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Corporate disclosure of environmental information has played an important role in the avoidance of dangerous climate change. How firms choose to disclose environmental information about the business opportunities and risks associated with climate change is important to policy makers and investors. In the literature, there are two dominant theories of corporate disclosure: legitimacy theory and voluntary disclosure theory. Under legitimacy theory, firms are more likely to disclose information in response to their risks; under voluntary disclosure theory, firms are more likely to disclose information in response to their opportunities. In certain industries, if firms disclose environmental information according to legitimacy theory (voluntary disclosure theory), society may be unaware of the true risks (opportunities) of climate change, and society, in these cases, we will need policies that mandate disclosure. Therefore, this study examines the power of legitimacy theory and voluntary disclosure theory to explain corporate disclosure in three industry groupings: manufacturing, non-manufacturing, and energy & utilities. We use Bloomberg's Carbon Disclosure Project (CDP) dataset of 3,861 firm level observations from 2008-2012, and regress the corporate social disclosure score evaluated by Bloomberg on variables that indicate regulatory and physical risks and opportunities. We find that legitimacy theory does not explain corporate disclosure of regulatory risks in any of the industries and that of physical risk in the energy and utilities industry. In addition, voluntary disclosure theory does not explain disclosure of regulatory opportunities in the energy & utilities

industries. However, voluntary disclosure theory explains disclosure of opportunities in all of the industries.

Key Words: *Legitimacy theory, Voluntary disclosure theory, disclosure score, climate change, CDP*

1. Introduction

Amid concerns about the contribution of firms to adverse climate change, corporate disclosure of environmental information is more important than ever before. Information about risk management and business opportunities related to climate change is important not only to firms, but also to investors and policy makers. In this study, we examine how recognition of risks and opportunities related to climate change affects a firm's disclosure score.

Since Churchman (1971) [1)] and Mobley, (1970) [2)], there has been increasing research on social environmental accounting [3)]. There are now two dominant theories of corporate disclosure in the social environmental accounting area: the voluntary disclosure theory [4), 5)], and the legitimacy theory [6), 7)].

Voluntary disclosure theory, which is derived from information economics, considers the disclosure costs incurred when disclosing information. There is a partial disclosure equilibrium wherein firms disclose information by, maximizing firm share-value net of expected proprietary costs [5)]. Thus, according to the theory, firms decide to disclose information when it leads to competitive advantages and decide not to disclose the information when it harms the firm's' reputation.

Legitimacy theory, which is derived from social science, is often used in organizational theory. Lindblom (1994)[6)] defined legitimacy as "a condition or status that exists when an entity's value system is congruent with the value system of the larger social system of which the entity is a part. When a disparity, actual or potential, exists between the two value systems, there is a threat to the entity's legitimacy." Thus, legitimacy is a measure of society's perceptions of the adequacy of corporate behavior [7)]. Criticisms by society are the primary way by which a firm's legitimacy is harmed. When this occurs, it is necessary for the firm to repair its legitimacy, perhaps by improving communication with stakeholders. Disclosing information is also one of the most important means to repair legitimacy.

Both theories explain how firms consider external perception when choosing the information to

be disclosed. From the standpoint of voluntary disclosure theory, we can assume that firms are more likely to reveal information that points to business opportunity and competitive advantage in their efforts to address climate change than information that points to the risks or disadvantages of climate change. On the other hand, according to the legitimacy theory, in order to repair legitimacy, firms disclose more when there is a possibility they may be criticized by society. Thus, when they think they are facing risks of climate change, they disclose more and better.

Hence, the characteristics of the information disclosed depend on the purpose and motivation of the disclosure. Based on these characteristics, investors and policymakers change their own behavior. For example, if in a partial disclosure equilibrium the firm discloses only the information that can benefit its reputation and not the information that could possibly harm its reputation, then in an environmental accounting context, the firm may hide information about its poor performance on climate change prevention. This information asymmetry has a negative impact on effective investment, because investors overestimate the firm's value. Making matters worse, they might end up invested in firms that contribute to adverse climate change. Thus, it is important to create incentives to disclose or to raise the cost of failing to disclose information that is not favorable to firms.

On the other hand, if firms disclose according to the underlying assumptions of legitimacy theory, firms disclose when they recognize their legitimacy might be harmed and they under-disclose when they might do well. This also is an information asymmetry. As a result, investors cannot identify which firm is worthy of being invested in, in terms of sustainability.

According to recent guidance, the Securities and Exchange Commission (SEC) recognizes that climate change has become an important feature of physical and regulatory environments. According to Coburn et al., (2011) [8], firms also recognize the risks and opportunities of climate change in their physical and regulatory aspects. However, the extent to which they recognize those risks and opportunities is difficult to quantify. To solve this problem, Former Carbon Disclosure Project (CDP) made dummy variables that indicate whether the firm recognizes climate

change risks and opportunities in their physical and regulatory aspects. In this way, CDP is helping to quantify the extent to which firms recognize climate change risks and opportunities

As mentioned above, it is important for investors and policymakers to get reliable information about climate change risks and opportunities. Thus, many organizations that auditing and evaluate firms' eco-friendly behavior are forming and gaining power. CDP is one examples of such an organization created by institutional investors. It sends questionnaires to firms, asking them to describe their strategy for climate change and to disclose the amount of their greenhouse gas emissions. In addition, CDP evaluates the responses it receives based on a set of criteria they call the Climate Disclosure Leadership Index (CDLI). Approaches like these provide important information for firm valuation [9].

Considering this backgrounds, our study examines how the business risks and opportunities of climate change affect a firm's disclosure score. In section 2, we introduce the model we test in our study. The dependent variable is disclosure score and the independent variables are the CDP dummy variables that indicate whether the firm recognizes climate change risks and opportunities. We divide risk and opportunity into regulatory and physical aspects, and we make four regression models, one for each industry grouping: Manufacturing, Non-manufacturing, and Energy & Utilities. In section 3, we explain the data and present some descriptive statistics. The data we use in this study is CDP data provided by Bloomberg Environmental Social Governance (ESG) Professional Services from 2008 to 2012. It includes 45 countries and 20 industry groups. In addition, we divided the industry groups into Manufacturing, Non-manufacturing, and Energy & Utilities. The analysis consists of two phases. The first step is a descriptive analysis that compares trends in the average disclosure score by industry. In section 4, we do the second phase of analysis: regressions using the models we introduce in section 2. Section 5 concludes with a discussion and interpretation of the results for decision making by firms' and policymakers.

2. Model

The purpose of this study is to examine how risk and opportunity related to climate change affects the quality of firms' environmental disclosure. In other words, the objective of the study is to identify whether voluntary disclosure theory and legitimacy theory are supported by firms' environmental disclosures. In this section, we introduce the model we use in the regression analysis.

The dependent variable is the indicator that reflects the quality of environmental disclosure. As discussed, the quality of information affects the behavior of investors and policymakers. In order to improve and maintain the quality of disclosure, there are organizations which evaluate the quality of the information disclosed. We use the disclosure score given by a third party organization as the dependent variable, and name it *Score*.

Independent variables include two opportunity variables, which are used for testing whether voluntary disclosure theory is supported, and two risk variables, which are used for testing whether legitimacy theory is supported. Since the two aspects of opportunity and risk that the firm can recognize and disclose information about are regulatory and physical aspect. We use four independent variables: regulatory aspects of risk (*RegRisk*), physical aspects of risk (*PhysRisk*), regulatory aspects of opportunity (*RegOpp*), and physical aspects of opportunity (*PhysRisk*).

In addition, we include control variables (*Controls*) to consider firms' characteristics and to control for firm. We also use fixed effect model. We examine the predictors of a firm's disclosure score using the following regression model:

$$\begin{aligned} Score = {} & \beta_0 + \beta_1 \cdot Reg\ Risk + \beta_2 \cdot Phys\ Risk + \beta_3 \cdot Reg\ Opp + \beta_4 \cdot Phys\ Opp \\ & + \beta_5 \cdot Controls + \alpha_i + \alpha_t + e \end{aligned} \tag{1}$$

where i and t denote firm and year, and e is the error term.

β_1 and β_2 are coefficients to test legitimacy theory. If these coefficients are significantly posi-

tive, firms makes better disclosure when they recognize more risks from climate change. If these coefficients are significantly negative, firms make poorer disclosure when they recognize more risks, a contradiction of legitimacy theory. In addition, β_1 and β_2 indicate regulatory aspects and physical aspects of the risks respectively. Hence, if β_1 is significantly positive (negative), firms makes better (poorer) disclosure when they recognize risks that their business might soon be regulated or that they might have violated some regulation. If β_2 is significantly positive (negative), firms makes better (poorer) disclosure when they recognize climate change risks in their fundamental business.

β_3 and β_4 are coefficients to test voluntary disclosure theory. If these coefficients are significantly positive, firms makes better disclosure when they recognize more opportunities from climate change. If these coefficients are significantly negative, firms make poorer disclosure when they recognize more opportunities, a contradiction of voluntary disclosure theory. In addition, β_3 and β_4 indicate regulatory aspects and physical aspects of the opportunities respectively. Hence, if β_3 is significantly positive (negative), firms makes better (poorer) disclosure when they recognize opportunities, to make a business plan in the expectation of future regulation or to take a leadership position in creating a regulatory standard. If β_4 is significantly positive (negative), firms makes better (poorer) disclosure when they recognize climate change opportunities directly, by emitting less CO_2 or by offering ecofriendly products or services that best the offerings of other firms'

3. Data and descriptive statistics

In this section, we explain the data used in regression analysis, and we investigate descriptive statistics in order to see trends and to see how disclosure scores differ from industry to industry. The data is CDP data (2008-2012) provided by ESG Professional Services. The number of observations is 3,806. The data includes 45 countries and 20 industry groups

(1) Data

Data used for this study was based on Bloomberg ESG data, which was collected by Bloomberg Professional Service. The data includes ESG data, financial data, ESG ratios, and CDP data (2008-2012). The number of observations is 3,806. The data includes 45 countries and 20 industry groups.

The dependent variable is *Score* that is The Climate Disclosure Leadership Index (CDLI) score that reflects the comprehensiveness of a company's response to the CDP questionnaire. The CDP questionnaire includes three kinds of questions: management, risk and opportunity, and emission. The response to each question is equally weighted in the CDLI. The score is normalized to a 100-point scale. Generally, companies scoring within a particular range suggest comparable levels of commitment to, and experience of, carbon disclosure. Thus, the higher CDLI score the respondent gets, the better reputation reports they receive from CDP.

The model includes four independent variables, which are *RegRisk, PhysRisk, RegOpp,* and *PhysOpp*. It is difficult to quantify and compare the risk and opportunity by dividing it into regulatory aspects and physical aspects. Thus, CDP provides dummy variables that indicate whether the company considers itself exposed to climate change regulatory risk, physical risk, regulatory opportunity, and physical opportunity. We use the dummy variables as independent variables. Although these dummy variables are part of the disclosure score, the score also includes other aspects. Thus, they can contribute to the examination of the relationship between indicators of risk and opportunity and the disclosure score.

We include the following control variables–*ROA, lnSize, lnCP* and *lnLP* that indicates firm's' characteristics. *ROA* (return of asset) is calculated by EBIT divided by total assets. *lnSize* is the logarithm of total assets. *lnCP* is the logarithm of the capital labor ratio, which is net fixed assets divided by the number of employees. *lnLP* is the logarithm of labor productivity, which is revenue divided by the number of employees.

Next, we explain the classification of industries. We categorize industries using two classification schemes. First, the industries are divided into three broad groupings: Manufacturing,

Non-manufacturing, and Energy & Utilities. This is because the central tendency of a firm's score is expected to depend on how much its industry emits carbon dioxide. For example, Manufacturing and Energy & Utilities are more likely to emit CO_2 than Non-manufacturing. Also, Energy & Utilities are more greatly influenced by the government and policy makers. We excluded the financial industry because the number of observations was comparatively small.

The second classification scheme is based on the Global Industry Classification Standard (GICS), an industry classification standard developed by MSCI in collaboration with Standard & Poors (S&P). GICS consists of 10 sectors, 24 industry groups, 62 industries, and 132 sub-industries. The GICS classification assigns an industry group name to each company according to its principal business activity. The GICS industry group classification is the largest classification that can define whether the industry is categorized as manufacturing or non-manufacturing.

(2) Descriptive statistics

The means, standard deviation, maximum, and minimum of all variables are shown in **Table 1**. The average value of Score is 68.81. The mean of *PhysOpp* is relatively lower than the means of the other measures of risks and opportunities.

Table 2 shows the average disclosure score and growth rate of each industry groups by year. The growth rate is calculated by the difference of the present year's average and the previous year's average, divided by the present year's average, multiplied by 100. The rightmost column contains simple average from 2008 to 2012.

As a whole, the average of all industries by year is monotonically increasing. We can find over 10 increases in four years when we see the average of all industries is 59.99 in 2008 and 73.18 in 2012. Notably, in 2009 and 2011, the growth rate exceeds 7%. For manufacturing, the average score is higher than the average of all industry groups from 2008 to 2012. Automobiles and Components and commodity industries like Food, Beverages & Tobacco and Household &

Personal Products got higher scores than other manufacturing industries. Although Consumer Durables & Apparels got a relatively low score, it has grown since 2009 and reached 73.7, which is higher than the average of all industries. On the other hand, Healthcare Equipment & Services, which also got a lower score than other manufacturing, had an average score in 2012 that was lower by about 10 than the average of all industries.

With regards to the Non-manufacturing industry, the average disclosure score is lower than Manufacturing and Energy & Utilities. However, it increased rapidly compared with other industries. The scores of Consumer Services, Retailing and Food & Staples Retailing increased around 20. Food & Staples Retailing got 79.21, which was the third highest score in 2012. We can assume that individual consumers have become more interested in environmental issues. In addition, we can assume that managing CO_2 emissions in the supply chain has become increasingly important. However, some industries like Media got a low score because they are not emitting much CO_2.

In addition, Energy & Utilities scored higher than the average of all industries. These industries are regulated by the government; thus, they are under pressure from governments to disclose information.

4. Results

In this section, we explain the regression results in **Table 3**. Regression model (1) includes all industries. Regression models (2), (3), and (4) include only Manufacturing, Non-manufacturing, and Energy & Utilities, respectively. **Table 4** is a summary of the coefficients from **Table 3**, with + denoting positive significance and blank denoting insignificance.

First, we explain the results on risk. Regression models (1), (2), (3), and (4) show that *RegRisk* is statistically insignificant. On the other hand, *PhysRisk* is positively significant in models (1), (2), and (3). However, *PhysRisk* is statistically insignificant in model (4). From these results, firms, other than those in the Energy & Utilities industry, make environmental disclosures by legitimacy theory with regard to physical aspects, but not with regard to regulatory aspects.

5. Conclusions

The purpose of the study is to examine how climate change risks and opportunities affect disclosure score and to deepen the understanding of whether or not firms' environmental disclosure is adequately explained by voluntary disclosure theory and legitimacy theory.

We provide an overview of the trends in disclosure score by industry, presenting an average of disclosure score by industry group. We find that the Manufacturing industry and Energy & Utilities, which are more likely to emit CO_2, get higher scores than the Non-manufacturing industry. However, within the Non-manufacturing industry, the average score of Food & Beverage Retailing is higher than the average score of all industries. In addition, the average growth rate of the Non-manufacturing industry from 2008 to 2012 is higher than other industries. It can be said that the industry that is most directly related to the issue of climate change makes better disclosure, and the industry that is not directly related does not pay much attention to environmental disclosure. However, even if this industry does not affect climate change directly, the possibility exists that its activities affect climate change indirectly. Thus, before making policy based on s these indirect relations, policymakers should consider how to make these industries pay attention to environmental disclosure.

By regression analysis, we tested whether voluntary disclosure theory and legitimacy theory are supported. We find that voluntary disclosure theory is supported in almost all regression models. Regulatory aspect of voluntary disclosure theory is supported except in Energy & Utilities. The physical aspect is supported in all models. On the other hand, legitimacy theory is only partially supported in this study. Physical risk has significantly positive impact on disclosure score in all models except the Energy & Utility industry, whereas Regulatory aspect is not supported in all models. When taken together, voluntary disclosure theory is strongly supported in almost all models, compared to legitimacy theory. In addition, we can conclude that the physical

aspect has a stronger relationship to the disclosure score than the regulatory aspect does.

From here, we discuss the implication of the results and make suggestions for firms and policymakers. As Dhaliwal et al., (2011) [5] discuss, if firms disclose according to voluntary disclosure theory, they will want to be competitive and differentiate themselves by disclosing. Thus, the evidence supporting voluntary disclosure theory in this study indicates that a disclosure score can work as an incentive for the firm to treat environmental problems proactively.

However, there is one problem investors and policymakers have to consider when firms' disclosure behavior is governed by voluntary disclosure theory. As Dhaliwal et al., (2011) [5] mentioned, firms decide to disclose when it maximizes profits net of disclosure costs and they decide not to disclose when it harms their reputation. This might be very dangerous if the firm is destroying the environment without being noticed by anyone, because the pollution has not yet caused an observable problem. Obviously, that is not good for the environment. It is also not good for the firm because they miss the opportunity to notice the risk in their business and therefore they cannot prepare for it. As a result, they might be punished with a negative impact to their reputation or perhaps an obligation to pay compensation. In addition, information asymmetry causes inefficient investment. Investors cannot identify which firms really do well in terms of business sustainability. In order to prevent this problem, policymakers should create incentives that ensure the disclosure of information that is not favorable to the firm. It is necessary to create some mandatory standard of disclosure or to create cost of not disclosing.

Another finding is that, except for the physical risk in the Energy & Utilities industry, all physical indicators are significant predictors of the disclosure score. In some countries, increasing attention is being paid to the importance of disclosing environmental liability and of meeting global standards for environmental accounting. In February 2010, the SEC decided to issue guidance for companies on the climate change-related information they should be disclosing to investors [8]. The Climate Change Disclosure Guideline was published in 2013. According to this guideline, the disclosure of physical risk and opportunity is mandatory for all publicly traded

companies. This is controversial because the rule applies to all companies, not just those with environmental issues. Considering these trends, the initiatives being taken to quantify environmental performance and the investments being made to meet these standards will result in more effective decision making on climate change.

Finally, the regulatory aspect does not show a clear relationship to the disclosure score. For one thing, unlike the physical aspect, there are already some legal standards for regulatory aspects in particular countries. According to **Table 1**, the average of regulatory risk is not very low compared with other aspects. This may also explain why, with the exception of physical opportunity, the independent variables of Energy & Utilities do not show a significant relationship to disclosure score. Because Energy & Utilities are regulated by the government, we can assume that their disclosures about regulation do not make much difference.

To summarize our conclusions, voluntary disclosure theory is supported in almost all models and legitimacy theory is partially supported. Policymakers should redesign a system that discloses information that is not favorable for firms, in order to avoid adverse climate change. In addition, although the average level of disclosure of physical opportunity is the lowest for risk and opportunity, it has the strongest relationship with disclosure score. Thus, not only are quantitative standards important for quantifying firm's bad impacts on the environment, but they are also important for quantifying firms' good impacts on the environment, both of which might affect firm value.

Finally, we identify some limitations of this study and suggestions for future research. First, the indicators of risk and opportunity are dummy variables; thus, we cannot reveal the relationship between the amount of information about risk and opportunity and disclosure score. Although this is a problem, it is worth attention because it is difficult to compare regulatory aspects and physical aspects. Second, we used CDLI as a dependent variable. Thus, our conclusion is only applicable to CDP. However, non-environmental organizations such as the SEC have been more interested in environmental issues, and they have tried to apply the methods of environmental organization. In

terms of this trend, our study can contribute to further research. Finally, we cannot identify the reason why legitimacy theory is not supported. Thus, further analysis will help improve understanding of environmental disclosure.

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Table 1 Descriptive statistics of all variables

Variable	Description	Obs	Mean	s.d	Min	Max
Dep. variable						
Score	The Climate Disclosure Leadership Index (CDLI) score which reflects the comprehensiveness of a company's response in terms of the depth and breadth of its answers to the CDP questionnaire	3,807	68.94	18.41	0	100
Indep. variable						
Reg Risk	Indicates if the company considers itself exposed to climate change regulatory risk.	3,807	0.87	0.34	0	1
Phys Risk	Indicates if the company considers itself exposed to climate change physical risk.	3,807	0.78	0.41	0	1
Reg Opp	Indicates if the company considers itself exposed to potential climate change regulatory opportunity.	3,807	0.86	0.35	0	1
Phys Opp	Indicates if the company considers itself exposed to potential climate change physical opportunity.	3,807	0.64	0.48	0	1
Control variables						
ROA	Return on Assets	3,807	0.09	0.08	−0.36	2.014
lnCL	Capital labor ratio=Net Fixed Assets/ Number of employees	3,807	11.85	1.89	5.94	20.82
lnSize	Total Assets	3,807	23.00	1.44	18.00	27.39
lnLP	Labor productivity=Sales/ Number of employees	3,807	12.96	0.915	9.77	18.95

Table 2 Average disclosure score and growth rate of score by industry group and year

Type of industry	Industry group	2008	2009	2010	2011	2012	08-12
Manufacturing		63.38	67.65	67.76	72.87	74.64	69.26
			(6.32)	(0.16)	(7.01)	(2.38)	
	Automobiles and Components	70.67	74.38	67.83	77.06	77.03	73.39
			(4.99)	(-9.66)	(11.98)	(-0.04)	
	Consumer Durables and Apparels	56.57	56.13	63.4	65.6	73.7	63.08
			(-0.78)	(11.47)	(3.35)	(10.99)	
	Food Beverage and Tabaco	59.79	86.11	76.63	76.41	77.19	75.23
			(30.57)	(-12.37)	(-0.29)	(1.01)	
	Healthcare Equipment and Service	59.14	63.44	64.9	68	62.6	63.62
			(6.78)	(2.25)	(4.56)	(-8.63)	
	Households and Personal Products	64.5	69.53	73.13	79.5	86.67	74.67
			(7.23)	(4.92)	(8.01)	(8.27)	
	Materials	61.79	67.41	68.76	74.71	73.86	69.31
			(8.34)	(1.96)	(7.96)	(-1.15)	
	Pharmaceutical, Biotechnology and Life Science	61.79	67.41	68.67	74.71	73.86	69.29
			(8.34)	(1.83)	(8.08)	(-1.15)	
	Semiconductors and Semiconductor Equipment	75.35	58.54	59.33	70.93	75.34	67.90
			(-28.72)	(1.33)	(16.35)	(5.85)	
	Technology hardware and Equipment	60.79	65.89	67.17	68.87	71.53	66.85
			(7.74)	(1.91)	(2.47)	(3.72)	
Non-Manufacturing		55.02	62.39	66.36	71.08	71.29	65.23
			(11.81)	(5.98)	(6.65)	(0.30)	
	Commercial & Professional Services	49.62	60.43	65.86	68.43	73.06	63.48
			(17.89)	(8.25)	(3.76)	(6.34)	
	Consumer Services	53	65.72	60	69.47	73.03	64.24
			(19.35)	(-9.53)	(13.63)	(4.87)	
	Food & Staples Retailing	54.91	65.72	73.14	68.23	79.21	68.24
			(16.45)	(10.14)	(-7.20)	(13.86)	
	Media	51	54.38	60	65.35	62.88	58.72
			(6.22)	(9.37)	(8.19)	(-3.93)	
	Real Estate	58.69	61.12	68.06	71.53	67.86	65.45
			(3.98)	(10.20)	(4.85)	(-5.41)	
	Retailing	59.43	63.77	66.96	75	71.92	67.42
			(6.81)	(4.76)	(10.72)	(-4.28)	
	Software & Services	54.58	61	67.06	71.12	67.78	64.31
			(10.52)	(9.04)	(5.71)	(-4.93)	
	Telecommunication Services	57.3	64.81	67.81	78.3	73.17	68.28
			(11.59)	(4.42)	(13.40)	(-7.01)	
	Transportation	56.68	64.56	68.32	72.3	72.72	66.92
			(12.21)	(5.50)	(5.50)	(0.58)	
Energy & Utilities		65.29	64.96	68.63	75.77	74.59	69.85
			(-0.52)	(5.35)	(9.42)	(-1.58)	
	Energy	62.78	62.43	64.88	73.11	69.03	66.45
			(-0.56)	(3.78)	(11.26)	(-5.91)	
	Utilities	67.8	67.48	72.38	78.42	80.14	73.24
			(-0.47)	(6.77)	(7.70)	(2.15)	

Total	59.99	65.01 (7.72)	67.26 (3.35)	72.47 (7.18)	73.18 (0.97)	67.58

Notes: Average disclosure score is without parentheses, and growth rate of disclosure score is in parentheses. Growth score are calculated by the difference of present average and previous average divided by the present average multiplied 100.

Table 3 Regression result

	(1) *Score* *All industry*	(2) *Score* *Manufacturing*	(3) *Score* *Non-manufacturing*	(4) *Score* *Energy and Utilities*
Reg Risk	1.10	0.03	2.05	1.74
	(0.90)	(1.15)	(1.637)	(3.74)
Phys Risk	2. 58***	2.39**	3.32**	-.042
	(0.77)	(0.96)	(1.507)	(2.30)
Reg Opp	3.93***	3.01***	5.15***	3.84
	(0.77)	(1.15)	(1.496)	(3.33)
Phys Opp	3.65***	3.55***	3.13*	5.46***
	(0.64)	(0.86)	(1.215)	(1.50)
ROA	-6.04	-1.88	-7.21	-33.13
	(6.43)	(7.99)	(14.797)	(1.50)
lnCL	-1.01	0.58	-0.75	-2.59
	(1.07)	(1.40)	(2.441)	(2.34)
lnSize	0.71	1.31	-0.18	4.54
	(1.30)	(1.70)	(2.599)	(3.57)
lnLP	0.67	-0.80	-0.92	6.44
	(1.34)	(1.89)	(2.79)	(2.88)
Constant	35.09	23.77	67.31	-104.12
	(32.66)	(44.74)	(63.08)	(85.95)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Obs	3,806	2,083	1,186	537
The number of industry group	20	9	9	2
Year	2008-2012	2008-2012	2008-2012	2008-2012
Within R-squared	0.47	0.48	0.50	0.41
Overall R-squared	0.16	0.17	0.18	0.22

Notes: Columns 1 and 2 shows results of regression model. ***, **, and * denote significances at the 1%, 5%, and 10% level, respectively. Coefficients are without parentheses, and standard errors are in parentheses.

Table 4 Results summary

	Score(1)	*Score*(2)	*Score*(3)	*Score*(4)
RegRisk				
Phys Risk	+	+	+	
RegOpp	+	+	+	
PhysOpp	+	+	+	+

Notes: The table is summary of the coefficients which mark significant on Table 3. + donates positively significant and blank donates insignificant.

[2014.10.22 1178]