N., 2007. The Economics of Climate Change: The Stern Review. Cambridge University Press, Cambridge, ISBN-13: 9780521700801, Pages: 692.

Sun, Z.Q., Y.K. He and J.H. Lin, 2011. Major safeguard for low-carbon development-carbon management. Environ. Prot., 12: 40-41.

Tian, C.X., Y. Liu and O.Y. Li, 2012. Discussion on the status and improvement of carbon information disclosure in Chinese enterprise. Commercial Account., 10: 15-17.

Tilt, C.A., 1994. The influence of external pressure groups on corporate social disclosure: Some empirical evidence. Account. Auditing Accountability J., 7: 47-72.

Weinhofer, G. and V.H. Hoffmann, 2010. Mitigating climate change: How do corporate strategies differ? Bus. Strategy Environ., 19: 77-89.

Zheng, Y., 2011. Showing up your carbon information. World IT Manager, 5: 24-24.