A literature review of enterprise green transformation from the perspective of complex social network and prospects

WAN Liang，FANG Wenpei，WANG Chengyuan，WANG Shanyong

School of Management，University of Science and Technology of China，Hefei 230026，china

Abstract：How to promote the change of development mode through enterprise green transformation，to realize the balance between economic and social development and environmental quality is an urgent and important research topic. In this sense，the empirical test of the enterprise green transformation is not only among the key interests of academics，but also has strong policy implications. Different from the previous research on it，this paper attempts to start from the new research perspective of complex social network，uses the research history of enterprise green transformation as an entry point，systematically sorts out and analyzes the influencing factors，the mechanism and peer evolution that affect the enterprise green transformation. On the basis of this，an integrated theoretical framework is put forward，and some reference is provided for the development of relevant research on enterprise green transformation. This paper aims to broaden the research perspective of enterprise green transformation，enrich and improve enterprise green transformation theories and methods. The research results will help reveal the "black box" of green transformation，and provide government guidance for the diffusion of green transformation.

Key words：environmental regulation；enterprise green transformation；complex social network；influence mechanism

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0　Introduction

Green transformation is an important way to achieve both economic and social development and environmental quality. The China Commission for International Cooperation on Environment and Development（2019）pointed out in its report that China's economic development has paid a huge environmental price. From the "13th Five-Year Plan"（2016-2020）to the "14th Five-Year Plan"（2021-2025），China's economy is changing its lanes，from high-speed growth to high-quality development. The "five developments" proposed at the fifth Plenary Session of the 18th Central Committee of the Communist Party of China established the concept of "green development". To achieve a win-win for environmental，economic and social benefits，the implementation of the concept of green development and the realization of green transformation should be an important task. Therefore，in the context of the new economic normal，in the face of resource and environmental constraints，how to promote the transformation of

development mode through the green transformation of enterprises and shape sustainable competitiveness is an urgent and important research topic with practical significance[1].

The green transformation of enterprises is the micro foundation of the national green development strategy. It is an important way for enterprises to promote pollution reduction by increasing investment in green technology innovation[2]. Without policy intervention，companies generally have no incentive to invest in green technological innovation，which is mainly caused by the problem of "dual externalities"[3,4]. Therefore，environmental regulation is considered to be the initial driver of corporate green innovation[5,6]. However，can environmental regulations definitely promote corporate green technological innovation and corporate green transformation? First，when companies face environmental regulations，they have a variety of evasive strategies. They can move to areas with looser environmental regulations[7] or turn to financial and other investment areas with lower environmental pollution intensity[8]；Second，

environmental regulation is a toolbox containing multiple policy instruments. Different environmental regulation tools have different mechanisms of action, which naturally have a different effect on promoting the green transformation of enterprises[9]; Third, there is an important relationship between environmental regulation intensity and green transformation. Too high or too low environmental regulation intensity not only harms regional economic development, but also does no good to green transformation development[10]. Based on the above, further exploration of the mechanism through which environmental regulation specifically affects the green transformation of enterprises is a topic worthy of in-depth investigation in the current academic community.

Most studies on environmental regulation and green transformation have focused on the impact of environmental regulation on enterprise (green) technological innovation, industrial pollutant emission and industrial green total factor productivity[11-18]. In general, the existing research provides a wealth of ideas for the study of corporate green transformation, but there is still a lack of literature to study in depth the mechanism of environmental regulation that affects industrial green transformation through green technological innovation. Moreover, the effects of different types of environmental regulations on industrial green transformation are quite different, and different types of environmental regulations in different regions also have greater heterogeneity[2,6,19]. In addition, current research is mostly based on industry or province data, and there are problems with insufficient samples and low degrees of freedom[20]. It is necessary to further clarify the micro-mechanism of environmental policies on enterprises' green transformation, and this requires empirical analysis using data from subdivisions at the enterprise level[21].

Social networks have an important influence on the green transformation behavior of enterprises. The enterprise does not act in an "atomic" state, and the economic behavior of the enterprise itself is socially embedded. Through the relationship network, enterprises can obtain resources and information, and weaken the opportunistic behavior of network members[22]. The green behavior of enterprises has obvious externalities and interactions, and requires cooperation between enterprises to form an ecological industrial chain[23-25]. In fact, the internal and external relationship network deeply embedded by the enterprise is the key resource which is necessary to influence the enterprise's behavior and decision[26]. The green transformation of enterprises is affected by internal and external social networks[27], the complex social network composed of the government, upstream and downstream of the supply chain, consumers, the enterprise itself, and the interaction between them is the key influencing factor and driving force of the green innovation behavior of enterprises[28-31]. Therefore, a good social network is conducive to resource-based companies to absorb external green behavior information resources and participate in green innovation cooperation, thus increasing the green participation of enterprises and promoting the spread of green behaviors[32]. Based on this, this paper studies the influence mechanism of environmental regulations on the green transformation of enterprises from a new perspective of complex social networks, systematically combs and explores the dynamic mechanism of green transformation at the micro level of the enterprise.

1   The historical evolution of the research on the impact of environmental regulations on green transformation

In order to propose an integrated analysis framework for the study of corporate green transformation from the perspective of complex social networks, this paper systematically sorts out authoritative journals in related fields of environmental regulation, corporate green transformation, and complex social network research from 2000 to 2020, including typical papers in journals such as *Ecological Economics*, *Journal of Environmental Management*, *Energy Policy*, *Journal of Macroeconomics*, *Economic Research*, *Chinese Industrial Economy*, *Economic Management*, etc. as well as articles from *AMJ*, *AMR*, *ASQ*, *Management Review*, *Scientific Research*, *Foreign Economics and Management*, and other comprehensive and review journals of management and economics. On this basis, we begin from the interactive perspective of the enterprise being affected by the complex social network, taking the historical evolution of the research on the impact of environmental regulations on the green transformation of enterprises as the starting point, and summarize and refine the influencing factors of individuals and organizational contexts that affect the green transformation of

enterprises, so as to fully understand the historical development and research status of corporate green transformation research.

1.1　Related research on environmental regulations

The existing literature on environmental regulation itself mainly includes the connotation and extension of environmental regulation, the classification of environmental regulation tools, and the strategic choices for environmental regulation, etc. Although the strong negative externalities of environmental issues have long been a consensus, the connotation and extension of environmental regulations are still changing and adjusting[9]. As economic incentives and restraint policies based on market regulation (such as environmental taxes, subsidies, etc.), and behavioral norms based on the conscious awareness of the masses (such as information leaks, complaints, etc.) have been continuously included in the scope of environmental regulations[33]. Scholars usually divide environmental regulation tools into three categories: the command control type based on administrative orders, laws and regulations, etc.; the economic incentives and constraints type that uses market regulation as a means; and the implicit environmental regulations related to environmental protection concepts, environmental awareness, environmental protection attitudes and environmental awareness[34].

Under different research perspectives, scholars have also made other classifications of environmental regulations[35]. In essence, no matter what type of environmental regulation tool, its way of action is to realize the internalization of the external cost of pollution, and this will change the game equilibrium between polluting companies and the government that represents the public interest[36], prompting companies to re-select production strategies that are conducive to the ecological environment. However, when factors such as local economic development, industrial policies, environmental endowments and cross-regional local government competition are considered[37], the strategic choice of environmental regulation has become particularly important, which is mainly reflected in the choice of regulatory tools and the grasp of regulatory intensity[38-39].

The research on the economic effect of environmental regulation mainly involves environmental regulation and production efficiency[40-42], environmental

regulation and corporate location[7,43,44], environmental regulation and regional economic growth[45-47], environmental regulation and industrial structure transformation[48,49] and environmental regulation and import and export trade[50,51]. Their views can be roughly divided into three categories: First, environmental regulations have optimized the production behavior of enterprises and have produced positive economic effects; Second, environmental regulations increase the additional costs of enterprises and are not conducive to economic development; Third, affected by the types of specific environmental regulatory tools and the intensity of environmental regulations, there is a non-linear relationship between environmental regulations and economic indicators such as inverted U-shaped and threshold-shaped.

The research on the social effects of environmental regulations mainly focuses on exploring and testing whether environmental regulations are beneficial to pollution control. For example, Goldar and Banerjee[52] examined the relationship between environmental regulations and water pollution control in India; Wang and Xu[53] examined the relationship between environmental regulations and air pollution control in China; Fan and Zhang[54] constructed a theoretical model of two environmental regulatory policies including corporate pollution control capital investment, government implementation of environmental taxes and emission reduction subsidies, and they simulated their equilibrium solutions. These studies all support the conclusion that environmental regulations are beneficial to pollution control. However, there is no agreement on the role of environmental regulation in pollution control, and the main debate is whether the "Porter effect" really exists.

1.2　Related research on green transformation

Research on green transformation can be roughly divided into two categories, the first category concerns calculations of green productivity or efficiency, and measures the performance of green transformation under energy or environmental constraints based on quantitative analysis. The second category is mainly about its influencing factors and interaction mechanism. In terms of connotation, green transformation is a process by which companies move towards "intensive use of resources and energy, reduction of pollution

emissions, improvement of labor productivity, and enhancement of sustainable development capabilities "[55]. Wu[56] defines its essence as optimizing green total factor productivity, that is, environmental efficiency or ecological efficiency.

Most of the existing evaluations of green efficiency have been achieved from traditional industrial industries and regional perspectives[57], since Chung[58] first used the directional distance function based on the weak disposability of undesired output to measure traditional industrial green productivity, which provides a theoretical and methodological basic framework for the study of economic effects under environmental operating conditions. Subsequently, a large number of scholars have explored green efficiency, especially in response to the increasingly severe environmental problems in developing countries. Zhou et al[59] found that the eastern coastal provinces, due to their higher technological level, have significantly higher industrial environmental performance than the central and western provinces through the measurement of the regional environmental performance of the Chinese power industry. In addition, most studies only consider environmental constraints or energy constraints. Xiao et al[60] measured the technological innovation efficiency of industrial enterprises under environmental constraints based on panel data of large and medium-sized industrial enterprises in China. The results show that China's overall innovation efficiency has improved during the inspection period, and there is still greater development potential. The research of Wang and Feng[61] shows that China's overall energy efficiency is relatively low, and the difference between the east and the west is large.

As the green economy has attracted increasing attention, scholars have also explored its influencing factors and mechanism on the basis of measuring the green efficiency of regions and industries. A representative study on the impact of environmental technology innovation is the "Porter Hypothesis" proposed by Porter: Effective environmental policies can promote technological innovation of enterprises, then offset costs and improve the economic performance of environmental operations[62]. On this basis, scholars have carried out a lot of research on its influencing factors. The analysis of Nesta et al[63] based on different

competitive environment conditions shows that environmental policies largely affect the output of green patents and can effectively promote green technological innovation. In addition, the study by Pan et al[64] shows that per capita GDP and R&D investment are conducive to improving industrial green production efficiency, while the marketization index and coal consumption proportion factors have different effects in different regions.

Zhang et al[65] found that independent innovation has a greater impact on industry green growth than domestic and foreign technology introduction through research on 36 industries. At the same time, the impact of technology introduction, foreign direct investment and environmental regulation has positive and negative effects, and there are big differences in different industries. Zhang et al[65] established an empirical analysis of the driving factor model of China's manufacturing resources and environmental protection capabilities, showing that the level of economic development, technology investment, and FDI all have a significant positive impact on China's manufacturing resources and environmental protection capabilities[66]. In short, the research conclusions of most literatures show that environmental regulation can promote the improvement of environmental efficiency[67,68]. Some studies have also found that there is a nonlinear relationship between the two by adding quadratic terms[13] or using nonlinear threshold panel models[69]. However, there is still a large research gap in the existing literature on the research of green transformation mechanism[70].

1.3　Related research on social network theory

Complex social network theory is widely used in the study of social economic systems. It is extremely important to promote the research of behavioral diffusion mechanism and other issues. The complex social network theory also has many new enlightenments to the research on the implementation of green management issues in enterprises. Social network theory believes that individuals always exist in a specific network and interact with the external environment and other individuals, which is the dynamic process of an individual constantly repeating contact, analysis, learning, evaluation, and decision-making with other individuals. Social network is for the purpose of effectively realizing the transfer of high-quality

information between organizations and solving problems together. It is a closely connected embedded interactive relationship established based on mutual trust[71].

The interaction between individuals and groups of green behaviors due to social interaction is conducive to the transfer and sharing of technology, knowledge, and information between enterprises and other organizations. Under the dual pressure of resource consumption and environmental protection, green behavior information has become an urgent need for enterprises to obtain. Companies always make behavioral decisions based on "imitation" or "innovation". When green behaviors are adopted, the company's green transformation can be realized[32]. The green behavior of enterprises can only be realized through cooperation between enterprises to form an ecological industry network[24].

At present, the literature on the green transformation of enterprises from the perspective of social networks is rare. Scholars have mainly carried out research on ecological industrial networks around the enterprise circular economy model. In recent years, research has been on the characteristics, construction content, symbiosis form, operation mode, construction mechanism, construction conditions of the ecological industrial network[25,72-74], but it has tended to ignore the autonomy, diversity and complexity of micro-subjects, and insufficient attention has been paid to the research on micro-subject consciousness and behavior transformation.

Some scholars have also studied the green behavior of resource-based enterprises from the perspective of social networks, Li et al.[75] used the method of social network analysis to study the inter-enterprise relationship of key resource-based industrial enterprises in terms of products, by-products or waste. The results of the study show that resource-based enterprises have relatively close connections, and the connections between individuals are mainly related to the final product. Hao[32] studied the green behavior diffusion mechanism of resource-based enterprises based on complex social networks, while his research focuses on how social networks affect the proliferation of corporate green behaviors and how the green behaviors of resource-based companies evolve in social networks, and does not involve the issue of corporate green transformation mechanisms. As Newman[76] pointed out, the ultimate goal of studying network structure is to understand and explain the operation of systems built on these networks. Therefore, the research on corporate green behavior based on the perspective of complex social networks is becoming an emerging research direction.

2 An integrated research framework for corporate green transformation from the perspective of complex social networks

Different from previous studies on the characteristics and process of corporate green transformation, this paper attempts to start from the new research perspective of complex social networks, with a focus on sorting out and analyze the influence mechanism of environmental regulation on green transformation at the micro level of enterprises, and tries to solve the following problems. Firstly, what is the direct impact of environmental regulations on the green transformation of enterprises? The effects of environmental regulation on the green transformation of enterprises under different circumstances, such as different types of environmental regulation, intensity of environmental regulation, regional heterogeneity and industry heterogeneity, are systematically analyzed. Secondly, based on social network theory, this paper comprehensively explores the specific mechanism of internal and external factors such as the government and policy level, the upstream and downstream levels of the supply chain, the consumer level, and the company's own level and their interactions in the impact of environmental regulations on the green transformation of enterprises. Finally, this paper studies the evolution of green transformation of enterprises based on complex social networks, and integrates current research based on this, and then establishes a systematic analysis framework (the research framework is shown in Fig. 1).

2.1 Explanation of the effect of environmental regulations on the green transformation of enterprises

This part focuses on explaining the direct impact of environmental regulations on the green transformation of enterprises, and combining current research to give relevant future research
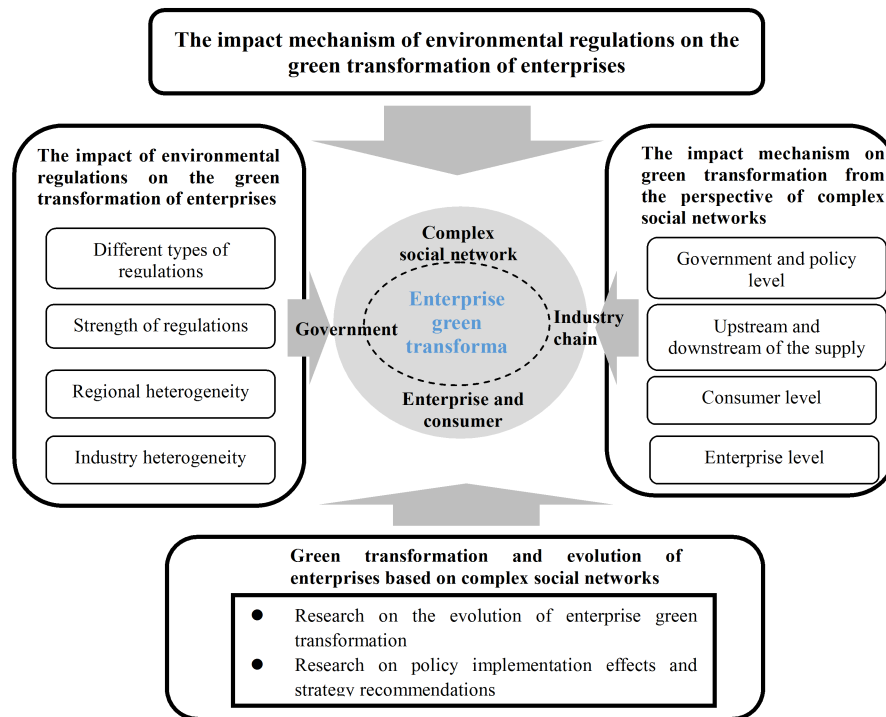
Fig. 1　Research framework of enterprise green transformation mechanism from the perspective of complex social network

directions，this part mainly discusses from the following two aspects.

2. 1. 1　The impact of different types of environmental regulations and their intensity on the green transformation of enterprises

The relationship between environmental regulation and the green development of enterprises is not unified. There are three conclusions between the two：positive incentive（Porter hypothesis），reverse restriction（pollution paradise hypothesis）and threshold effect. The divergence of the conclusions of existing research shows that environmental regulation is usually regarded as a whole，ignoring the role of heterogeneity in different dimensions. Environmental regulation has multiple dimensions，which together constitute the heterogeneity of environmental regulation[19]. Clarifying the impact of different dimensions of environmental regulations on the green transformation of enterprises can provide a theoretical basis for the formulation of government policies and the implementation of green transformation of enterprises.

Firstly，environmental regulations can be divided into three types：command and control environmental regulations，market-based incentive environmental regulations，and voluntary environ-

mental regulations[77]. Future research can build a multi-index evaluation system to measure environmental regulations. We can use entropy method to assign weights to obtain classification indexes of different types of environmental regulations，and study the impact of different types of environmental regulations on the green transformation of enterprises.

Secondly，the Porter hypothesis affirms the positive impact of a reasonable level of environmental regulation on enterprises. However，the current environmental regulations faced by most Chinese companies have not reached the strength to stimulate companies to make green transformations. Only by designing the optimal environmental regulation intensity that can promote the green transformation of enterprises be promoted，before we can achieve a win-win situation for environmental protection and economic development. In view of this，future research can be based on the Mohr model，by which an econometric model to analyze the transmission mechanism of the impact of the intensity of environmental regulations on the green transformation of enterprises.

Finally，given that the current empirical tests on green transition issues are mostly based on industry or province data，there are problems with

insufficient samples and low degrees of freedom, which can easily lead to inaccurate estimation of the measurement model[20]. Future research can use the LP method and the OP method to accurately calculate the enterprise's green transformation efficiency, making it possible to study the green transformation from the micro level of the enterprise.

2.1.2 Consider the impact of regional and industry heterogeneity of environmental regulations on the green transformation of enterprises

Different types of environmental regulations have different implementation effects, and different types of environmental regulations in different regions also have large spatial heterogeneity[78], China's eastern coastal areas are quite different from the central and western inland areas in terms of economic development, human capital and technological innovation. The different types of environmental regulations in the eastern coastal areas are quite different from those in the central and western regions, which may lead to large differences in the impact of environmental regulations on the green transformation of enterprises[2]. Based on this, future research can conduct empirical analysis of sub-samples of sub-regions and consider empirical research combining different types of regulatory tools.

As the traditional measurement method only considers the influencing factors of the region itself, it will lead to biases in analyzing regional issues[69]. We can use the global Moran's index to characterize the spatial distribution of the green transition, based on which, we can construct a spatial measurement model to empirically analyze the regional differences in the relationship between environmental regulation and green transformation. In addition, when studying the impact of soft institutional constraints on green transformation, scholars mostly base their research on the assumption of homogeneous industries, and examine the linear impact of soft institutional constraints on industrial green development. However, due to the different industries in which the companies are located, there are big differences in the technical level and pollution emissions of each industry. Therefore, the government's environmental policies for different industries are bound to be different. If the assumption of heterogeneous industries is relaxed, the research

results will lack practical guidance value. Based on this, future research can use the Super-SBM model to measure the environmental efficiency of various industries. Then, by constructing a double difference model and a panel threshold model to fit and test the relationship between the environmental regulations and the green transformation of enterprises.

2.2 Explanation of the impact mechanism of environmental regulations on the green transformation of enterprises from the perspective of complex social networks

The green behavior of enterprises has obvious externalities and interactions, and requires cooperation between enterprises and their stakeholders to form an ecological industry chain[23-25]. In fact, the internal and external relationship network embedded in the enterprising is a critical resource that is essential to influence the behavioral decision-making of an enterprise[26]. Droste et al[79] believed that the government plays the role of regulators in the game of green innovation, and environmental regulation is an important tool and means for the government to adjust the green transformation of enterprises. Specifically, the appropriate intensity of environmental regulations can promote companies to carry out green technology innovation, thereby promoting corporate pollution reduction and achieving green transformation.

Green management is considered to be a measure for companies to coordinate the environment, corporate strategy and business operations, which can enhance the company's green competitive advantage. At the same time, the internal pressure of the market and supply chain also pushes companies to adopt green supply chain management. Paniagua et al[80] believed that the ability to absorb technology, management, and knowledge is conducive to the transformation of FDI spillover effects to the innovation capabilities of inward enterprises. Xue and Yang[81] further pointed out that enterprises' absorption of spillovers from green management in the industry plays an important role in regulating their own green practices. Consumer participation theory believes that consumer participation helps companies develop new products with completely different product functions. Consumers' green demand for products can induce companies to innovate green products and affect the formation of

their comprehensive capabilities[82,83]. Based on this, the green transformation of enterprises is affected by internal and external social networks[27]. The complex social network composed of the government, upstream and downstream of the supply chain, consumers, enterprises themselves and their interaction is the key influencing factor and driving force of the green innovation behavior of enterprises[28-30].

Based on the above, from the perspective of complex social networks, future research can construct the role path from environmental regulation to enterprises' green technology innovation ability then to enterprises' green transformation. At the same time, drawing on the views of many scholars on the influence of the two internal and external forces of consumer participation and green management ability on green innovation activities, as a regulating variable, studies the mechanism of green transformation at the micro level. Specifically. First, it is necessary to identify and select the intermediary variables and moderator variables that may affect the relationship between environmental regulations and the green transformation of enterprises. Second, construct a structural equation model that includes environmental regulation variables (single environmental regulation and different types of environmental regulations), intermediary and regulatory variables, and corporate green transformation variables. Analyzing the logical relationship between variables in detail, calculating the indirect impact value of environmental regulations on the company's green transformation. Then, according to the environmental regulation intensity model, future research can calculate the indirect influence coefficient of the degree of environmental regulation on the company's green transformation; Finally, conduct a comparative analysis of multiple groups, to study the indirect influence of different environmental regulations and their intensities on the green transformation of enterprises, and whether there are differences in results in different regions and under the heterogeneity of industries.

2. 3 Explanation of the evolution mechanism of corporate green transformation from the perspective of complex social networks

Social network relationships have a significant impact on the green behavior decisions of companies. However, management theory believes

that decision makers have certain rational thinking ability and can make independent decisions. Therefore, in a certain period of time, although there will be significant impacts inside and outside the industrial cluster, a large number of green behavior adopters are still able to independently make green behavior decisions and adopt corresponding behaviors. These green behavior adopters, based on their own green behavior information, will make independent decisions and choose a green behavior model that suits the company's own development, and they can do the same by learning from and imitating other green behavior adopters, the adoption behavior is completed one by one, thus evolving into the adoption behavior network. Based on the above discussion, future research can analyze the herd behavior of enterprises in green transformation under the stable state of network evolution. Also an econometric model to study the evolution of corporate green transformation from the perspective of complex social networks.

In addition, the government is the main body in formulating and implementing corporate green transformation policies. For policy makers, comparing the green transition effects of different types of environmental regulations has strong policy implications. At the same time, the implementation effect of environmental regulations will directly affect whether its implementation strategy needs to be supplemented, modified, improved and adjusted. On the basis of the above research topics, the implementation effect and corresponding implementation strategies of environmental regulation can also be studied. Firstly, building an environmental regulatory system for corporate green transformation, on this basis, constructing an effectiveness evaluation model of enterprises' green transformation, and then quantitatively evaluate the effectiveness of various types of environmental regulations; Secondly, constructing a model of the effect of green transition environmental regulations on the enterprises' green transition is constructed, and the implementation effects of green transition regulations can be analyzed; Finally, based on the literature review and policy interpretation, the research results are systematically summarized to form relevant policy suggestions and management practice references for enterprises' green transformation.

3 Conclusion

Climate change, environmental degradation, and resource shortages have seriously affected the sustainable development of the economy and society. How to promote the transformation of development modes through the green transformation of enterprises, and realize the balance between economic and social development and environmental quality is an urgent and important research topic with practical significance. Research on the theme of green development is a research topic that has gradually emerged in recent years. In the past, research on green transformation was mostly focused on the macro level such as the industry and the provincial level. There is a lack of research at the micro-level green transformation of enterprises, and the research on the mechanism of green transformation at the enterprise level is relatively rare in the previous research. This paper starts from the new perspective of complex social networks, and through a large number of literature reviews, taking into consideration the internal and external influencing factors like government policy, industrial chain, consumer and embedded in the social network of enterprises, this paper studies the influencing mechanism of environmental regulation on the green transformation of enterprises, which is innovative from the perspective of research.

In terms of research questions, this article focuses on research issues such as the impact mechanism of environmental regulations on corporate green transformation, the evolution of corporate green transformation behaviors, and the implementation effects of environmental regulations from the perspective of complex social networks. At present, there are few studies on different types and intensities of environmental regulations, as well as regional heterogeneity and industry heterogeneity to study the green transformation at the micro level of enterprises and the differential results it brings. At the same time, there is a lack of evaluation on the evolution of corporate green transformation behavior and the implementation effect of environmental regulations based on the above-mentioned research.

The core content of this paper is to clarify these research questions, which can further enrich and improve the theory of corporate green transformation, and provide reference for the government to formulate green transformation policies and reference for the enterprises to implement green transformation management. In a word, this paper puts forward an integrated theoretical framework, and provides some reference for the development of relevant research on corporate green transformation. This paper aims to broaden the research perspective of corporate green transformation, enrich and improve corporate green transformation theories and methods, the research results will help reveal the "black box" of green transformation, and provide government guidance for the diffusion of green transformation.

Acknowledgements

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复杂社会网络视角下企业绿色转型的研究述评与展望
——一个整合性分析框架

万　　亮，方文培，王成园，王善勇

中国科学技术大学管理学院，安徽合肥 230026

摘要：如何通过企业绿色转型来推动发展方式转变，实现经济社会发展与环境质量兼顾，是一个紧迫且有重要现实意义的研究主题. 因此，对企业绿色转型进行系统的分析论证，不仅是经济管理学界关注的重点议题，其结论还具有较强的政策启示. 区别于以往企业绿色转型的相关文献，本研究试图从复杂社会网络这一新的研究视角出发，以环境规制对企业绿色转型影响研究的历史演进脉络为切入点，对影响企业绿色创新转型的影响因素、作用机制以及同群演化的研究成果进行了系统梳理和评析. 在此基础上，提出一个整合性的理论分析框架，并给出了未来的相关研究方向，研究成果有助于拓宽企业绿色转型研究视角，揭示企业开展绿色转型活动的"黑箱"，丰富和完善企业绿色转型理论与方法，同时为当前开展企业绿色转型的相关研究提供一定的借鉴和参考.

关键词：环境规制；企业绿色转型；复杂社会网络；影响机制

WAN Liang：PhD/associate researcher. Research field：Environmental resource management.
　　　　　　E-mail：wanl001@ustc.edu.cn
FANG Wenpei：Corresponding author. PhD. Research field：Environmental resource management.
　　　　　　　E-mail：wenpei@mail.ustc.edu.cn
WANG Chengyuan：PhD/associate researcher. Research field：Environmental resource management.
　　　　　　　E-mail：wanl001@ustc.edu.cn
WANG Shanyong：PhD/associate professor. Research field：Environment resource management.
　　　　　　E-mail：wsy1988@ustc.edu.cn