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A Review of Research on the Impact of ESG Factors on Corporate Performance

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Abstract. This paper systematically sorts out and comments on the correlation between ESG factors and corporate performance. Existing research shows that ESG practices are often positively correlated with corporate performance. European and American companies have increased their profits through environmental innovation and governance optimization, and the ESG investment of some Chinese enterprises has also shown a positive effect, but there is significant regional and industry heterogeneity. Existing research also reveals that ESG improves corporate performance through risk management and resource efficiency improvement, but existing research has limitations such as insufficient data quality, lack of dynamic models, ambiguous causal relationships, and gaps in industry and geographical adaptability analysis. By summarizing and analyzing the existing literature, this paper looks forward to the future research should be expanded in the direction of integration of emerging fields, practice-oriented optimization, and interdisciplinary method integration, so as to provide reference for theory and practice. Additionally, this paper emphasizes the need for more granular and localized ESG frameworks to address the unique challenges faced by enterprises in different institutional and cultural contexts.

Keywords: ESG, Corporate Performance, Dynamic Model, Regional Heterogeneity

1. Introduction

With the deepening of the global concept of sustainable development, ESG factors have leapt from marginal responsibility indicators of enterprises to core indicators for measuring the comprehensive value of enterprises. They have a huge impact on the operational efficiency, market competitiveness and long-term development potential of enterprises, and have received widespread attention from the academic community. In recent years, relevant studies have emerged in an endless stream. Scholars have conducted multi-dimensional discussions on the correlation between ESG and corporate performance, internal mechanisms and boundary conditions, and have formed rich and divergent research results. From the existing research, most empirical results show that ESG practices are positively correlated with corporate performance. The environmental innovation and employment productivity of European companies significantly promote the growth of return on assets (ROA) [1]. The experience of S&P 500 listed companies in the United States shows that by optimizing the governance structure and reducing agency costs, stock prices can be effectively stabilized and market valuations can be improved [2]. Under the background of strengthened

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supervision, enterprises in the Yangtze River Delta region of China and listed power generation companies have gradually played a positive role in corporate performance, which can effectively save contract costs and enhance brand reputation [3,4]. On the other hand, these studies also reveal significant regional and industry heterogeneity. Companies in emerging market countries such as Brazil tend to cut ESG investment when competition intensifies, reflecting the constraints of different institutional environments and market maturity on the realization of ESG value [5]. Highly polluting companies such as the power industry and manufacturing industry are more susceptible to environmental factors. In addition, scholars have also explored the paths of ESG to reduce compliance risks through risk management, improve resource efficiency to reduce operating costs, and drive innovation to open up green markets. These internal mechanisms will affect corporate performance to varying degrees. On this basis, the existing literature has controversial points such as unclear causal relationships and inconsistent measurement standards [6]. Starting from the core conclusions of existing research, this paper will systematically sort out the analytical results of existing research on the correlation between ESG and corporate performance, regional and industry differences, and influencing mechanisms, including different economies (emerging markets and developed countries in Europe and the United States), different industries (financial industry, power industry), and the differentiated impact of various dimensions of ESG. It also elaborates on the disputes and limitations of existing research. Finally, combined with the research limitations, it looks forward to future research directions and provides a comprehensive perspective for future theoretical development and practical application.

2. Limitations of existing research data and methods

2.1. The data quality dilemma

In the literature analyzed in this article, most of the studies rely on ESG data from third-party rating agencies (such as MSCI, S&P Global, etc.) to conduct analysis. Different rating agencies have different understandings of indicator weights and evaluation standards, which leads to discrepancies in corporate ESG scores. In the study of European and American companies, by comparing the rating data of MSCI and Refinitiv, it was found that due to different understandings of indicators such as "environmental innovation investment weight" and "employee diversity evaluation standards", the ESG score deviation of the same US S&P 500 listed company under the two rating systems can reach 15%-25% [2]. When studying Chinese market companies, different rating agencies have different definitions of "green technology patent ratio" and "community public welfare expenditure accounting scope", which makes it difficult to unify the quantitative results of corporate ESG performance [3,4].

In addition, there is also the problem of insufficient sample coverage. In the study of emerging market companies, the samples focusing on emerging market development regions such as Brazil and India are mostly concentrated on leading listed companies [5]. A large number of small and medium-sized enterprises are not included in the mainstream rating system. The main reason is the high disclosure cost and loose local regulatory requirements. The sample of this literature only covers companies with a local market value of 20%, while the ESG data of small and medium-sized enterprises, which account for more than 80% of the total number of companies, is missing, resulting in the research conclusions being difficult to reflect the full picture of ESG practices in emerging markets, and there is a risk of "generalizing from a single case."

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2.2. The split between static reality models and dynamic reality

Existing literature mostly uses static models such as linear regression to construct the relationship between ESG and corporate performance, but in the process, it ignores the dynamic complexity of the interaction between the two. When studying the ESG practices of European companies, although it was found that environmental innovation was positively correlated with return on assets (ROA), it did not distinguish between short-term and long-term effects, that is, ESG investment may increase corporate costs in the short term due to equipment purchases and project construction, and be negatively correlated with performance [1]. In the long term, it will be transformed into a positive driving force with the accumulation of brand reputation and the improvement of risk resistance. The static model cannot capture this dynamic transformation from short-term pain to long-term benefits, resulting in a contradictory conclusion on the relationship between ESG and performance.

The paths of ESG's impact vary significantly in different industries, and their industry adaptability is different. In the financial industry, the path of ESG's impact is often "investor trust-capital inflow-market value management"; in the power industry, it is driven by "compliance cost control-green technology iteration-policy subsidy acquisition", but existing literature often uses a unified linear model to fit all industries. When focusing on the ESG rating of the financial industry, although we focus on the governance dimension (G), the cross-industry model dilutes the unique impact of "board independence" and "executive compensation transparency" of financial companies on performance [7]. When studying China's listed power generation companies, although linear regression can find that the environmental dimension (E) is associated with performance, it cannot include the interference of external dynamic factors such as "carbon emission trading market fluctuations" [4].

Most literature stops at the discovery of "correlation" and lacks in-depth exploration of the causal chain between ESG and performance. When studying the relationship between competition and ESG investment in emerging market companies, scholars observed that "ESG investment reduction and performance decline coexist under competitive pressure", but it is unclear whether insufficient ESG investment leads to poor performance or lower performance expectations force companies to cut ESG investment [5]. These causal ambiguities weaken the practical value of the research conclusions.

3. Research gaps in industry and regional adaptability

3.1. Industry adaptability: industry differences in action logic have not been fully explored

Existing research focuses on highly polluting and energy-intensive ESG-constrained companies, but does not adequately cover the ESG action paths in other industries, which results in the neglect of logical differences between industries.

In China's power generation companies, environmental dimensions such as carbon emission control and clean energy transformation are the core factors affecting performance [4]. These environmental dimensions are directly related to compliance costs and policy subsidies. In the financial industry, governance dimensions are more relied upon [7]. The impact of environmental dimensions on the financial industry is weaker than that on high-energy-consuming industries. This is mainly due to the fact that the financial industry has a smaller direct impact on the environment. It can be seen that these studies focus on explaining the ESG characteristics of highly constrained industries, and lack in-depth discussion on the unique role of ESG in non-strongly constrained industries such as technology, consumption, and finance. The core competitiveness of technology

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companies lies mainly in innovation and talent, and their ESG value is mainly transmitted through the "governance-innovation" path. Modern technology companies usually attract high-end R&D talents through governance structures such as equity incentives and board diversity, thereby promoting the transformation of technology into performance income. When describing corporate governance dimensions, existing literature rarely focuses on this unique mechanism of the technology industry , nor does it distinguish the differences between the technology industry and other industries [1,2]. The ESG value of consumer companies relies more on the "social dimension-brand value" path. Social dimensions such as consumer responsibility and supply chain labor rights will directly affect brand reputation and customer loyalty. In the existing literature, although most of them have mentioned the impact of corporate disputes on performance, they have not analyzed the "social dimension-brand value" transmission path of the consumer industry [8]. At the same time, the unique logic of the consumer industry has not been detailed. This neglect of non-strongly constrained industries has made it difficult to clearly define the adaptation strategies of ESG in different industries.

3.2. Regional adaptability: insufficient analysis of regional differences in institutions and markets

In different economies, there are significant differences in institutional environment, market drivers and legal regulations. Existing research literature has loopholes in systematically integrating the impact of these differences on ESG, resulting in a logical break in regional adaptability.

Taking the UK and the US as examples, among developed economies, the correlation between ESG and performance of UK companies is more stable because they are required to disclose ESG and have stable legal constraints; at the same time, investors' high attention to ESG is also driven by a more mature market [6]. The governance dimension of US companies affects performance by reducing agency costs, which is closely related to the strict supervision of corporate governance in developed countries [2]. However, these studies have failed to make a comparison with emerging markets, making it difficult to highlight the differences and role of the institutional environment.

In emerging markets, ESG practices present different logics due to low market maturity and limited legal norms. In Brazil, when companies find that competition is intensifying, their ESG investment will be cut [5]. In emerging markets, investors tend to focus more on short-term returns, and with the imperfect legal system, the "cost-benefit" balance of ESG is more fragile. Taking enterprises in the Yangtze River Delta region of China as an example, with the gradual strengthening of supervision, the positive impact of ESG on performance has gradually emerged, but the article did not make an in-depth comparison between it and Europe and the United States in terms of the "regulation-market-ESG" transmission logic [3]. Some literature only focuses on the impact of institutional theory on ESG, but does not specifically integrate the differences in different regions in terms of regulatory enforcement, market maturity, third-party rating system, etc., resulting in the regional adaptability of ESG practices [9]. The law has not been fully refined. Fragmented regional ESG analysis also limits the targeted application of ESG strategies in different regions.

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4. Shortcomings in research on the dynamic relationship between ESG and corporate performance

4.1. Ambiguity about long-term effects

Although existing research has explored the relationship between ESG and corporate performance from multiple dimensions, there are still significant limitations in the in-depth analysis of dynamic relationships. It has failed to fully analyze the dynamic process of ESG-driven innovation and brand sedimentation gradually transforming into sustainable competitive advantages. It only uses static models for analysis, and there is a clear gap in the characterization of the long-term value transmission path. Through data envelopment analysis, we found that there is a nonlinear relationship between ESG information disclosure and corporate efficiency, that is, a moderate level of disclosure is more conducive to efficiency improvement [10]. However, this study only focuses on the efficiency correlation at a single point in time, and does not track how environmental innovation or social dimensions are transformed into sustainable performance advantages through knowledge accumulation and organizational capability iteration in the long term. The initial investment in environmental protection equipment by the enterprise may increase costs in the short term, but the long-term costs can be reduced through energy recycling. This dynamic transformation from short-term costs to long-term benefits has not been disassembled in the literature. Based on European corporate data, it can be confirmed that ESG is positively correlated with ROA and ROE, and the impact of environmental penetration and employment productivity is more significant [1]. However, machine learning models mainly rely on short-term data from 2018 to 2019 and are unable to track the long-term innovation outputs brought about by ESG investment, making it difficult to judge the growth of long-term performance. After integrating more than 1,000 studies on ESG and financial performance, 58% of the results support that ESG is positively correlated with financial performance, and the long-term effect is more significant, but this is a general summary and lacks an analysis of the mechanism of brand sedimentation. Although some literature mentions the mitigating effect of ESG on brand risk, it does not quantify the continued impact of increased brand loyalty on market share in the long term; or focuses on the impact of governance dimensions on stock price stability, and fails to analyze how board diversity can maintain performance growth through strategic consistency in the long term, resulting in a vague transmission path for the long-term value of ESG [8].

4.2. Nonlinear responses in extreme scenarios

Existing research has not adequately addressed the nonlinear response of ESG to extreme situations such as economic recession and environmental crisis, and needs to capture the dynamic changes of ESG impact from linear to nonlinear. Taking Brazil's economic fluctuations in 2015 as an example, when competition intensifies, companies will cut ESG investment [5]. However, the article only attributes this to short-term cost pressure and does not explore the "threshold effect" of ESG under extreme competition. When competitive pressure exceeds the critical point, the marginal benefits of ESG investment may turn from positive to negative, or show a nonlinear step-by-step decline. In the analysis of British companies, a dynamic panel model was used, but the interaction terms under extreme situations were not included, and it was impossible to verify whether ESG would transform from a "cost item" to a "risk buffer" during an economic recession [6]. In addition, when analyzing high-energy-consuming industries such as the power industry, the impact of extreme environmental events on the relationship between ESG performance is missing [4]. Under extreme environmental

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conditions, investment in the environmental dimension may surge due to policy mandates, and its marginal benefits differ from those in normal situations, but the literature does not capture this dynamic transformation, resulting in the underestimation of the value of ESG under extreme situations. Therefore, future research needs to combine longitudinal data and scenario simulation to fill these gaps and provide more accurate theoretical support for corporate long-term strategies and risk responses.

5. Multi-dimensional expansion of future research areas

5.1. Innovative paths for integration of emerging fields

In the context of the deep integration of digital transformation and global sustainable development goals, ESG research needs to break through the existing framework and extend to the direction of dynamic optimization of emerging field integration and practice orientation. The deep integration of digital technology and ESG management is an important breakthrough. There is a nonlinear relationship between ESG information disclosure and corporate efficiency, and machine learning also has considerable potential in the prediction of ESG-related financial performance [1,10]. In the future, we can explore blockchain technology and build an ESG information implementation traceability mechanism to solve the information asymmetry problem exposed in controversial events [2]. With the continuous development of artificial intelligence today, the development of AI-driven dynamic decision-making systems can also achieve the "cost-benefit" balance of ESG in emerging markets and resist competitive pressure. At the same time, in the process of digitalization, we need to pay more attention to the digital barriers of small and medium-sized enterprises to prevent ESG practices from becoming exclusive to leading enterprises.

Most existing studies focus on traditional industries. However, with the rise of emerging businesses such as the sharing economy and platform economy, the ESG evaluation dimension needs to be reconstructed. By studying the ESG transmission model of platform enterprises between "platform-merchant-customer", the gap between social responsibility and market returns can be filled [11]. By quantifying the ESG value in the circular economy and combining it with digital twin technology, the value of renewable resources throughout their life cycle can be tracked.

5.2. Practice-oriented dynamic optimization

The optimization of the effectiveness of localized ESG policies requires detailed research. There are considerable differences between China and the West in terms of ESG policy tools [4,11]. The West mainly relies on mandatory disclosure, while China advocates resource practice. Future research needs to focus on comparing and analyzing the synergistic effects of control policies and market incentive tools, paying attention to the balance between policy intensity and corporate tolerance in emerging markets [5]; analyzing the moderating role of regional heterogeneity, such as industrial cluster characteristics, and studying the effect of shared facilities in industrial parks on reducing the ESG compliance costs of small and medium-sized enterprises [1]; building a policy dynamic monitoring panel to quantify the long-term impact of policies on employment and carbon emissions and avoid "symbolic compliance" [1].

The dynamic optimization of corporate ESG strategies requires strengthening the collaboration of stakeholders. ESG strategies need to adapt to the corporate life cycle [10]. In the future, a crisis management framework of "risk warning-emergency response-reputation repair" can be established, and public opinion analysis on social platforms can be combined to improve response speed. At the

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same time, through digital platforms, multiple demands from investors, communities, etc. can be integrated to transform the "responsible supply chain" into actionable indicators. The symbiotic path between ESG and innovation is also worth exploring. Based on the positive impact of environmental innovation ROA, it is possible to study how ESG investment can improve competitiveness through research and development, thereby solving the cost dilemma of emerging market companies [1].

In terms of research methods, we need to promote interdisciplinary integration. By introducing complex system theory, we can extend nonlinear analysis to the simulation of ESG ecosystem evolution [10]; strengthen the causal inference of cross-national comparisons, use cross-national data from different regional markets to build a double difference model, and identify the impact of institutional differences; integrate qualitative and quantitative research, and combine case analysis with big data methods to better reveal the transformation mechanism of ESG strategy from "compliance-driven" to "value creation".

6. Conclusion

ESG research is gradually moving from theoretical explanation to value empowerment. On the theoretical level, existing literature has clarified the relationship between ESG and corporate performance. ESG information disclosure and corporate efficiency are nonlinear, and a moderate level of disclosure is most conducive to improving efficiency. Scenario differences have also been clarified. In some mature markets, ESG ratings have no significant correlation with excess returns, while emerging market companies will reduce ESG investment when competition intensifies. The practical breakthroughs of value empowerment mainly focus on three aspects: technology-driven quantitative tools show that machine learning can accurately predict the impact of ESG on financial indicators and provide support for dynamic decision-making; localized adaptation emphasizes the regulatory role of regional industrial characteristics, and it is necessary to avoid a "one-size-fits-all" policy; third, it is necessary to strengthen risk collaborative management. ESG can alleviate the impact of controversial events on performance and should be embedded in the corporate crisis response system. Future research directions need to achieve further integration of theory and practice, so that ESG can be transformed from a compliance requirement to a core capability for creating comprehensive value, and achieve a win-win situation for sustainable development and corporate competitiveness.

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