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Does ownership concentration affect corporate environmental responsibility engagement? The mediating role of corporate leverage

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Does Ownership Concentration Affect Engagement in Corporate Environmental Responsibility? The Mediating Role of Corporate Leverage

Abstract: This paper examines the effect of ownership concentration on engagement in corporate environmental responsibility (CER) in time and spatial dimensions. The time dimension focuses on the macroeconomic environment, in particular, periods of rapid and moderate-speed economic growth. The spatial dimension focuses on industry characteristics and different types of ownership (state or private). Further, it explores the mediating role of corporate leverage using panel regression models and stepwise regression with a sample of Chinese A-share listed companies over the period 2008-2016. The results show that ownership concentration has a significantly negative effect on CER. In addition, when we consider the macroeconomic growth rate, ownership type, and industry characteristics, the effect is heterogeneous. In periods with rapid economic growth, ownership concentration has a significantly negative effect on CER whereas it is not significant in a period with moderate economic growth. Further, the negative effect exists at state-owned and non-state-owned companies and at non-heavy-polluting industries. Corporate leverage has a partial mediating effect between ownership concentration and engagement in CER.

Keywords: Corporate leverage; engagement in corporate environmental responsibility; heterogeneous effect; ownership concentration
JEL Classifications: G31, G38, M14.

1. Introduction

The issue of corporate environmental responsibility (CER) has been widely discussed recently and has received a great deal of attention from governments, shareholders, and the public. Both academic researchers and business managers have acknowledged the significance of CER activities (Broadstock et al., 2019; Chen et al., 2019; Li et al., 2020; Liu et al., 2016; Peng et al., 2018; Su et al., 2020; Tapver, 2019; Trumpp and Guenther, 2017; Zhang, 2017). With the rapid development of the economy, enterprises tend to invest their capital in finance (Xu et al., 2020), so investment in the environment is easily crowded out. Although financial development can promote economic growth (Tripathy, 2019), this positive effect is not always produced (Matei, 2020). In particular, financial cycle spillover is subject to economic policy uncertainty, bilateral trade intensity, and capital flows (Liu et al., 2019). In evaluating the quality of economic development, environmental factors should be taken into account (Li and Li, 2020). Further, pressure from stakeholders has gradually driven companies into taking environmentally responsible actions. CER

comprises corporate practices related to managing and using natural resources, production activities, disposing of waste, environmentally friendly products, recycling, and pollution prevention and control (Perrini, 2007). In other words, CER refers to the way in which companies undertake their responsibility to minimize and manage the negative impact of their operations and activities on the environment (Dummett, 2006; Li et al., 2020; Peng et al., 2018; Trumpp and Guenther, 2017). Indeed, companies have crucial roles to play in environmental protection by undertaking environmental responsibility. Academics explain the connotation of CER from various perspectives, such as ethical perspective (Onkila, 2009), stakeholders (Bansal and Roth, 2000), strategic management (Meng et al., 2019; Schaltegger and Wagner, 2011; Su et al., 2020), environmental behavior (Lyon and Maxwell, 2008), financial performance (Dal Maso et al., 2018; Dang et al., 2019). These scholars argue that environmentally friendly products and using resources sustainably can reduce pollutants and improve the environment, which leads to sustainable development. CER engagement can coordinate the interests of stakeholders and improve companies' reputation as well as increase growth opportunities. It can also increase corporate green innovation (Hong et al., 2020) and reduce corporate risk (Li et al., 2017) and the cost of debt (Tseng et al., 2020; Xie et al., 2019) in the process of sustainable development through effective resource management.

Ownership concentration is an important factor that influences companies in taking environmental responsibility. The goal of CER is to maximize the value of stakeholders, who are committed to achieving corporate sustainable development. In recent years, an increasing number of companies are taking the initiative to engage in CER. According to stakeholder theory, CER can build a good reputation among stakeholders, which not only increases firm value but also is a competitive advantage in the market (Chen et al., 2019; Dal Maso et al., 2018; Li et al., 2019). At the same time, sustainable development prevents companies from falling into crisis because of environmental responsibility issues and reduces the potential costs of environmental penalties (Henri et al., 2016). However, at listed Chinese companies a small number of shareholders hold most of the shares. According to agency theory, increasing ownership concentration can enhance the supervisory role of major shareholders in enterprise management (Burkart et al., 1997), which effectively limits managers' decisions and mitigates inefficient behavior within enterprises. However, concentration in equity is likely to trigger agency conflicts between major sharehlders and minor shareholders. Large shareholders have greater control over the company, and their predatory motivations are enhanced (Shleifer and Vishny, 1997). Large shareholders will make use of the control right to realize their own interests at the expense of the interests of minority shareholders. To maximize their own wealth, largest shareholders might think that CER is not conducive to corporate development because it increases firm costs and reduces firm profitability (Darnall and Edwards, 2006). If companies spend a large amount of funds on taking more environmental responsibility, it might reduce their investment in core resources. Therefore, companies often spend as little as possible in meeting relevant CER requirements (Elmagrhi et al., 2019; Trumpp and Guenther, 2017). Thus ownership concentration

affects firm decisions about engaging in CER.

A body of literature focuses on the influence of ownership structure on corporate social responsibility (Dam and Scholtens, 2013; Harjoto and Jo, 2011; Li and Zhang, 2010), corporate social responsibility disclosure (Roberts, 1992; Tapver, 2019), and corporate social performance (Johnson and Greening, 1999). Li and Zhang (2010) use the CSR ranking of Chinese firms and find that, at non-state-owned enterprises, decentralization of corporate ownership is positively correlated with CSR. At state-owned enterprises, however, the relationship is reversed, because of political interference. Harjoto and Jo (2011) also find that, at US firms, CSR is positively related to governance characteristics such as board independence, institutional ownership, and analyst following. In addition, the research focuses on the relationship between mutual funds and CSR and finds that CSR friendly mutual funds improve CSR (Li et al., 2020). Some papers also indicate that there should be a close relationship between ownership concentration and CER (Abeysekera and Fernando, 2020; Erhemjamts and Huang, 2019; Walls et al., 2012), however, the relationship between them is controversial. Some authors believe that ownership concentration has a positive effect on CER. Liu et al. (2019) find that, at Chinese manufacturing enterprises, the ownership structure can improve environmental performance, due to the regulatory effect of financial performance. Other authors believe that ownership concentration is negatively correlated with CER. According to Calza et al. (2016), ownership structure matters in firms' environmental proactivity, and ownership concentration seems to be negatively related to having a proactive environmental strategy. A dispersion of ownership leads to an increase in the sensitivity of managers to environmental and social issues (Cox, Brammer, and Millington, 2004). Kuasirikun (2004) suggests that, even though large shareholders care about the environment, they do not always take into account their environmental responsibility. Therefore, companies with concentrated ownership pay less attention to environmental issues.

Many papers analyze corporate social responsibility from the perspective of corporate management. Because CER is a single dimension of corporate social responsibility, ownership concentration may have different effects on CER than on CSR. Because owners may have different objectives and decision-making horizons, it is worthwhile to study the relationship between ownership concentration and CER. To the best of our knowledge, in most cases corporate ownership is used as a moderating or mediating variable (Li et al., 2013; Meng et al., 2013), and no previous research focuses on ownership concentration at Chinese firms and CER engagement, particularly considering macroeconomic growth, ownership type, and industry characteristics. Moreover, there is a lack of existing research on the measurement of engagement in CER. Most studies have only established an analytical framework of CER at a theoretical level or rely on the evaluation of one case. This leads us to expect that ownership concentration might affect firms' environmental policies. So, this paper raises the following questions. How does ownership concentration affect corporate decisions related to environmental responsibilities? Is the effect of ownership concentration on CER engagement heterogeneous when the time and spatial dimensions of this relationship are considered? Finally, does the leverage ratio

have a mediating role in the relationship between ownership concentration and CER engagement?

This paper uses a sample of 4,968 observations from China A-share listed companies to create a comprehensive measurement of CER engagement as well as exploring the impact of ownership concentration on CER engagement.

This paper makes four main contributions to the literature. First, we offer unique evidence on the relationship between ownership concentration and CER engagement that suggests a negative relationship between concentrated ownership and CER engagement. Second, to the best of our knowledge, this is the first study to highlight the heterogeneous effect of ownership concentration on CER engagement that considers the macroeconomic environment. Third, we explore the heterogeneity of the effect of ownership concentration and CER engagement by considering the spatial dimension, mainly focusing on different types of ownership and industry characteristics. Fourth, we examine the mediating role of the leverage ratio on the relationship between ownership concentration and CER engagement.

The structure of this paper is as follows. Following this introduction, in Section 2 we construct the model and the measurement of CER engagement and list the descriptive statistics; in addition, to confirm our results, we conduct robustness tests on the effect of ownership concentration on CER engagement. Section 3 shows the heterogeneous effect of ownership concentration on CER engagement, in which heterogeneity is addressed in three settings (macroeconomic environment, type of firm ownership, and industry characteristics). Section 4 shows the mediating role of the corporate leverage ratio on the relationship between ownership concentration and CER engagement. In Section 5, we conclude the paper and provide policy implications.

2. Ownership Concentration and CER Engagement

2.1 Panel Regression Model

This paper argues that the effect of ownership concentration on CER engagement shows heterogeneity across companies and periods. In terms of the spatial dimension, companies have different internal characteristics, which lead them to have different levels of engagement in CER and result in heterogeneous effects of ownership concentration on CER. Companies have their own principal-agent problems. The supervisory and tunneling behaviors by large shareholders in corporate governance are heterogeneous across companies, which also implies heterogeneous environmental investment. Companies usually have diverse strategic targets in the process of daily operations and management, depending on their stage of development and financial conditions. For instance, at the early stage, corporate development requires capital and large shareholders to pay more attention to financial variables. At the stage of maturity, the brand effect is more favorable to corporate development and large shareholders

desire a better corporate image. Further, in terms of the time dimension, depending on macroeconomic development as well as economic policies and laws, the government puts forward different requirements for corporate development, which will influence management decisions and corporate development programs. In this paper, we explore the effect of ownership concentration on CER engagement in both the spatial and time dimension using a panel regression model as follows:

$$CER_{it}=\beta_0+\beta_1 OCI_{it}+\beta_2 SIZE_{it}+\beta_3 LEV_{it}+\beta_4 FP_{it}+industry+year+\varepsilon_{it}, \quad (1)$$

where i represents a firm, and t represents the year. CER is the explained variable. OCI is the explanatory variable representing ownership concentration. We also include some control variables: firm size (*SIZE*), leverage (*LEV*), and financial performance (*FP*). In addition, to mitigate the impact of firm heterogeneity and period characteristics on corporate R&D and innovation activities, we consider industry effects (*industry*) and year effects (*year*).

2.2 Variable Measurement

2.2.1 Dependent Variable: CER Engagement

This paper measures CER engagement comprehensively with five dimensions: legal consciousness, social evaluation, ecofriendly production, low-carbon technology, and green management (Kim et al., 2017; Kolk, 2016; Li et al., 2020; Phiri et al., 2019). We use the dimension on legal consciousness to examine whether companies have violated relevant laws and regulations. The social evaluation dimension is used to examine whether companies' environmental behaviors receive public praise and recognition. The ecofriendly production dimension identifies the production modes adopted by companies. The low-carbon technology dimension examines whether companies have achieved low-carbon technology while the green management dimension explores whether environmental factors are considered in daily operations and management. Table 1 summarizes the specific dimensions, which focus on whether companies meet certain conditions. Thus, each indicator takes a value of 1 if the answer is yes, and 0 otherwise. Further, to ensure that all indicators are in a consistent direction, companies that have received environmental penalties take a value of 0, and 1, otherwise. To ensure the objectivity of the results, all indicators have the same weight. Then we calculate the values for dimensions to obtain the CER engagement score. The CER engagement score for a specific firm is calculated as follows:

$$CER_{it}=\sum_{k=1}^{5} I_{itk}, \quad (2)$$

where I_{itk} represents the indicator for firm i, year t, and dimension k. CER_{it} is the final value of CER for firm i and year t.

Table 1. Measuring CER engagement

Dimensions	Indicator name
I_1: Legal consciousness	1. Whether it follow the guide for sustainable development reporting from the Global Reporting Initiative (GRI) 2. Whether it discloses environmental and sustainable development 3. Whether it is subject to environmental penalties
I_2: Social evaluation	1. Whether it received any environmental awards 2. Whether it has other environmental advantages
I_3: Ecofriendly production	1. Whether it adopts a circular economy 2. Whether it engages in green production (measurement to decrease three wastes)
I_4: Low-carbon technology	1. Whether it saves energy 2. Whether it generates environmentally friendly products
I_5: Green management	1. Whether it has been verified by a third party 2. Whether its vision is related to environmental responsibility 3. Whether it has an ISO 14001 certification 4. Whether it uses green offices

2.2.2 Explanatory and Control Variables

Ownership concentration is usually measured by the ratio of the largest shareholders or the cumulative shareholding ratios of the top largest shareholders (top three, top five, or top ten, etc.). Accordingly, this paper uses the shareholding ratio of the largest shareholder (*OCI*) as a measurement of ownership concentration. In addition, we use the sum of the top five largest shareholders as an alternative measurement for a robustness check.

According to existing empirical results, company size is an important factor that influences CER engagement (Chen et al., 2020). Large companies have greater ability to perform corporate governance than small companies. Their business activities are relatively stable because of their abundant capital and human resources. Thus, large companies can engage in more CER (Meng et al., 2016; Ortas et al., 2015). They are inclined to take CER and disclose environmental information. The leverage ratio is a primary variable for measuring corporate solvency and debt risk. Companies with a higher leverage ratio usually have more risk. Further, companies with a high leverage ratio usually weaken their performance of environmental responsibility as they view CER performance as a financial burden (Meng et al., 2016).

Financial performance can be considered an economic condition for companies to engage in environmental responsibilities. Thus, low financial performance may reduce the companies' attention to environmental issues. Companies with good financial performance are more likely to engage more in environmental responsibilities (Chen and Hamilton, 2020; Ortas et al., 2015). Based on the relevant literature, we select three control variables: company size (*SIZE*), measured by the logarithm of total assets; leverage ratio (*LEV*), measured by the ratio between debt and assets; and financial performance (*FP*), measured by the rate of return on total

assets.

Table 2. Descriptive statistics

	Variable	Mean	Std. Dev.	Min.	Max.
Full sample	*CER*	4.8428	2.5963	1	12
(*N* = 4,968)	*OCI*	0.3895	0.1608	0.0894	0.7802
	OC5	0.5396	0.1664	0.1851	0.9196
	SIZE	9.9123	0.6235	8.6089	11.6225
	LEV	0.5140	0.1949	0.0795	0.9284
	FP	0.0471	0.0566	-0.1421	0.2342
T1 (*N* =	*CER*	4.3457	2.5771	1	12
3,312)	*OCI*	0.3958	0.1623	0.0923	0.7894
	SIZE	9.8158	0.6175	8.5317	11.5033
	LEV	0.5160	0.1921	0.0840	0.9458
	FP	0.0527	0.0586	-0.1358	0.2437
T0 (*N* =	*CER*	5.8370	2.3366	1	12
1,656)	*OCI*	0.3768	0.1568	0.0879	0.7482
	SIZE	10.1041	0.5931	8.9177	11.7713
	LEV	0.5100	0.2007	0.0711	0.8978
	FP	0.0358	0.0502	-0.1503	0.1805
SOE (*N* =	*CER*	5.0273	2.6048	1	12
3,444)	*OCI*	0.4191	0.1550	0.1072	0.7668
	SIZE	10.0209	0.6322	8.7657	11.7381
	LEV	0.5282	0.1923	0.0862	0.9269
	FP	0.0409	0.0537	-0.1522	0.2038
NSOE (*N* =	*CER*	4.4259	2.5284	1	12
1,524)	*OCI*	0.3222	0.1525	0.0745	0.7802
	SIZE	9.6682	0.5396	8.3676	11.0491
	LEV	0.4819	0.1973	0.0660	0.9416
	FP	0.0613	0.0607	-0.0912	0.2814
IND0 (*N* =	*CER*	4.6347	2.6121	1	12
3,258)	*OCI*	0.3785	0.1574	0.0923	0.7430
	SIZE	9.8784	0.6172	8.5574	11.5632
	LEV	0.5185	0.1954	0.0879	0.9306
	FP	0.0480	0.0531	-0.1294	0.2319
IND1 (*N* =	*CER*	5.2392	2.5193	1	12
1,710)	*OCI*	0.4107	0.1663	0.0807	0.8374
	SIZE	9.9788	0.6367	8.7673	11.8764
	LEV	0.5051	0.1943	0.0540	0.9248
	FP	0.0452	0.0629	-0.1662	0.2381

Notes: T1 is a subsample for periods with a high economic growth rate while T0 is a subsample for periods with moderate economic growth rate. SOE = state-owned enterprises; NSOE = non-state-owned enterprises. IND0 is a subsample for heavily polluting industries; IND1 is a subsample in non–heavily polluting industries.

2.2.3 Data and Descriptive Statistics

This paper uses a sample consisting of China's A-share listed companies from 2008 to 2016. The final sample for analysis consists of 522 companies with 4,968 firm-year observations. We exclude financial companies and companies for which necessary data is missing for the variables used in our analysis. Financial data is collected from the China Stock Market & Accounting Research (CSMAR) database. CER data come from both CSMAR and the China National Research Data Service (CNRDS) platform. After all the sample data are obtained, we winsorize all the continuous variables to eliminate the effect of any extreme values at the 1 percent level.

Table 2 shows descriptive statistics for all the variables. The minimum value of *CER* is 1 and the maximum is 12. The mean of *CER* is 4.8428, which suggests that the overall CER level is medium. The minimum ratio of the largest shareholder is 0.0894, and the maximum is 0.7802. The mean of the largest shareholder ratio is 0.3895, the minimum of the first five shareholders is 0.1851, and the maximum is 0.9196, with a mean of 0.5396. This shows the significant heterogeneity of ownership concentration at listed nonfinancial companies. Moreover, we also report descriptive statistics for six groups of subsamples—T1, T0, SOE, NSOE, IND0, and IND1, in which T1 and T0 are divided according to the macroeconomic growth rate, SOE and NSOE are divided according to corporate ownership, and IND0 and IND1 are divided according to their industry characteristics.

Table 2 shows that the minimum and maximum of *CER* is the same in all subsamples, where the minimum is 1 and the maximum is 12. The differences between the minimum and maximum in ownership concentration are almost the same in the subsamples. However, both the minimum and maximum values of ownership concentration show significant heterogeneity in the subsamples. The mean of *CER* is lower in the period with high economic growth than in the period with moderate economic growth, whereas ownership concentration is a little higher in the period of high-speed economic growth than in the period of moderate economic growth. Both means of *CER* and ownership concentration are higher at SOEs than at non-SOEs. Also, the means of *CER* and ownership concentration are both higher in heavily polluting industries than at non–heavily polluting industries.

2.3 Empirical Results

To explore the effect of ownership concentration on CER engagement, we used OLS to estimate the model parameters. CER is influenced by many factors, and variables might be omitted in this paper. In addition, a reverse causal relationship might exist between ownership concentration and CER, as enterprises can enhance their value and reputation through engaging in CER, which might attract some owners and affect their ownership concentration. Both omitted variables and inverse causality

of variables lead to endogeneity in the model. To mitigate the endogeneity in the model, we use a panel model with fixed effects as a robustness test. At the same time, we use a first-order lagged term for ownership concentration as an instrumental variable. Then, we use two-stage least squares (2SLS) estimation and the generalized method of moments (GMM) to estimate the parameters and to reduce endogeneity problems. In addition, we use the top five shareholders as an alternative proxy for ownership concentration. The results are shown in Table 3.

Table 3 shows that the coefficient of ownership concentration in model (1) is -0.754 ($p < 0.01$). The sum of the shareholding ratio of the top five shareholders is used as a measurement of ownership concentration in model (2). Model (3) uses a panel regression model with fixed effects. Model (4) uses the 2SLS method while model (5) uses GMM. The signs of the parameter estimates are all consistent with those in model (1), but with a small difference in absolute values and significance levels. This shows the robustness of the parameter estimate. The empirical results show that all the regression coefficients of ownership concentration exceed the significance level of 5 percent, regardless of the explanatory variable or the alternative estimate method. The effect of ownership concentration on CER is negative, which suggests that large shareholders do not pay sufficient attention to CER engagement. High ownership concentration impedes CER engagement.

As China is an emerging market, stocks are mostly held by minority shareholders. The conflict between large shareholders and small shareholders dominates the main agency problem. To maximize their interests, large shareholders often ignore the rights and interests of other stakeholders. Moreover, minority shareholders in China generally have a free-rider mentality, which weakens their oversight of large shareholders and corporate executives. China began to require listed companies to disclose social responsibility information in 2008, but it has not yet formed a mature regulatory system and a good evaluation system. Because of concentrated ownership, the supervisory role of major shareholders on enterprise managers is enhanced (Claessens et al., 2000). However, because of the weak awareness of environmental protection among major shareholders and their encroachment on the interests of minority shareholders, shareholders are often unwilling to invest their funds in environmental protection. Corporate governance is affected by product market competition (Giroud and Mueller, 2011), and product market competition also affects shareholder decisions about fulfilling enterprises' environmental responsibility (Meng et al., 2016). The competitive environment often reduces the cash flow of enterprises, so that enterprises have a negative profit outlook. What is more, some enterprises are affected by excess competition, so they face default risk. With limited resources and maximization of shareholders' wealth, major shareholders choose production and operations that can bring direct benefits, while ignoring their fulfillment of environmental responsibilities. With regard to the control variables, all the coefficients of company size are significantly positive, which confirms that large companies are inclined to undertake CER. The coefficients of firm leverage ratios are significantly negative, at a significance level of 1 percent, suggesting that the leverage ratio restrains CER engagement.

3. Heterogeneous Effect of Ownership Concentration on CER

3.1 Ownership Nature, Industry Characteristics, and Macroeconomic Environment

Although we have found that ownership concentration has a significantly negative effect on CER engagement, we cannot ignore the heterogeneous effects when considering different companies and different macroeconomic environments. The macroeconomic environment, industry characteristics, and corporate ownership are important factors that influence CER engagement. First, in China's capital market, the percentage of large shareholders is usually high. Large shareholders achieve their profits through tunneling behaviors. From the microperspective of China's new normal economy, companies are required to optimize their ownership structure and address the imbalance from excessive ownership concentration and then formulate rational corporate governance structures and support the transformation of economic development. In addition, for political and economic reasons, local governments often take action on environmental protection but pursue GDP unilaterally (Du, 2015), which results in severe environmental problems. In its new normal economy, China has played an important role in reducing pollution through economic restructuring and economic slowdown (Zheng et al., 2019). The economic deceleration means paying more attention to the quality of economic development and requiring companies that are heavily polluting to transform and upgrade. Unlike in high-speed development, after economic deceleration, decreased industrial production reduces pollutant emissions and improves environmental quality. This provides the external conditions for companies to engage in CER. Furthermore, the new normal economy requires companies to strengthen their awareness of environmental protection, which also drives companies to undertake their environmental responsibilities. Second, companies' attention to CER is heterogeneous when the characteristics of different types of companies or industry are considered (Zeng et al., 2012). Corporate production and operations in different industries show significant differences in how they affect the environment, which leads to different stakeholder expectations and different levels of media attention. Thus, the effect of ownership concentration on CER engagement may be influenced by industry characteristics. Production by heavily polluting companies is considered a serious problem that affects the environment. Companies are required to deal with the pollutants created by production. Otherwise, any environmental problem will have a negative impact on their reputation, stock prices, company value, and so forth. Further, non–heavily polluting companies are subject to tighter regulations by the government, which can force them to engage in CER and disclose information on environmental responsibility. At the same time, investors and financial institutions are paying greater attention to CER performed by heavily polluting companies when they are assessing corporate risk and the firms' capacity for sustainable development. Thus, heavily polluting companies are more willing to perform their environmental responsibilities and disclose information on CER.

The type of ownership is also an important factor that influences CER engagement. The dominant stockholder at SOEs is the government. This particularity means that SOEs have to pay more attention to environmental responsibility (Zeng et al., 2012). SOEs are charged with maximizing the public interest when pursuing their economic interests. The government requires SOEs to actively undertake environmental responsibilities in order to offer good models and spread positive effects. In addition, SOEs can take advantage of bank loans and that means they face fewer financing constraints. They can also take advantage of adequate capital and human resources, which enable them to perform their environmental responsibilities well. However, non-SOEs are more sensitive to the cost of meeting their environmental responsibilities as they face more financing constraints. Accordingly, the effect of ownership concentration on CER engagement is heterogeneous when different types of corporate ownership are considered.

Table 3. Regression results for ownership concentration and CER

Variable	(1) OLS	(2) OLS	(3) FE	(4) 2SLS	(5) GMM
OCI	-0.754***		-0.903***	-0.763***	-0.763***
	(0.208)		(0.204)	(0.230)	(0.230)
OC5		-0.648***			
		(0.209)			
SIZE	1.734***	1.741***	1.759***	1.838***	1.838***
	(0.0623)	(0.0638)	(0.0609)	(0.0653)	(0.0653)
LEV	-1.105***	-1.093***	-1.579***	-1.290***	-1.290***
	(0.211)	(0.210)	(0.201)	(0.222)	(0.222)
FP	-0.294	-0.174	-0.834	-1.211*	-1.211*
	(0.614)	(0.615)	(0.547)	(0.653)	(0.653)
Constant	-13.11***	-13.17***		-11.86***	-11.86***
	(0.566)	(0.569)		(0.626)	(0.626)
individual			Yes		
industry	Yes	Yes		Yes	Yes
year	Yes	Yes	Yes	Yes	Yes
Observations	4,968	4,968	4,968	4,416	4,416
R-squared	0.315	0.314		0.291	0.291
Number of d	552	552	552	552	552
F-statistic	101.24	100.64			

Note: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

3.2 Empirical Results

Based on the theoretical analysis above, we divide the sample according to the macroeconomic growth rate, industry characteristics, and type of corporate ownership. We regard the new normal in the Chinese economy as an exogenous event and consider 2008-2013 a period of rapid economic growth and 2014-2016 a period of moderate economic growth. With respect to industry characteristics, the sample is divided into two groups: heavily polluting industries and non–heavily polluting industries. According to the guidelines on industry classification for listed companies revised by the China Securities Regulatory Commission in 2012, heavily polluting industries comprise 16 categories, and non–heavily polluting industries comprise the remainder. As to the type of corporate ownership, the sample is divided into two groups: SOEs and non-SOEs.

Table 4. Regression results on the macroeconomic environment

Variable	(1) Rapid economic growth	(2) Moderate economic growth
OCI	-1.009***	-0.228
	(0.253)	(0.366)
SIZE	1.806***	1.542***
	(0.0761)	(0.109)
LEV	-1.349***	-0.512
	(0.261)	(0.363)
FP	-0.00524	-0.938
	(0.734)	(1.136)
Constant	-13.85***	-9.023***
	(0.695)	(1.017)
industry	Yes	Yes
year	Yes	Yes
Observations	3,312	1,656
R-squared	0.296	0.186
F-statistic	80.72	21.60

Note: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4 shows the results of parameter estimates for rapid and moderate rates of economic growth. The effect of ownership concentration on CER engagement is heterogeneous for economic growth rates. In rapid economic growth, the coefficient of ownership concentration is -1.009 with a significance level of 1 percent. In moderate economic growth, the coefficient of ownership concentration is -0.228, but it is not significant. In periods of rapid economic growth, economic activities have frequently caused great environmental damage. Meanwhile, CER engagement in China is still in its early stages. The system of oversight and relevant laws are not

mature. Considering the high cost of environmental protection and the fact that corporate performance through undertaking CER cannot be enhanced quickly, companies usually ignore their CER when pursuing economic interests. Ownership concentration significantly restrains CER engagement in periods of rapid economic growth. However, no evidence has been found on the effect of ownership concentration on CER engagement in periods of moderate economic growth.

Table 4 also shows that economic growth makes a difference in the effect of ownership concentration on CER engagement. Accordingly, we add it to the regression for the subsamples distinguished by their type of ownership and industry characteristics.

Further, Table 5 reports the parameter estimates of the effect of ownership concentration on CER engagement for different types of ownership and different industry types. The results show that the coefficient of ownership concentration is not significant in periods of moderate economic growth. However, with respect to the effect of ownership concentration on CER engagement in periods of rapid economic growth when the type of ownership is considered, the coefficient of ownership concentration at SOEs and non-SOEs are –0.951 and –1.135, respectively, which are both significant at 5 percent. Ownership concentration restrains CER engagement at non-SOEs more than at SOEs, although ownership concentration is higher at SOEs than at non-SOEs. Thus, SOEs are not only economic entities but also political entities. This requires SOEs to coordinate the public interest, environmental interests, and economic interest, rather than only maximizing profit. Thus, SOEs usually pay sufficient attention to and actively undertake their environmental responsibilities. Further, when considering the type of industry, the coefficients of ownership concentration in heavily polluting industries are –0.581 and –1.330, respectively, but not significant; however, it is significant in non–heavily polluting industries with rapid economic growth. Production by non–heavily polluting industries does less damage to the environment than production by heavily polluting industries, resulting in weaker oversight. In general, CER engagement depends on corporate initiative. However, because of the high ownership concentration and tunneling behaviors by large shareholders, companies are unwilling to undertake more CER while they are pursuing their economic interests. Thus, ownership concentration significantly restrains CER engagement by non–heavily polluting industries.

4. The Mediating Effect between Ownership Concentration and CER Engagement

4.1 Mediating Effects Model

The relationship between ownership concentration and CER may be influenced by the corporate leverage ratio. On the one hand, the corporate capital structure is

determined by the controlling power of shareholders (Schmid, 2013). Large shareholders usually prefer debt financing, rather than equity financing, in order to protect their controlling power and maintain oversight of corporate governance. In addition, corporate development and capital accumulation benefit from management of debt from external financing sources. Therefore, with high ownership concentration, large shareholders can abuse debt capital in their own interest, increasing the corporate leverage ratio. At the same time, the leverage ratio is an important indicator in measuring the ability to repay debt and the corporate debt risk. A high leverage ratio presents a high corporate risk and might expose firms to high bankruptcy costs. In addition, an excessive asset-liability ratio greatly reduces the external credit evaluation for those companies, which may cause financial distress. Shareholders with higher controlling power might be inclined to reduce corporate liabilities and corporate risk and avoid creditor checks (Lee and Kuo, 2014).

Thus, a high ownership concentration means a low leverage ratio. In addition, Lo et al. (2016) confirm a U-shaped relationship between ownership concentration and the leverage ratio. More concretely, if ownership concentration is low, shareholders can strengthen their controlling power through corporate liabilities. The corporate leverage ratio increases with increases in ownership concentration. After ownership concentration reaches its maximum, bankruptcy risk exceeds the return on leverage, and shareholders avoid financial distress and bankruptcy risk by reducing corporate liabilities. Conversely, the leverage ratio decreases with an increase in ownership concentration.

The leverage ratio is also an important factor in influencing CER engagement. On the one hand, according to contract theory, companies are accountable not only to shareholders but also to creditors. Companies are inclined to undertake more environmental responsibilities if they are accompanied by a high debt ratio, in order to justify the legitimacy of their operations to creditors. Meanwhile, creditors are increasingly demanding that companies disclose environmental information. Thus companies with higher leverage ratios are inclined to take their environmental responsibilities (Ortas et al., 2015). On the other hand, higher debt ratios mean higher principal and interest payments, which more easily lead to a debt crisis, resulting in earning fluctuation. Thus, a higher corporate debt ratio means a greater earnings fluctuation and higher corporate risk. CER engagement is costly; moreover, the benefits of this engagement cannot be achieved in a short time without uncertainty. Therefore, companies with high leverage ratios perform their minimum environmental responsibilities to avoid adding to their financial burden.

Accordingly, the leverage ratio might play a mediating role between ownership concentration and CER engagement, which we examine with a stepwise regression in this paper. First, we test the total effect of ownership concentration on CER with model (3), which does not include a mediating variable. Second, we identify the effect of ownership concentration on the mediating variable, namely, the leverage ratio, by setting the mediating variable as an explained variable and ownership concentration as an explanatory variable as seen in model (4). Finally, we test the mediating effect

of the leverage ratio between ownership concentration and CER engagement by adding the mediating variable to model (3), written as (1). Models (3) and (4) are as follows:

$$CER_{it}=\theta_0+\theta_1 OCI_{it}+\theta_2 SIZE_{it}+\theta_3 FP_{it}+industry+year+\varepsilon_{it}, \quad (3)$$

$$LEV_{it}=\theta_0+\theta_1 OCI_{it}+\theta_2 SIZE_{it}+\theta_3 FP_{it}+industry+year+\varepsilon_{it}, \quad (4)$$

where i means the company and t means the year. If the coefficient θ_1 is significant, then we examine the mediating effect. If the coefficients θ_1, β_1, and β_2 are all significant, this suggests that the effect is one of partial mediation. If both θ_1 and β_2 are significant but β_1 is not, then the mediating effect is complete. If both θ_1 and β_2 are insignificant, then a mediating effect is absent. If neither θ_1 nor β_2 is significant, then further examination is needed.

Table 5. Heterogeneity in the effects of ownership concentration on CER

	SOE		**Non-SOE**		**Non–heavily polluting industries**		**Heavily polluting industries**	
Variable	**Rapid economic growth**	**Moderate economic growth**	**Rapid economic growth**	**Moderate economic growth**	**Rapid economic growth**	**Moderate economic growth**	**Rapid economic growth**	**Moderate economic growth**
OCI	-0.951***	0.0384	-1.135**	-0.665	-1.330***	-0.653	-0.581	1.318
	(0.319)	(0.446)	(0.477)	(0.758)	(0.307)	(0.468)	(0.459)	(0.609)
SIZE	1.812***	1.467***	1.695***	1.643***	1.806***	1.765***	1.763***	1.056***
	(0.0860)	(0.120)	(0.166)	(0.275)	(0.0973)	(0.147)	(0.121)	(0.158)
LEV	-1.362***	-0.333	-0.456	-0.724	-1.241***	-0.676	-1.704***	0.00216
	(0.321)	(0.416)	(0.418)	(0.735)	(0.319)	(0.502)	(0.450)	(0.509)
FP	0.0870	-0.280	-0.194	-1.470	1.171	-3.021*	-2.389*	1.882
	(0.923)	(1.326)	(1.279)	(2.277)	(0.858)	(1.674)	(1.362)	(1.574)
Constant	-13.71***	-8.823***	-12.80***	-9.819***	-13.83***	-10.83***	-12.92***	-5.367***
	(0.794)	(1.151)	(1.478)	(2.497)	(0.864)	(1.347)	(1.098)	(1.470)
industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,302	1,142	1,010	514	2,172	1,086	1,140	570
R-squared	0.302	0.197	0.288	0.189	0.314	0.217	0.239	0.130
F-statistic	58.55	56.13	30.28	7.70	58.20	17.88	38.71	14.22

4.2 Empirical Results

The macroeconomic growth rate is included in the regression analysis, followed by an examination of the influencing mechanism between ownership concentration and CER engagement. The full sample is divided into two groups: the first group is for the period of rapid economic growth, and the second is for the period of moderate economic growth.

Table 6. Regression results of intermediate effect

	Rapid economic growth		**Moderate economic growth**	
Variable	**CER**	**LEV**	**CER**	**LEV**
OC1	-0.928***	-0.0604***	-0.220	-0.0154
	(0.253)	(0.0166)	(0.366)	(0.0237)
SIZE	1.647***	0.118***	1.463***	0.155***
	(0.0695)	(0.00517)	(0.0955)	(0.00688)
FP	1.771***	-1.316***	-0.0872	-1.661***
	(0.634)	(0.0594)	(1.001)	(0.0835)
Constant	-13.07***	-0.578***	-8.522***	-0.979***
	(0.678)	(0.0535)	(0.952)	(0.0752)
industry	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes
Observations	3,312	3,312	1,656	1,656
R-squared	0.290	0.438	0.185	0.501
F-statistic	81.22	136.76	22.37	132.86

Note: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6 reports the parameter estimates from the stepwise regression model. The coefficient θ_1 is –0.928, at the 1 percent significance level, suggesting that we can further examine the mediating effect. In rapid economic growth, the coefficients are $\theta_1 = -0.0604$, $\beta_1 = -1.009$, and $\beta_2 = -1.349$, all at the 1 percent significance level, suggesting the existence of a partial mediating effect of the leverage ratio between ownership concentration and CER. Table 4 shows a significant relationship between ownership concentration and CER engagement, with the total effect measured as –0.928, which reflects that the structure of concentrated ownership is not conducive to stimulating companies to engage in their environmental responsibilities. The direct effect of ownership concentration on CER is –1.009, which implies that the mediating effect of the leverage ratio is measured as (–0.0604)×(–1.349) = 0.081 or –0.928 – (–1.009) = 0.081. The leverage ratio shows a positive mediating effect between ownership concentration and CER, which reduces the negative effect of ownership concentration on CER. Indeed, shareholders pay great attention to corporate financial indicators. Shareholders' decision behavior depends on the corporate capital structure. The concentrated ownership structure enhances not only

the tunneling motivations of large shareholders but also their supervision over administrators, which helps shareholders to make efficient decisions. Large shareholders are conscious of high-risk levels as companies are subject to high leverage ratios. To avoid creditor checks and a decline in credit ratings, companies undertake their environmental responsibilities to demonstrate the legitimacy of their operations. Thus, the leverage ratio may reduce the inhibiting effect of the concentrated ownership structure on CER engagement. With moderate economic growth, θ_1 is –0.0154 and β_2 is –0.220, and both are insignificant, suggesting the absence of a mediating effect. In summary, the leverage ratio plays a mediating role between ownership concentration and CER engagement in periods of rapid economic growth.

5. Conclusion and Practical Implications

This paper examines the effect of ownership concentration on CER engagement considering the time and spatial dimensions of this relationship. In this investigation, the time dimension mainly focuses on the macroeconomic environment, in particular, periods of rapid and moderate economic growth, and the spatial dimension mainly focuses on looking at different types of ownership and industry characteristics. Further, this paper explores the mediating role of corporate leverage on the relationship between ownership concentration and CER engagement at Chinese A-share listed companies over the period 2008-2016.

The results show that ownership concentration has a significant negative effect on CER engagement for two reasons. First, large shareholders are unwilling to invest more in environmental protection because of their lower environmental awareness and tunneling motivations induced by having a concentrated ownership structure. Second, because of the absence of laws and regulations as well as a lack of proper supervision, CER has no hard constraints. Overall, concentrated ownership is not conducive to CER engagement. Shareholders are inclined to pursue economic interests, rather than balancing economic interests and environmental activities. Further, the effect of ownership concentration on CER engagement is heterogeneous across macroeconomic growth rates, type of ownership, and industry characteristics. Ownership concentration has a significant inhibiting effect on CER engagement during periods of rapid economic growth, but not in periods of moderate economic growth. In periods of rapid economic growth, companies should earn more profit. Large shareholders focus on tunneling behaviors and are more unwilling to assume their environmental responsibility in this period. Thus, concentrated ownership significantly inhibits CER engagement. In periods of moderate economic growth, the strong motivations of large shareholders pursuing their own interests may be weaker. Shareholders at some companies might plan to contribute to environmental protection and sustainable development. Concentrated ownership might not have significant effects on CER engagement in such periods.

Second, the inhibiting effect of ownership concentration on CER engagement exists at both SOEs and non-SOEs but is stronger in non-SOEs. Environmental awareness among shareholders is lower at non-SOEs than at SOEs. At foreign-owned companies in particular, large shareholders care most about their own interests and usually meet lower environmental standards or even evade environmental regulations to reduce their costs. Thus, as large shareholders at non-SOEs, especially at foreign-owned companies, have less environmental awareness, ownership concentration has a more significantly inhibiting effect on CER engagement at non-SOEs than SOEs. Ownership concentration has a significant inhibiting effect on CER engagement in industries that are not heavily polluting. However, we find no evidence on the relationship between ownership concentration and CER engagement at firms in heavily polluting industries, some of which have environmental problems due to severe pollution. This forces their large shareholders to pay more attention to their environmental responsibilities. Thus, the inhibiting effect of ownership concentration on CER engagement is not significant, unlike in non–heavily polluting industries.

The results also show that the corporate leverage ratio has a partial mediating effect on the relationship between ownership concentration and CER engagement. In addition, it is heterogeneous across macroeconomic environments, in particular, rapid and moderate economic growth. A high leverage ratio means high corporate risk. Large shareholders have to demonstrate the legitimacy of their operations by undertaking environmental responsibilities and engaging in more CER. Thus, the leverage ratio weakens the inhibiting effect of ownership concentration on CER engagement. Moreover, the leverage ratio shows a significant partial mediating effect between ownership concentration and CER in periods of rapid economic growth, but not in periods of moderate economic growth.

This paper makes three main contributions. First, this paper provides unique evidence on the relationship between ownership concentration and CER engagement, suggesting that concentrated ownership is negatively related to CER engagement. Second, to the best of our knowledge, this is the first study to highlight the heterogeneous effect of ownership concentration on CER engagement that considers the macroeconomic environment. Third, this paper explores the heterogeneity of the effect of ownership concentration and CER engagement by considering the spatial dimension, mainly looking at different types of ownership and industry characteristics. Fourth, this paper provides unique evidence on the mediating role of the leverage ratio on the relationship between ownership concentration on CER engagement.

The findings in this paper have important policy implications for the government, shareholders, decision makers, suppliers, and creditors. For instance, the government should establish an effective mechanism for balancing the ownership structure to protect the benefits of small investors and weaken the tunneling behaviors of large shareholders. Ownership concentration should be considered a dimension when assessing the environmental effect of foreign direct investment in the future. Companies are encouraged to undertake their environmental responsibilities and then

improve their system of environmental oversight. Further, shareholders should strengthen their environmental awareness and make sustainable decisions through full use of their controlling powers, driving coordination between economic interests and CER engagement and sustainable development. Also, the government should be aware of the fact that rapid economic growth greatly affects the environment. Thus, it should proceed with supply-side reform, develop a high-quality economy, and adapt to the new normal economy. The government could provide enterprises with subsidized green loans to reduce their energy-related emissions and raise environmental quality (Huang et al., 2019; Li et al., 2018). When designing various policies related to CER engagement, policy-makers should consider the heterogeneity in the type of ownership and industry characteristics. In particular, more attention should be given to non–heavily polluting industries and non-SOEs. Suppliers and creditors should raise their awareness of corporate environmental protection and corporate sustainability and require companies to engage in CER and disclose more environmental information. All stakeholders should make an effort to achieve sustainable development.

Our study has some limitations, which present possible starting points for future research. First, this paper measures CER based on the scores of corporate social responsibility in reports disclosed by listed companies. Because the reports are compiled by enterprises themselves, it is doubtful that they reflect their fulfillment of environmental responsibility truthfully. Further research could identify indicators that reflect the level of environmental responsibility fulfilled by enterprises more accurately, so that it can draw better-grounded conclusions. In addition, this paper does not consider the impact of product market competition on shareholders' propensity for fulfilling their environmental responsibility. Future studies could examine the influence of ownership concentration on CER based on different degrees of product market competition.

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