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Corporate Financing Costs from an ESG Multi-dimensional Perspective: An Empirical Examination of Policy Interaction Effects among A-share Listed Companies

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Abstract. This study adopts a research design of applying the two-way fixed effects.model in the market to examine whether ESG dimensions have a different influence on the costs of corporate financing and the mechanism by which the policy is transmitted using non-financial A-share listed companies between 2015 and 2024 as a research sample. It empirically studies the cross-effect of the ESG environmental (E), governance (G) and social (S) variables on the corporate financing costs, alongside the environmental policy, monetary policy and regulatory policy. The findings show that the three ESG dimensions have a substantial negative impact on the financing cost with the strongest effect found in governance. The cross-effect analysis shows that a tight environmental policy increases the influence of the environmental dimension on the costs reduction, accommodative monetary policy increases the positive effect of the governance dimension, and the intensive regulatory influence increases the worth of the social dimension. The three hypotheses are all proven. The results inform the heterogeneous policy channels, on which the ESG can have impact in reducing financing costs and gives firms information to design differentiated ESG strategies.

Keywords: ESG Dimensions, Effects of policy interaction, Cost of corporates financing, Two-way fixed effect model, Listed Companies.

1. Introduction

On a backdrop of global sustainable development and intensive reforms in the Chinese capital markets, the environmental, social and governance (ESG) performance gradually becomes the essential parameter that the stakeholders consider in the assessment of corporate sustainability performance. Being one of the most important indicators representing non-financial corporate performance, the role of ESG as an element influencing corporate financing costs has become a topic of great interest among academia professionals and practitioners. Available studies affirm to a great extent that a high level of ESG performance may assist in decreasing financing resource costs via the channels like alleviating information asymmetry and reducing operational risks [1,2]. Nonetheless, the majority of these researches make use of aggregate scores of ESG as an analytical

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tool, disregarding individual underlying processes by which the environmental, social, and governance aspects have a reflection on corporate behaviour.

Quite on the contrary, the three ESG dimensions have different connotations and influence the corporate financing activities via differentiated routes: the environmental dimension is associated with whether the company adheres to environmental regulations and the severity of green investment; the governance dimension is associated with the advanced level of internal controls and the reduction of agency problems; the social dimension is associated with management of relations with stakeholders and the development of the social reputation. At the same time, the macroeconomic policies necessarily affect the behaviour of corporate financing. Policy contexts can either dilute or enhance the effect of ESG performance but the extant literature tends to disregard whether and how each of the ESG dimensions affects corporate financing costs along certain policy channels.

The present paper is based on the following fundamental research questions: Which of ESG dimension has the strongest impact on corporate financing costs? Do environmental policies enhance the cost effect of the environmental dimension? Is the effect of the governance dimension on the financing costs moderated by the monetary policy? Are the regulatory policies good in increasing the value of social aspect in funding activities? The contributions of the research are three-fold, first, it breaks the composite ESG score to analyze the most various effects of the three dimensions since the existing research presupposes that overall scores are more significant than individual dimensions. Second, it proposes policy interaction terms to explain policy transmission channels under which ESG is used to determine financing costs which enhances the research framework of ESG-macro policy synergies. Third, it develops an analytic framework that draws both ESG performance-policy environment and corporate financing behavior relationships to provide specific information needed in strategic development of corporate ESG strategies and the optimization of policy.

2. Literature review

2.1. ESG and corporate financing costs

Ample empirical evidence is that there is a negative relationship between the performance of ESG and the cost of corporate motivation, but most of research works use aggregate ESG performance without considering effects of each dimension. In the domestic context, Duan Xiangyu [1] discovered that good ESG performance may boost corporate reputation, thus saving on debt funding, and achieve financial performance. Both Huo Mingyue [2] and Zhang Wen [3] confirmed the negative impact of ESG performance on the cost of debt financing, which was attributed to the avoidance of information asymmetry between companies and lenders. Wang Liqing and Yang Xiaofeng [4] also reported that the relationship between the ESG performance and the financing costs is common among various corporation types. Qian Shiyin [5] concentrated on the topic of ESG disclosure; it was discovered that the level of disclosure that is transparent can vary the financing cost significantly by increasing the credibility of the corporation.

This has been researched intensively by the international research. Yu Yan et al. [6] found out that climate risk and ESG performance have a chain relationship with cost of debt capital, which implies that mitigation of the adverse effect of climate risk on the cost of funding can be achieved through ESG performance. Shujie Chen [7], studied on its own the impact of environmental performance on the cost of debts and found out that good environmental performance lowers the cost of premiums on the risk of creditors. Zhan WL et al. [8] established that on top of the reduction in the cost of

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financing through debt, ESG performance motivates firms to make more investments in the environment. Nevertheless, these studies all were either using composite ESG measures, or concentrated on one dimension of them without systematically juxtaposing the differentiated impacts of the environmental, societal, and governance dimensions and their interrelationships with policy.

2.2. ESG and policy channels

The relationship between ESG and policy channels is a comparatively small part of research, and thus this paper attempts to fill the gap in the research. Current literature mainly on the specific effects of particular policies on ESG or financing costs, and little research has looked into the spinning influence of policy in the examining of the association between ESG and financing expenses. Indicatively, other studies have established that environmental policies are capable of incentivising firms to improve their environmental performance, therefore, impacting on their financing conditions [7], though it is not known whether environmental policies mediate the impact of environmental dimensions on financing costs.

There are few studies that have moderating variables that allow indirect support to this paper. According to Deng, C. and Wang, J. Y. [9], the relationship between ESG performance and corporate innovation performance is only moderated by the digital transformation, which indicates that ESG implications are contextual. However, previous studies do not provide closely matching between particular policy dimensions (e.g., environmental policy-environmental dimension, monetary policy-governance dimension, regulatory policy-social dimension) and the actual ESG sub-dimensions as well as do not analytically examine their interactive interplays. To fill this gap, in this paper, an analytical framework of the sub-dimensions of ESG policy-interaction with the cost of financing is developed to diversify the research paradigm.

3. Research hypotheses and theoretical framework

3.1. Theoretical framework

In this paper, a research framework is developed using the signalling theory and the stakeholder theory. On the one hand, corporate ESG performance is a high-quality message that it sends to the marketplace, minimizing information asymmetry among creditors. Conversely, the context of policies also affects the performance of this signal: various policies will shift the focus of stakeholders, hence will attenuate the role of an individual ESG dimension on the costs of financing. In particular, corporate environmental compliance is observed in the environmental policies, market liquidity and risk preference of creditors in the monetary policies, and operational and social responsibility achievement by corporations respectively. These three aspects of the policy are a direct match of the three aspects, namely, environmental, governance and social dimensions of ESG respectively.

3.2. Research hypothesis

In the case of the environmental dimension (E), the tighter the environmental policy, the higher the environmental compliance pressure pressed on the businesses in a region. Companies that are more environmentally dimensionally rated are more able to handle their environmental management levels and other levels of compliance, thus being able to easily escape punishments on policies, minimize operational risks, and send the low-risk signal to creditors. Strict environmental measures

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also enhance the impact of this signal to a larger degree as they contribute to creditors being more willing to decrease their risk premiums and reduce the cost of corporate financing.

H1: There is a lower financing cost in the enterprises that have a higher level of environmental policy of the ESG (E) dimension in the regions that hold stricter environmental policies.

H2: Firms that have a stronger ESG governance (G) score have a lower cost of financing in the relatively accommodative monetary policy.

H3: When the intensity of regulatory policy is increased, companies that score high on the social (S)-dimension of the ESG dimension have low financing costs.

4. Data and empirical design

4.1. Data sources and sample selection

The research sample adopted in this study is non-financial listed companies on the Chinese A-share market between the year 2015 and 2024. Data sources and definitions of variables are the following ones: (1) ESG dimension scores: Obtained on the basis of the Huazheng ESG Rating Database and CSMAR Database, annual data are used; (2) Corporate financing cost (Cost): The Zoom-in variable is the interest expense ratio between debt financing expenses and the average total interest bearing liabilities. In the case of robustness testing, the cost of equity computed based on the CAPM model is replaced; (3) Policy variables: The three variables used in the policy are, Environmental Policy Index (EP): is an entropy-based compound index which has the dimensions of policy quantity, enforcement intensity and investment intimacy; Monetary Policy Index (MP): represents the rate of growth of real money supply (M2 growth rate-GDP growth rate- CPI growth rate); Regulatory Intensity Index (RP): is calculated through the weight of the number of CSRC penalties and regulatory inquiry letter in the industry

The processing of the sample follows the following principles: (1) ST*/ST enterprises should be excluded, as they introduce interference into the process of empirical analysis; (2) The trimming of minimum and maximum percentiles of continuous variables should be conducted at the 1% and the 99 percentile to exclude the impact of the outliers. This gave 22, 247 data observations of unbalanced panel. The data processing and empirical analysis was done on STATA 18.0.

It is important to note that, the monetary policy variable, is a macroeconomic variable on the national level, which changes only with time. In a case of a year fixed effect, its dominant influence has been missed in the year fixed effect. Consequently, the term of interaction between the monetary policy and the ESG governance dimensions is the subject of this research. This correlation can be traced to the observation that the financing cost responsiveness is varied in different firms when the macro monetary policy shock is the same, an observation which can be attributed to the level of governance.

4.2. Empirical model

In order to address the research hypotheses, this paper creates a two-way fixed effects model (with controlling the firm-specific fixed effects and time-specific fixed effects) to investigate the interaction between the ESG dimensions and policy. The models in question are the following:

$$Model1(testingH1):\ Cost = \alpha + \beta ESG\_E + \beta EP + \beta ESG\_E \times EP + \Sigma\gamma Controls + \mu + \lambda + \varepsilon \quad (1)$$

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$$Model2(testingH2):\ Cost = \alpha + \beta ESG\_G + \beta MP + \beta ESG\_G \times MP + \Sigma\gamma Controls + \mu + \lambda + \varepsilon \quad (2)$$

$$Model3(testingH3):\ Cost = \alpha + \beta ESG\_S + \beta RP + \beta ESG\_S \times RP + \Sigma\gamma Controls + \mu + \lambda + \varepsilon \quad (3)$$

The following models represent the explanatory variables and the interaction terms; the dependent variable (cost in firms) represents Cost this is explained by the core explanatory variables (ESG environmental, governance, social dimension scores). Policy variables represent EP, MP and RP, interaction terms are represented by ESG E x EP, ESG G x MP and ESG S x RP, Controls represent a set of control variables, μ refers to the firm specific fixed effect, 0- refers to the time specific fixed effect and 0 denotes the random error value. The attention is mainly on the coefficient of interaction 0 -p. In case of a large negative β, then associated hypothesis is true.

5. Empirical findings and analysis

5.1. Descriptive statistics

The table below shows the findings of descriptive statistical analysis of each variable. As indicated, the effective sample size is 22, 429. The variables of the dependent variable are the corporate financing costs with a mean of 0.013 and standard deviation of 0.011. The lowest range is 0 with the highest range being 0.050. The value of standard deviation is relatively lower than that of the mean and the implication is that there is not enough variation in the financing costs. The E mean value of 0.514, S mean value of 0.748, and G mean value of 0.774.

5.2. Baseline regression results

5.2.1. Benchmark regression

The paper has conducted a regression analysis to further examine the effect of the ESG environmental (E), social (S) and governance (G) ratings of a company on its financing costs. Results are as follows: First column is coefficient of E which = -0.003 and the coefficient is significant at 1% level, which indicates a significant negative influence of E on financing costs Higher the E scores the lower are the financing costs. The second column reveals that S coefficient is -0.004 ($p<0.01$), which has a significant cost in financing at 1 percent, and the higher S scores are the lower the financing cost. Coefficient of G -0.007 ($p<0.01$) in the third column is significant at 1% and indicates that the higher the G score, the less the costs involved in financing the venture.

5.2.2. Interaction item regression

The results of the table indicate that three terms of interaction between ESG dimensions and policy variables are strongly negative ($p <0.05$). E Environment (coeff= -0.006) suggests that Environment moderates the E-Cost association at 5 significance level: tighter environmental regulations imply that firms with high E scores incur lower financing costs. S_Supervise (coefficient=-0.003) indicates that Supervise moderates the S-Cost relationship; an increasing regulatory intensity lowers the costs in firms whose S performance is high. G_Currency (coefficient= -0.001) discloses that Currency tends to moderate the G-Cost relationship: accommodative monetary policy reduces the cost of the firms with higher G scores. Regressions are specified differently in terms of the specifications of

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different variable and interaction terms, yet sample sizes and R2 are the same, and core conclusions remain the same as fixed-effects settings and reghdfe command are used in all cases.

5.3. Robustness tests

The regression model found that interaction between ESG environmental performance and environmental policy (E_Environment) is significantly negative at the 5% level of significance, interaction between ESG social performance and regulatory intensity (S_Supervise) is significantly negative at the 5% level of significance, and interaction between ESG governance performance and monetary policy (G_Currency) is significantly negative at the 5% level of significance.

More robustness tests employing a different province year fixed interaction structure give the same results. In particular, the coefficients of E Environment and (G) Currency are of a significantly negative value at 5% threshold and S Supervise at the 10% threshold. On the whole, the sign and the strength of the estimated coefficients do not depend on the specification, which supports the validity of the key results.

5.4. Heterogeneity analysis

5.4.1. Nature of enterprise ownership

The heterogeneity when it comes to ownership brings about different findings in the policyESG interaction effects. The relationship between the ESG environmental performance and environmental policy (E Environment) is also not statistically significant at the state-owned enterprises but significantly negative at the 1percent levels at the non-state owned enterprises, which is to say there are strong moderating effects of the state owned firms. The relationship between ESG social performance and regulatory intensity (S Supervise) is very negative both in state-owned enterprises (10 percentage level) and non-state owned enterprises (1 percentage level) but there are stronger coefficients on both the non-state owned firms which indicates that the effect is stronger in non-state owned enterprises. Conversely, the corpusive relationship between ESG governance performance and monetary performance (G_Currency) has a very negative value at 10% level in state owned enterprises but not significant in non state owned enterprises, which implies that policy effects due to governance are more significant among state owned enterprises.

Table 1. Nature of enterprise ownership

	(1) State-Owned Enterprise	(2) Private Enterprise	(3) State-Owned Enterprise	(4) Private Enterprise	(5) State-Owned Enterprise	(6) Private Enterprise
	Cost	Cost	Cost	Cost	Cost	Cost
E	-0.004***	-0.003***				
	(-3.492)	(-3.016)				
E_Eviroment	-0.001	-0.008***				
	(-0.337)	(-2.633)				
Eviroment	-0.000	0.004**				

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Table 1. (continued)

	(-0.103)	(2.460)				
S			-0.003*	-0.005***		
			(-1.735)	(-3.654)		
S_Supervise			-0.004*	-0.003*		
			(-1.693)	(-1.691)		
Supervise			0.004**	0.003**		
			(1.983)	(2.099)		
G					-0.006***	-0.008***
					(-2.910)	(-5.483)
G_Currency					-0.002*	-0.001
					(-1.818)	(-1.572)

5.4.2. Regional affiliation

The findings have shown that there are evident differences among regions on the effects of policy-ESG interaction. The relationship between ESG environmental performance and environmental policy (E environment) shows the significant negative value of 10 percent at the eastern regions correspondingly to the firms, but does not indicate any statistical significance in the same case at both the central and western regions. In the same vein, the association between the ESG social performance and the intensity of regulatory (S_Supervise) is very negative at the 5 percent mark compared to the eastern enterprises, and no significant differentiation is experienced in central and western enterprises. Also, the relationship between the ESG performance in governance and monetary policy (G_Currency) is considerably negative at the 1-percent level, concerning eastern enterprises but it is insignificant concerning firms situated at central and western regions. Comprehensively, policy effect variation on the correlation between ESG performance and business financing cost is stronger among business ventures in the eastern areas.

6. Conclusion

The given work of research empirically analyzes heterogeneous effects of ESG dimensions on the financing cost of A-share non-finance listed companies (20152024) and the moderating role of policy interventions.

ESG dimensions have a negative impact on financing costs that have heterogeneous strength governance (strongest), social and environmental dimensions (all significant). ESG effects are conditional on political settings: strong environmental regulations enhance the cost-cutting force of the environmental dimension; generous monetary regulations enhance the governance dimension; and extensive regulatory measures enhance the social dimension (all three hypotheses were confirmed). Effects of interaction between ESG-policies are heterogeneous: non-SOEs interact

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between the environment and social policy, SOE between governance policy, eastern firms with central interactions, and western without interactions.

The companies are advised to incorporate differentiated strategies of ESG according to ownership, region and policy non-SOE companies should focus on environmental and social performance, SOEs on governance under accommodative monetary policies. The policymakers must have a coherent "ESG+policy" framework to align policies with its respective ESG dimensions and enforce the policies in central and western China. To enhance aspects of transparency and signal, capital markets are supposed to optimize dimension segmented ESG disclosure infrastructure. They are limited to ESG scoring, policy variable biases. Manual ESG data can be used in future studies to examine the transmission processes, create accurate indices of policies to examine, and increase the samples to cross-border companies to provide an institutional comparative analysis.

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