Influencing factors on environmental behavior of iron-steel enterprise in China

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Abstract

At first this paper selected the related data from the iron-steel listed Corporation during 2010-2012, after that, used the multivariate linear regression method to analyze the implementation status. Taking degree of enterprise environmental behavior as the dependent variable, and taking enterprise scale, market performance, profitability, risk resistance ability and the enterprise nature as the independent variable, this paper studied the influence factors of fulfillment corporate environmental responsibility and their relationships. Results show that the degree of steel enterprises environmental behavior has enhancement with profitability improvement, consumer preferences from market pressure can make the enterprise more positive on taking environmental measures. Risk resistance ability, enterprise nature and enterprise scale have no significant effect on the environment behavior.

Keywords

Iron-steel enterprises, corporate environmental responsibility, influencing factors.

1. Introduction

As is known to all, economy is the essential attribute of enterprise; profit is the premise of its existence. For hundreds of years, the high-speed development of enterprise achievement of human's economic rise, but in the process, gradually appeared resource depletion, environmental pollution and other issues, human began to think about dialectical relationship between economic development and environmental protection problem, enterprise also began to think about the trade-off between economic responsibility and environmental responsibility. The conclusion of theoretical research and practice experience both agree that enterprise as the basic component of economic and social unit has an obligation to pursue profit, at the same time, to undertake the responsibility of protecting and improving the environment, namely the corporate environmental responsibility. And the implementation status of corporate environmental responsibility as the main content of corporate environmental responsibility, to a certain extent, affects natural resources efficiency, economic benefits of enterprises, also affects effect of environment protection and sustainable development of human beings, so the implementation status of corporate environmental responsibility good or bad is a very important research subject.

According to the relevant provisions of further standardize the production and operation of heavy pollution industry listed companies to apply for or refinancing of the verification work of environmental protection issued by China SEPA, steel industry belongs to the heavy pollution industry, in addition to its production process requires a lot of natural resources, and it will produce pollutants such as sulfur dioxide, nitrogen oxides. According to statistics, in 2010, steel industry emission sulfur dioxide, nitrogen oxides, smoke and dust of industrial emissions, respectively, 9.5%, 6.3%, 9.3% and 20.7%. Steel enterprise, therefore, is high consumption, high emissions and high pollution, its environmental impact is very big, whether steel enterprise with environmental responsibility consciousness, whether willing to take environmental responsibility, whether and how

to practice of environmental management behavior to a large extent determines the efficiency and effectiveness of environmental protection, therefore, research on factors influencing implementation status of environmental responsibility of China steel enterprise can not only improve steel enterprise environmental responsibility consciousness, effectively motivate the initiative of environmental responsibility and enthusiasm to achieve the goal of "energy conservation and emissions reduction", but also help other industrial enterprises to implement environmental management behavior, help the government to formulate effective management policy, improve policy pertinence and maneuverability.

2. Literature research

2.1 The origin and definition of corporate environmental responsibility.

Corporate environmental responsibility is an extension of corporate social responsibility. Corporate social responsibility is a big category, including responsible behavior to shareholders, employees, communities, suppliers and other stakeholders, the donation and charity behavior to the vulnerable group, and also including its attention and protect behavior to environment and resources. Originated in the 1970s "environmental movement" and the government strict legal rules forced companies to add the protection of environment in its social responsibility behavior, the corporate environmental responsibility aroused at the historic moment, and promoted the sustainable development of environment through the implementation of social responsibility such as waste minimization and environmental protection action. Joe Desjardins (2009) pointed out that the corporate environmental responsibility has two meanings: one is noun attribute, referring to all the environmental and ecological issues influenced by the enterprise management behavior; the other is verb attribute, referring to the company's environmental protection measures and actions in order to promote sustainable economic development. Grane, a., Matten, d. (2008) put forward the enterprise Social environmental Responsibility (called Corporate Social and Environmental Responsibility, abbr. CSER); pointing it is a cluster concept, which includes business ethics, corporate philosophy, corporate citizenship, sustainable development and environmental responsibility. Georges Enderle (1997) from the perspective of environmental responsibility researched firm foundation of Christian ethics, noting that the whole Christian world is orderly operation, not because of scientific inventions or philosophy predict occurrence of any change, therefore, whether the micro-level of individual or meso-level corporate and organization, or macro-level economic system should not be to artificially change the world and environment. If people do not follow the objective laws of nature and humanity, they will be punished, so people, economic organizations and countries have obligation to environmental responsibility.Lu Daifu (2002), Ma Yan (2003), Zhao Jingtao (2010) agreed that corporate environmental responsibility is a part of the corporate social responsibility, that the company in the pursuit of the best interests of shareholders and the process of development should fulfill the social responsibility of protecting the environment, taking into account the social needs of environmental protection. Make company's behavior most likely to comply with environmental ethics and legal requirements, to promote economic, social and sustainable development of nature. "

2.2 Measure on the behavior and the implementation status of corporate environmental responsibility.

As mentioned above, corporate environmental responsibility is a complicated system, it can be divided into three levels from the vertical, enterprise environmental awareness, enterprises environmental behavior and environmental performance, corporate environmental behavior as the intermediate links, is crucial. How to burden environmental responsibility in process of enterprises actual operation, not only determines the level of corporate environmental performance, but also affects the sustainable development of the enterprise, therefore, there are many research on the status of corporate environmental responsibility and environmental behavior. Sukru Ozen and Fatma Kusku (2009) gave the citizenship to enterprise, and described the conduct of developing countries in the form of corporate environmental behavior, process and operation mode, on this basis, they proposed a "three-stage theory" of corporate environmental behavior patterns: in order to avoid penalizing,

passive compliance stage, in order to comply with the norms recognized by society stage, in order to reduce uncertainty phase and active compliance stage. Gao Honggui (2011) used private enterprises as the research object, used the game analysis method, analyzed the regulation push and promote role when enterprise in the face of fulfilling environmental responsibility decisions, studies show that award and punish simultaneously is advantage scheme, government intervention is necessary. There are two ways to measure on the behavior and implementation status of corporate environmental responsibility; one is single index, environmental information disclosure index (EIDI), mainly built on the basis of the environmental information disclosure (Xin Min and Wang Jianming, 2009). Zheng Chunmei and Xiang Chun (2013) used the method of scoring, from the environmental costs and investment, enterprise environmental protection policy and ISO14000 certification, the government environmental subsidies and sewage circumstance four aspects to build the environmental information disclosure index (EIDI). Another is directly to use the corporate social responsibility or environmental assessment data announced by a third-party agency, such as HEXUN information technology co., LTD launched the listed company social responsibility report score, one is the environment responsibility, accounting for 20% of the total score, if it is manufacturing industry, the percent increases to 30%, the basis indicators including the environmental protection consciousness, environmental management system certification, environmental protection investment amount, sewage species and types of energy saving.

2.3 Factors influencing implementation status of environmental responsibility and their relationship.

Enterprise is the basic unit of society and economy, with a typical social attributes, and therefore its business processes and behavior are bound to be affected by a variety of factors, according to the literature, factors fall into two categories, namely external factors, internal factors .

External factors are from outside of the enterprise, including degree of government legal regulation, public awareness about environmental protection, economic development and media attention, etc., studies have shown that these factors and corporate environmental information disclosure level basically have negative correlation, public environmental awareness and social supervision levels have no significant effect on disclosure level (Zhang Yan and Guan Min, 2009). Sükrü Özen and Fatma Küskü (2009) pointed out that the way in which companies bear environmental responsibility, depending largely on market positioning, industry concentration and business nature. Hu Dasha and Li Yang (2012) pointed out that the role of government regulation to improve corporate environmental behavior and environmental efficiency was not significant. Yu Ruixiang and Zhu Qing (2009) pointed out that the government environmental regulation effect depends on selectivity of response and response level of the company, the impact of consumer preferences along with the various industry-specific changes. Given the fundamental purpose of business is to maximize profits, investment for improving environment will undoubtedly increase the cost of business operation, which resulted in many companies choose to avoid fulfilling its corporate environmental responsibility, but consumer awareness of green consumption trends will force enterprises to improve production and management methods, to improve their competitiveness, or to make positive improvements to enhance the corporate social prestige and reputation to get more profits.

Internal factors are from the enterprise interior, including enterprise scale, various financial indicators, executive's environmental protection consciousness, ownership concentration and equity structure, etc. Xin Min and Wang Jianming (2009) used environmental information disclosure level as explained variables, enterprise scale, capital structure and profitability as explanatory variable, taking an analysis on data of 12 heavy pollution industries of 55 listed companies found that, enterprise scale and profitability has a significant positive effect on environmental information disclosure level, company capital structure has no significant influence on environmental information disclosure. Liu Yanna (2011), used the single factor variance analysis and multiple linear regression, took a empirical research on 100 listed companies of 17 industries, found that enterprises ownership nature and industry pollution property have significant effects on the implementation frequency of

environmental management behavior, state-owned enterprises are better than that of private enterprises, heavily polluting enterprises are better than light polluting enterprises. Enterprise scale and implementation frequency of environmental behaviors are positively correlated. Carolyn P. Egri and David A. Ralston (2004) in their research showed that corporate social environmental responsibility and employee's self-interest are significantly negative correlation, and universalism is significantly positive correlation. The executives or experts with high universalism will raise fulfillment level of corporate social environmental responsibility, this phenomenon is more obvious in developed countries, and they also found that personal values of executives and management experts have no significant influence for the company's environmental responsibility. Meng Qingfeng and Li Zhen (2010) argued that enterprise scale, technology level, the different leaders' environmental awareness, can make enterprise produce different environmental costs, which lead to different environmental behavior and performance. Tang Yali and Chen Zili (2006) found that the enterprise scale and performance are positively related to the environmental information disclosure level.

In addition, there are some literature research on corporate environmental responsibility problem from different angles, such as Peng Peixin and Du Feng (2011) used the literature research method to study the content, methods, motivation and influence factors of environmental information disclosure systematically; Wang Junhui and Fu Haoyue (2014) constructed environmental information disclosure framework based on stakeholders and the legitimacy. Meng, x. and Zeng, s. (2013), Wahba, and Hayam (2010), Mao He and Chen Juan (2009) used the data of listed companies, researched the relationship between environmental disclosure and corporate performance, environmental performance measurements, whether corporate environmental responsibility has market value and so on ; Lo, Carlos w. h. and Egri, Carolyn P (2008), Wang Hanyu (2012), Liu Zhongmei (2009), used comparative study methods to analyze the difference of corporate environmental responsibility between China and the United States.

3. Research design and empirical results

3.1 Variable Design.

Explained variable - implementation level of environmental behavior. Enterprise fulfill their environmental responsibility, namely the implementation of environmental behavior mainly embodied in three aspects: green manufacturing, green products and green industry, green manufacturing including major environmental protection investment, total quantity of main pollutant emissions and energy saved; Green products including excellent and highly sophisticated green products ratio , social carbon reduction for using green products, the number of green solutions to provide customers and the proportion of the original fuel suppliers green certification and materials suppliers through the environment management system certification; The green industry, including energy saved every year, recycled solid waste resources and rate of solid waste resources industries. On basis of the above literature research, considering the scientific and data availability, take implementation level of environmental behavior as a measure of fulfillment status of steel enterprise environmental responsibility, namely be explained variable, represented by Y. Given the current environmental information disclosure index and social assessment of third parties in the pros and cons of two measurement methods, choose 2012 environment responsibility score from the third party – HEXUN information technology co., LTD., and correct the information on basis of industry, eventually decide data of steel enterprises environmental behavior implementation degree.

Explanatory variables. Studies have shown that the degree of implementation of corporate environmental behavior is the result of external factors and internal factors working together, in order to facilitate research, in line with the principle of internalizing external factors, selecting enterprise scale, market preferences, profitability , risk resistance ability and enterprise nature as explanatory variables, respectively using the company's total assets (x_1), the main business income (x_2), ROE (x_3) and the debt ratio (x_4) on behalf of enterprise scale, market performance, profitability and risk

resistance ability ,corporate nature using dummy variables d1, if state-owned companies, the variable takes 1, the variable takes a 0 otherwise.

3.2 Research hypothesis.

On basis of literature research, combining with related theory and management practice, put forward the following hypothesis.

Hypothesis 1: the lager the enterprise scale, the greater the implementation status of its environmental responsibility. Theoretically, the lager the scale of the enterprise, the greater its social influence, that will prompt enterprises to pay more attention and actively maintain its good social reputation and corporate image, so that enterprises will be actively committed to the implementation of environmental responsibility.

Hypothesis 2: the higher the enterprise market performance, the implementation status of environmental responsibility for the better. Generally speaking, customer is the god of the enterprise, sales income is the main source of corporate profits, in the current "buyer's market" situation, enterprise rely on the markets more and more, in order to obtain stable profits, enterprises try to through green products, green marketing way to maintain customer loyalty, by fulfilling environmental responsibility to obtain more market reputation and customer loyalty.

Hypothesis 3: the better enterprise profit ability, the implementation status of environmental responsibility for the better. Corporate environmental responsibility costs too much, strong economic support is the basis and prerequisite for enterprises to implement it, thus can assume that companies with good profitability will be more willing, more power to take environmental responsibility.

Hypothesis 4: the higher the risk resistance ability of enterprise, the implementation status of environmental responsibility for the better. If an enterprise risk resistance ability is low, its debt ratio is very high, its financing ability will be very low, it will hardly get investment from shareholders and capital markets, if the enterprise is difficult to sustain, it will be difficult to have the ability to take environmental responsibility, on the contrary, if the debt ratio is low, the ability to resist risk is high, capital market expectation is good, enterprise is well-funded, they will invest more funds to improve environmental conditions, to manage pollution and so on, to achieve environmental responsibility.

Hypothesis 5: state-owned enterprises are more willing than other properties to take responsibility. At present, our country has put building a resource-conserving society and environment-friendly society first in the development, under this background, state-owned enterprises as the main body of the national economy, not only bear the important mission of economic construction, more is bearing the weight of the historical mission of environmental protection, to ensure the sustainable development of human, therefore assume that state-owned companies are more willing and more obligated to take environmental responsibility.

3.3 Model building and empirical process.

Regression analysis is a statistical method and technology for dealing with relationships between variables, compared with correlation analysis, it is more focused on examining the value change rule of variables, through certain mathematical expressions to describe the relationship between the variables, and then determine the impaction level of changing one or several variables for another specific variables. According to the selected indicators, take sample enterprise environmental behavior implementation degree score as the dependent variable, company's total assets, main business income, ROE, debt ratio and enterprise nature as the independent variable, build a multiple regression model:

$$y = \alpha + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \alpha_4 x_4 + d_1 + \mu \qquad (1)$$

y is the implementation degree of corporate environmental behavior, x_1 is for the company's total assets, x_2 is for the main business income, x_3 is for ROE, x_4 is for debt ratio, d1 is for corporate nature,

α is a constant, α_1, α_2, α_3, α_4 are coefficients, μ is a random error term. Then use Eviews6.0 software operation, the output results shown in Table 1-4.

As can be seen from Table 1, F statistic of the model is 10.8972; probability p is 0.0013, far less than 0.05, indicating that the model has better goodness of fit. Separately on a single variable T test, T statistic of variable d1 is too small, and the statistical probability is 0.9193, far greater than 0.05, indicating d1 doesn't pass through T-test; d1 on behalf of the enterprise nature does not have significant impact on corporate environmental behavior implementation. T statistical probability of variable x1 and x4 is 0.2651 and 0.3146 respectively, they are both greater than 0.05, indicating that variable x_1 and x_4 on behalf of the company's total assets and debt ratio are not significant affect the implementation level of corporate environmental behavior. The results show that only x_2 and x_3 through the test, namely variables x_2 on behalf of the main business income and x_3 represents ROE have significant impact the implementation level of corporate environmental behavior.

Use explained variables y, explanatory variables x_2, x_3, set up multivariate linear regression model as follows:

$$y = \beta + \beta_1 x_2 + \beta_2 x_3 + \mu \tag{2}$$

Table 1 Regression coefficients

	Coefficient	Std. Error	t-Statistic	Prob.
C	3.015	0.218	13.80	0.0000
x_1	-0.000098	0.000082	-1,188246	0.2651
x_2	0.018844	0.003349	5.626331	0.0003
x_3	0.000393	0.000164	2.390317	0.0405
x_4	-0.327011	0.307054	-1.064995	0.3146
d_1	-0.016421	0.157582	-0.104209	0.9193
R-squared	0.858237	Mean dependent var		2.802286
Adjusted R-squared	0.779479	S.D. dependent var		0.415292
S.E. of regression	0.195019	Akaike info criterion		-0.142261
Sum squared resid	0.342293	Schwarz criterion		0.140960
Log likelihood	7.066954	Hannan-Quinn criter		-0.145277
F-statistic	10.89723	Durbin-Watson stat		1.582108
Prob(F-statistic)	0.001308			

The empirical results are shown in table 2, main business income and ROE pass through F test and T test, and the fitting degree is 80%, after adjustment, absolutely coefficient is above 77%, indicating the model has better explain significance. Take LM and WHITE test for the regression model; determine whether heteroscedasticity and autocorrelation exist. Test results as shown in table 3 and table 4, statistical probability of two test is greater than 0.05, namely the regression model does not exist autocorrelation and heteroscedasticity. Then it is concluded that regression equation as follows:

$$y = 16.338 + 0.252 x_2 + 0.0054 x_3 \tag{3}$$

(13.233) (5.498)   (3.338)

Table 2 Adjusted regression coefficients

	Coefficient	Std. Error	t-Statistic	Prob.
C	16.338	1.235	13.23	0.0000
x_2	0.251805	0.04579	5.498170	0.0001
x_3	0.005395	0.001616	3.337512	0.0058
R-squared	0.804250	Mean dependent var		17.66667
Adjusted R-squared	0.771625	S.D. dependent var		6.078847
S.E. of regression	2.904994	Akaike info criterion		5.147596
Sum squared resid	101.2679	Schwarz criterion		5.289206
Log likelihood	-35.60697	Hannan-Quinn criter		5.146088
F-statistic	24.65137	Durbin-Watson stat		1.841913
Prob(F- statistic)	0.000056			

Table 3 Autocorrelation test

F-statistic	0.037331	Prob F(1,11)	0.8503
Obs*R-squared	0.050734	ProbChi-Square(1)	0.8218

Table 4 Heteroskedasticity test

F-statistic	0.470653	ProbF. (5,9)	0.7896
Obs*R-squared	3.109149	Prob. Chi-Square(5)	0.6832
Scaled explained SS	1.862135	Prob. Chi-Square(15)	0.8679

4. Conclusions

The main purpose of the paper is attempt to reveal factors influencing implementation status of environmental responsibility of China steel enterprise, using multiple regression analysis, the relevant data of steel listed companies to empirical analysis, and the results accept hypothesis 2 and hypothesis 3, reject the hypothesis 1, hypothesis 4 and hypothesis 5, and then draw the following conclusions.

Enterprise scale, nature and risk resistance ability have no significant effect on implementation of the corporate environmental responsibility of steel enterprise.

The empirical results show that for the steel enterprises, enterprise scale, enterprise nature and the risk resistance ability have no obvious role in promoting for the implementation of environmental responsibility, this conclusion is contrary to the original hypothesis, the main reason lies in 15 steel enterprises listed companies in this research have nearly same nature, size and risk resistance ability. Further statistical analysis research for that 15 samples enterprises, 13 for state-owned enterprises, two for the private enterprises, risk resistance ability and enterprise scale have little difference, these factors make the research conclusion inconsistent with research assumptions, this is caused by the data convergence in specific industry, so can not deny enterprise nature, scale and so on for the promotion of corporate environmental responsibility. After further investigation, comparing with other nature or enterprise scale, the author found that 15 sample companies have achieved good in the environmental information disclosure, energy conservation, emissions reduction and recycling economy construction. Therefore, the research conclusion indicates that trying to change the equity structure, increase assets or reduce leverage of stat-owned enterprises to promote taking better

environmental responsibility is meaningless, the existing equity structure, asset size are enough to guarantee the enterprise diligently perform environmental responsibility, no need to do other work.

The better the enterprise market performance, the implementation status of environmental responsibility for the better.

Steel industry belongs to the typical manufacturing, develops based on resources, technology and market, since homogeneity in resources and technology level, it is difficult to break through, under this background, market become the top priority of development. In recent years, global economy has entered the downlink channel, the domestic steel market since 2008 has been on a low stage of development, and the steel business is struggling. In order to maintain a stable income source, the major steel enterprises rack their brains to cater to the market demand, research and development of low energy consumption and high quality green products, in order to gain reputation in the market and consumer loyalty, thus forming the virtuous cycle, whether it is under pressure from the market or from market power, enterprises are more willing to take responsibility, therefore, the better the market performance, the higher enthusiasm of enterprise to fulfill environmental responsibility.

The better enterprise profit ability, the implementation status of environmental responsibility for the better.

For steel enterprises, implementation environmental responsibility needs large number of capital investment in technology research and development, pollution control and so on, these virtually increase a lot of production cost and management cost, if companies don't have enough profit ability as strong support, their implementation of environmental responsibility also can only be an armchair strategist, impossible to enforce. So, the profitability of steel companies in largely determines the implementation status of environmental responsibility, which is obvious positive correlation.

In view of this, establish green image, gaining the consumer's identity and loyalty, continuously improving the enterprises profitability is an effective measure to promote the steel enterprise environmental responsibility, thus enterprises develop into a state of sustainable development.

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