

External Pressure, Ownership Property and Carbon Information Disclosure: Evidence from Chinese Listed Agriculture-Related Companies

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Abstract: This paper uses manually collected data on carbon information disclosure of Chinese listed agriculture-related companies from 2009-2015 to measure corporate carbon information disclosure, and explores the effects of external pressure on carbon information disclosure through textual analysis and hierarchical analysis. The results show that, firstly, government pressure has a significant positive relationship with corporate carbon information disclosure, i.e., the stronger the government regulation, the higher the level of carbon information disclosure of listed companies. Secondly, public pressure is significantly and positively related to corporate carbon information disclosure, which indicates that as the public's awareness of "low carbon and environmental protection" increases, their purchasing preferences change and companies perceive more and more low carbon demands and pressure from the public.

Keywords: carbon information disclosure; external pressure; government pressure; media pressure; public pressure; ownership property

1. Introduction

Agriculture, as the second largest source of carbon emissions, has not received sufficient attention in terms of its significance in carbon emission reduction. The existing carbon information disclosure mechanism in China is immature, with the disclosure subjects being the heavy polluting industries and mostly policy-based mandatory disclosure, and there are no mandatory carbon information disclosure requirements for other industries[1]. In terms of the number of disclosures, the proportion of agriculture-related enterprises that can disclose independent reports is relatively small, and most enterprises' carbon information is briefly mentioned in the "Environmental Protection and Sustainable Development" paragraph of their social responsibility reports, and fewer enterprises disclose detailed information in separate sustainability reports or environmental reports.

This paper collected carbon information disclosure data of Chinese listed companies from 2012 to 2019, measured the level of carbon information disclosure using content analysis and index method, and studied the external pressure factors affecting the level of carbon information disclosure of listed companies based on legitimacy theory and stakeholder theory. The findings show that there is a correlation between external pressure factors and the quality of carbon information disclosure of agriculture-related enterprises. Specifically, government pressure has a significant positive correlation with corporate carbon information disclosure, i.e. the stronger the government regulation, the higher the level of carbon information disclosure of listed companies. Public pressure is significantly and positively correlated with corporate carbon information disclosure, indicating that with the increase of public awareness of "low carbon and environmental protection", corporate carbon information disclosure is more active in order to establish their own "low carbon and environmental protection" image and attract and retain more public consumers. The ownership property has a negative moderating effect between government pressure and carbon information disclosure quality. It indicates that the correlation between government pressure and carbon information disclosure is stronger in state-owned enterprises. The ownership property has a positive moderating effect between public pressure and carbon information disclosure quality. It indicates that the correlation between public pressure and carbon information disclosure is stronger in private firms.

There are three main contributions of this paper. First, based on stakeholder as well as organizational legitimacy theories, this paper incorporates external pressure into the research framework to study its impact on the level of corporate carbon information disclosure. Second, since there is no unified measurement standard for carbon information disclosure of listed companies in China, this paper adopts textual analysis and hierarchical analysis to quantify the level of carbon information disclosure of listed companies in China, which provides a method to measure the level of carbon information disclosure for future research. Again, this paper explores the effects of government pressure, media pressure and public pressure on carbon information disclosure of listed companies in China. These findings can provide a scientific basis for the formulation of stakeholder policies for listed companies to improve the level of carbon information disclosure, and also enrich the literature on stakeholder theory.

2. Research hypothesis

Hypothesis (H1): Government pressure is positively related to the quality of carbon information disclosure. **Hypothesis (H2):** Media pressure is positively related to the quality of carbon information disclosure. **Hypothesis (H3):** Public pressure is positively related to the quality of carbon information disclosure. **Hypothesis (H4):** The ownership property has a negative moderating effect between government pressure and carbon information disclosure quality. **Hypothesis (H5):** The ownership property has a positive moderating effect between media pressure and carbon information disclosure quality. **Hypothesis (H6):** The ownership property has a positive moderating effect between public pressure and carbon information disclosure quality.

3. Research model and variable definitions

3.1 Sample selection and data sources

This paper takes all agriculture-related listed companies listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange a-share from 2012 to 2019 as the sample. The selection process is as follows: First, special treatment (ST) or *ST companies were excluded; second, companies with missing data were excluded. The final sample consisted of 1252 research samples [2]. Manually collect carbon disclosure data from listed companies' annual reports, social responsibility reports and corporate environmental reports. All other data in this paper come from China Securities Market and Accounting Research (CSMAR) database, China Economic News database, CNKI China important newspaper full-text database, PITI index and Baidu Environmental Concern Index.

3.2 Definition of variables

Table 1: Variable measurement method

Variable Types	Variables	Measurement	Data source
Dependent Variable	cid	CID Index	Corporate Annual Report, Social Responsibility Report and Corporate Environmental Report
Independent Variables	gop	Pollution Information Transparency Index (PITI) of the city where the company is registered divided by 100	Pollution Information Transparency Index (PITI)
	mep	Total number of media reports divided by 100	China Economic News Database, China Important Newspaper Full Text Database
	pup	Company registered city Baidu environment concern index divided by 100	Baidu environmental concern index
Control Variables	siz	Total assets' natural logarithm at the conclusion of the time period	CSMAR
	lev	The proportion of total liabilities to total assets at the conclusion of the term	CSMAR
	roa	Net profit to Net Assets Ratio	CSMAR
	gro	Growth rate of operating income	CSMAR
Moderating Variable	pr	1 if the entity is a government or a government-controlled entity; 0 otherwise	CSMAR

The independent variables in this study are government pressure, media pressure and public pressure,

and the dependent variable is carbon information disclosure, which is measured by the level of carbon information disclosure. The control variables are firm size, leverage, profitability, and growth capacity. Table 1 details how these variables are measured.

3.3. Research model

In order to test the research hypotheses H1, H2, and H3, regression model (1) is established in this paper. Model (1) is a multiple regression model of external pressure factors (government pressure, media pressure, and public pressure) on the quality of carbon information disclosure.

$$\text{Model (1): } cid = \beta_0 + \beta_1 * gop + \beta_2 * mep + \beta_3 * pup + controls + \varepsilon$$

In order to verify the research hypotheses H4, H5, and H6, regression model (2) is set up in this paper. Model (2) is a multivariate regression model to verify the moderating effect of the nature of controlling power on the external pressure factors (government pressure, media pressure, public pressure) and the quality of carbon information disclosure.

$$\text{Model (2): } cid = \beta_0 + \beta_1 * gop + \beta_2 * mep + \beta_3 * pup + \beta_4 * pr + \beta_5 * goppr + \beta_6 * meppr + \beta_7 * puppr + controls + \varepsilon$$

4. Empirical results

The results of the full sample regression for model (1) are:

$$cid = -2.235 + 0.187 * gop - 0.00205 * mep + 0.0624 * pup + controls$$

The results show that the value of F-test is 23.68 which is significant at 1% level. the value of Hausman-test is 31.88 which is significant at 1% level. The results show an R-squared value of 0.210, which means that 21% of the variation in the quality of carbon disclosure can be explained by the sum of the predictors.

The regression coefficient of media pressure (mep) was -0.00205, but did not pass the significance test. h2 (media pressure is positively associated with carbon disclosure quality) was not verified. The state should develop appropriate protection measures to safeguard the security and freedom of the media industry.

The regression coefficient for public pressure (pup) is 0.0624, which is significantly positively correlated at the 1% level. This validates H3 (public pressure is positively related to the quality of carbon disclosure). There is a positive relationship between public pressure and carbon information disclosure.

Model (2) is a regression of the moderating effect of the nature of the holding on the relationship between external pressure factors (government pressure, media pressure, public pressure) and the quality of carbon disclosure. The results of the full sample regression of model (2) are:

$$cid = -1.886 + 0.573 * gop - 0.00746 * mep + 0.160 * pup + 0.0469 * pr - 0.255 * goppr + 0.000609 * meppr + 0.0518 * puppr + controls$$

The regression results of model (2) are shown in Table 2. After adding the interaction terms government pressure* ownership property (goppr), media pressure* ownership property (meppr), and public pressure* ownership property (puppr), the R-squared value of model (2) increases from 0.210 to 0.226, which means that 22.6% of the change in carbon disclosure quality can be explained by the sum of predictors. The correlation between public pressure and carbon disclosure is stronger in private companies. In state-owned enterprises, the correlation between public pressure and carbon information disclosure is weaker. The measurement results of specific variables are shown in Table 2.

The regression result of model (1) shows that the F test value is 23.68, which is significant at 1% level. The value of Hausman-test is 31.88 which is significant at 1% level. The results show an R-squared value of 0.210, which means that 21% of the variation in the quality of carbon disclosure can be explained by the sum of the predictors. Based on the regression coefficients and significance results in Table 2, we find that the regression coefficient of government pressure (gop) is 0.187, which is significantly positively correlated at the 1% level. The regression coefficient of media pressure (mep) was -0.00205, but did not pass the significance test. The regression coefficient for public pressure (pup) is 0.0624, which

is significantly positively correlated at the 1% level. The regression result of model (2) shows that the R-squared value increases from 0.210 to 0.226, which means that 22.6% of the quality change of carbon disclosure can be explained by the sum of predicted values. The results show that the regression coefficient of government pressure * ownership property (goppr) as an interaction term is -0.255, which is significantly negatively correlated at the 1% level. The coefficient of government pressure (gop) is 0.573, which is greater than 0, and the coefficient of government pressure * ownership property (goppr) is -0.255, which is less than 0, indicating that the ownership property has a negative moderating effect between government pressure (gop) and carbon disclosure quality. In private companies, the correlation between government pressure and carbon disclosure is weaker. The regression coefficient of media pressure * ownership property (meppr), which is the interaction term, is 0.0000934 and is significantly positively correlated at the 1% level. The coefficient of media pressure (mep) is 0.0000877, which is greater than 0. The coefficient of media pressure * ownership property (meppr) is 0.000609, but the significance is not verified. It means that the ownership property has no moderating effect between media pressure (mep) and carbon disclosure quality. The regression coefficient of public pressure * ownership property (pupr) as an interaction term is 0.0518, which is significantly positively correlated at the 10% level. The coefficient of public pressure (pup) is 0.160, which is greater than 0. The coefficient of public pressure * ownership property (puppr) is 0.0518, which is greater than 0, indicating that ownership property has a positive moderating effect between public pressure (pup) and carbon disclosure quality.

Table 2: Variable measurement results

VARIABLES	(1)	(2)
	Financial Factors	External Pressure Factors
	PR	PR
gop	0.187*** (0.0385)	0.573*** (0.123)
mep	-0.00205 (0.00207)	-0.00746 (0.00583)
pup	0.0624* (0.0349)	0.160*** (0.0522)
siz	0.108*** (0.0154)	0.0941*** (0.00619)
lev	0.0152 (0.0418)	-0.0388 (0.0276)
roa	0.0654 (0.0546)	-0.0293 (0.0628)
gro	-0.0263* (0.0137)	-0.0271* (0.0154)
pr		0.0469 (0.0341)
subpr		
grcpr		
goppr		-0.255*** (0.0731)
meppr		0.000609 (0.00407)
puppr		0.0518* (0.0314)
Constant	-2.235*** (0.319)	-1.886*** (0.142)
R-squared	0.210	0.226

5. Conclusion

From the theoretical and empirical findings of this article, firstly, there is a significant positive relationship between government pressure and corporate carbon information disclosure, i.e., the stronger the government regulation, the higher the level of carbon information disclosure of listed companies. In the socialist market economy with Chinese characteristics, the influence of the "visible hand" of the government on enterprises and other subjects cannot be ignored, and government regulation makes enterprises improve the quality of their carbon information disclosure in order to achieve the purpose of

legality. At the same time, given the property rights of the ecological environment belong to the state and the collective, and the externalities of the greenhouse effect, carbon information disclosure is bound to be influenced by government pressure. Secondly, as a bridge between enterprises and stakeholders, the media is not only a carrier of information disclosure, but also a "social instrument" to monitor the production and operation of enterprises, which will certainly have an impact on the quality of carbon information disclosure. However, in this paper, media pressure does not have a significant impact on the level of carbon information disclosure, which is inconsistent with the hypothesis of the previous study, probably because China is currently in the transition period of economic development, and the media's monitoring role is often interfered with, and the freedom of media reporting is restricted. In addition, public pressure is significantly and positively correlated with corporate carbon information disclosure, indicating that as the public's awareness of "low carbon and environmental protection" increases, their purchasing preferences change, and companies perceive more and more low carbon demands and pressure from the public, in order to establish their own "low carbon and environmental protection" image and attract and retain their customers. In order to establish their "low carbon" image and attract and retain more public consumers, companies are more active in disclosing carbon information. The ownership property has a negative moderating effect between government pressure (gop) and carbon information disclosure quality. It indicates that the correlation between government pressure and carbon information disclosure is stronger in state-owned enterprises. The ownership property has a positive moderating effect between public pressure (pup) and carbon information disclosure quality. It indicates that the correlation between public pressure and carbon information disclosure is stronger in private companies.

The results of this study provide new insights for stakeholders. As the "visible hand" in the socialist market economy, the government should play a good role in supervision and management, and increase the strength of supervision to make up for the shortcomings of the market in the process of economic development. To build a dynamic supervision mechanism with multi-departmental coordination and all-round control, government supervision can effectively improve the carbon information disclosure level of enterprises. The media should strengthen publicity and supervision, and play the driving role of public opinion on corporate carbon information disclosure. The media is not only the propagator of company image, but also the exposé of company scandals, and the initiator of capital market changes. By releasing information and making comments, the media can influence the capital market, thus restraining managers' behavior and prompting them to make environmental and social responsibility information disclosure. In addition, we should actively guide the public's low-carbon consumption concept and play the role of public consumers to drive corporate carbon information disclosure. As the public's awareness of "low carbon and environmental protection" increases, their purchasing preferences change and companies perceive more and more requests and pressure from public consumers to disclose carbon information in order to establish their own "low carbon and environmental protection" image. Therefore, in order to promote companies to actively disclose carbon information, it is necessary to increase the guidance of the public's low carbon consumption concept. By encouraging the public to purchase low-carbon energy-saving products, and by advocating a simple and moderate, energy-saving and environment-friendly, green and low-carbon lifestyle and consumption concept, energy-saving and low-carbon actions will become a norm for the public and become a trend in the whole society.

References

- [1] He R., Luo L., Shamsuddin A., & Tang Q. L. (2022). *Corporate carbon accounting: a literature review of carbon accounting research from the Kyoto Protocol to the Paris Agreement. Accounting and Finance, 62(1), 261-298.*
- [2] Luo X. Y., Zhang R. M., & Liu W. (2022). *Environmental legitimacy pressure, political connection and impression management of carbon information disclosure. Carbon Management, 13(1), 90-104.*