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Empirical Study of the Impact of International Environmental Management System on the Green Transformation of Chinese Enterprises

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Abstract

Green transformation of enterprises is imminently necessary with increasingly stringent environmental regulation. International environmental management system, an incentive environmental regulation, is an effective market tool to promote green transformation of enterprises. A mediating effect model is built based on Chinese data from 1999 to 2017 to analyses the direct and indirect influences of international environmental management system on green transformation of enterprises. The results show that international environmental management system has a direct and significant positive effect on green transformation of enterprises, and influences green transformation of enterprises indirectly through two mediation variables: environmental awareness and foreign direct investment, among which the mediation effect of foreign direct investment is more significant. The mediation effect of opening up is incorrect due to the effect of international environmental management system on opening up is not strong enough. Therefore, on the one hand, green transformation of enterprises should be promoted by attracting foreign investment and enhancing environmental awareness. On the other hand, environmental regulation in the process of opening up should be strengthened, in order to enhance the green transformation ability of enterprises.

Keywords

International Environmental Management System; Green Transformation of Enterprises; Mediation Effect; Environmental Awareness; Foreign Direct Investment; Opening up.

1. Introduction

How to ensure the harmonious and sustainable development of economy and nature and build a beautiful China, under the tremendous pressure of the double red line of natural resources and ecological environment? "The proposal of the Central Committee of the Communist Party of China for formulating the thirteenth Five-Year Plan for National Economic and Social Development" (hereinafter referred to as the "Thirteenth Five-Year Plan") emphasizes that "adhering to green development and work together to build a rich, prosperous and beautiful china." In order to realize green development, Green transformation of enterprises must be persisted in to improving the formation of green production and green consumption in society. Green transformation of enterprises is the key to promote win-win development of economy and environment. It plays an important role in high-quality economic development, industrial restructuring and environmental protection. Green transformation of enterprises is what guided by efficient and intensive utilization of resources and environmental friendliness, with green innovation as its core, and makes it possible to achieve higher economic and environmental benefits through green production and management throughout the life cycle (Chao et al., 2019). In the process of advancing the green transformation of enterprises, it is far from enough to merely rely on the strength of macro-control, and it's more important to rely

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on the invisible hand, exert the internal incentive of the market effectively. International environmental management system is a kind of voluntary environmental regulation. And the ISO14001 standard established by the International Organization for Standardization (ISO) is the most widely used voluntary environmental project in the world (Lim & Prakash, 2014). As an incentive-type environmental regulation, the promotion effect of international environmental management system on green transformation of enterprises deserves further discussions. Therefore, this paper attempts to explore the following issues. Is authentication and implementation of international environmental management system conducive to the green transformation of enterprises? If so, how does the international environmental management system affect it directly or indirectly? Answering the above questions could help to clarify the impact of international environmental management system on green transformation of enterprises, enrich the theory about the interaction between environmental regulation and green behavior of enterprises, and provide enlightenment for accelerating the realization of green economic development in practice.

2. Literature Review

Not much research achievements could be found which study on environment management system and green transformation of enterprises directly. Since the ultimate goal of green transformation of enterprises is to achieve win-win economic and environmental performance, this paper sorts out the research of the impact of international environmental management system on the enterprises' behavior, which with the benefits as start, and the difficulties as the entry point. On the one hand, the implementation of international environmental management system could help to improve the environmental performance of enterprises or organizations. Pollutant emissions are one of the most important criteria for inspecting the environmental performance of enterprise. The research of Singh et al. (2015) found that ISO14001 authentication can help small and medium-sized Indian enterprises reduce their waste emissions by 25%. Besides, Wagner (2008) confirmed that the implementation of environmental management system can not only reduce the carbon emissions of enterprises, but also promote mutual benefits with emission trading instructions, thus improving the efficiency of the two environmental policies. When it comes to environmental regulation, there are many approaches for international environmental management system to achieve sound environmental performance. Wong et al. (2017) believed that the authentication of the international environmental management system can improves the environmental performance of coal-fired power plants as well as leave power plants further aware the importance of environmental laws and regulations. Rino & Salvador (2017) believed that environmental management system not only enables enterprises to achieve better environmental performance, but also reduces the number of environmental penalties imposed by relevant departments on enterprises. Ross et al. (2019) took the royal college of pathologists of Australasia quality assurance programs as an example to integrate the environmental management system into the business. The results showed that the environmental, cultural and financial aspects of the medical institution had been significantly improved through resource conservation and environmental protection. On the other hand, the implementation of international environmental management system has imposed a positive impact on the economic performance of enterprises. Frondel et al. (2018) evaluated the influences of various environmental management systems on corporate performance, and found that the international environmental management system with signal effect (authentication system) has a positive impact on corporate financial performance. Teng (2011) conducted an empirical study on listed companies and the research told that the ratio of corporate value and market value of intangible assets to book value of companies accredited by ISO14001 is much higher than that of companies not accredited. Lo et al. (2012) & Guerrero-Baena et al. (2015) believed

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that international environmental management system authentication can improve the reputation and image of enterprises. Although authentication or implementation of international environmental management system of enterprises has many advantages, the process of implementation is not smooth. Voukkali et al. (2017) put forward that environmental management system can bring many benefits, such as advancing environmental performance and economic performance, but its implementation is not simple and requires the joint efforts of all. Babakri et al. (2003) argued that the biggest obstacle to the authentication of the system is the high cost, including the fees for processing authentication, the preparation of a large number of authentication documents and staff training, and sometimes it even needs to employ third-party auditors. And the second problem is the lack of other available resources for enterprises. Salim et al. (2018) also believed that high costs and low-level of recognition of ISO14001 standard are not conducive to establish an enterprise authentication environmental management system, and the lack of government support and incentives is also another difficulty. Scholars have made a series of explorations on its motivation and incentives, in order to promote enterprise authentication and implement the international environmental management system. Chang et al. (2008) pointed out that strengthening guidance and supervision of government and raising public awareness of environmental protection could enhance the initiative of the development of environmental management system of Chinese financial industry. Singh et al. (2015) believed that the main motivation for adopting environmental management system doesn't lie in innovation and cost savings, but enterprise scale and pollution emission. Compared with small and medium-sized enterprises, large enterprises are more likely to adopt international environmental management system. And compared with service industries, enterprises in manufacturing, chemical and agricultural sectors have more possibilities to accept this system. Salim et al. (2018) agreed that environmental management systems can improve product quality, reduce production costs and enhance corporate reputation, and environmental policies such as tax exemption will help push forward the adoption of costly environmental management systems.

In summary, the existing research pays more attention to the impact of the implementation or authentication of the international environmental management system on the environment and economic benefits of enterprises, and has achieved fruitful results in theory and method. However, the internal mechanism of the influences still needs further researches. The green transformation of enterprises is an effective way to achieve the coordinated development of enterprise environment and economic performance. Studying the direct and indirect impact of international environmental management system on enterprise green transformation is helpful to clarify the internal mechanism of promoting green development through environmental regulation, and to provide reference for achieving green, harmonious and sustainable development. Compared with the existing research, this thesis expects to make contributions in the following aspects. First, confirm whether the international environmental management system has a significant and direct impact on the green transformation of enterprises. Second, find out whether the international environmental management system has an indirect impact on the green transformation of enterprises through several mediation factors, such as environmental awareness, foreign direct investment and opening up. So as to provide practical approaches for enterprises to conduct green transformation as well as, and to provide reference for the green development of country.

3. Methodology and Data

3.1. Theoretical Analysis

China is in a critical period of economic development transition from speed to quality, in which the enterprise change from the extensive development with "high energy consumption, high

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pollution, low output and low efficiency" to the intensive development with "low energy consumption, low pollution, high output and high efficiency". In other words, realizing the green transformation of enterprises is one of the main tasks of the Chinese government at this stage. Environmental regulation is the core driving factor of green transformation of enterprises, and the incentive-type environmental regulation can increase the internal incentive function of the market to the greatest extent to promote the process of green transformation of enterprises (Chao et al, 2019). International environmental management system includes two parts: the standard of environmental management and the technical standard supported by environmental management. The enterprise can testify it's raw materials, processes, products and after-sales meet the requirements of environmental protection standards and regulations by authentication of international environmental management system, thereby winning more market share. Therefore, international environmental management system is a kind of incentive-type environmental regulation. The process by which the enterprise passes the certification of international environmental management system through green technology innovation, green production, green process and other approaches has a certain degree of homology with green transformation of enterprises. Both international environmental management system and green transformation of enterprises have an impact on the company's environmental performance and economic performance, and aim at environmental protection. Accordingly, the following hypotheses are proposed:

H1. International environmental management system affect green transformation of enterprises positively.

Environmental awareness refers to the attitudes towards environmental-related issues, indicating the willingness to support for solving environmental problems and to contribute to solving these issues. Environmental awareness is a dynamic psychological process with many factors influencing it. Among them, environmental information, environmental education and environmental management plan are hot topics of research. A study of Bozoglu et al. (2016) showed that environmental attitudes are influenced by environmental education, environmental information, gender and other factors, among which environmental information has the strongest impact. Yilmaz (2016) studied the current situation of environmental awareness of residents in Canakkale, Turkey, and its influencing factors, and point out that the improvement of environmental awareness benefits from the effective implementation of environmental protection plans. Du et al. (2018), took rural residents in Beijing as the research object, confirmed that the improvement of rural infrastructure and the accessing of more environmental information help to improve the environmental awareness of rural residents, and the environmental management measures leverages a positive function on environmental awareness. International environmental management system is a project for environmental protection by improving processes, procedures and equipment. And, enterprise personnel can receive the latest international environmental information, in the process of authentication of international environmental management system. In addition, it's the best evidence of green ability of enterprise by obtaining the certification of international environmental management system, and thus could deliver more green information of enterprise to consumers, partners, government and other external entities. International environmental management system has many attributes that can affect environmental awareness, so it is considered that the international environmental management system has a positive impact on environmental awareness. Green transformation of enterprises is the combination of a variety of green behaviors. Although there are few studies on the interaction between environmental awareness and green transformation of enterprises, the promotion of environmental awareness on green behavior has been verified by many scholars. Ari & Yilmaz (2017) took the students of Eskishir middle school as the research object, and analyzed the influence of

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environmental awareness and environmental literacy on pro-environment behavior, pro-environment attitude and environment-friendly products by structural equation method. The results showed that environmental awareness promoted the research object to produce pro-environment behavior by changing the attitude towards environmental, and held a positive view to environment-friendly products. Lu et al. (2019) conducted a survey of young car buyers at a large public university in Texas, USA, which proved that environmental attitudes, quality and self-image had a positive impact on the purchasing intention of pro-environment products, while perceptual control had a negative impact on the behavior of environmental responsibility. Environmental awareness breeds green behavior. The higher the environmental awareness of the state, enterprises and consumers, the easier the green behavior will be, and the faster of green transformation of enterprises will be. Therefore, the following hypotheses are proposed:

H2. Environmental awareness plays a mediating effect between international environmental management system and green transformation of enterprises.

The economic benefits of foreign direct investment (FDI) have been proved by many scholars (Comes et al., 2018; Ahmad et al., 2019), but its impact on the environment of the invested country has not yet been determined. Pan et al. (2014) analyzed the spatial spillover effect of FDI on carbon emission intensity empirically. The results showed that FDI has a positive effect on carbon emission reduction in spillover areas and their surrounding areas. However, Jun et al. (2018) proved that FDI will increase pollution in the short and long term, but not in the medium term, so strict environmental regulations are needed to restrict foreign polluting industries entering China. Although scholars have not reached a unified conclusion on the environmental performance of FDI due to the differences in research perspectives, objects, methods and indicators, it is certain that FDI can change the environment of the invested country. And this change is constrained by environmental regulation and other factors. Hu (2018) believed that the intensity of environmental regulation affects the spillover effect of FDI on green technology progress rate. When the intensity of environmental regulation is low, labor-based FDI has significant negative spillover effect, and capital-based FDI has manifest positive spillover effect. When the intensity of environmental regulation is high, the negative impact of labor-based FDI has been completely restrained, while capital-based FDI still has obvious positive spillover effect. Environmental regulation not only restricts the environmental performance of FDI, but also has a significant impact on FDI itself. Yang (2019) proved that environmental regulation has a negative impact on FDI, but it is not obvious in national level. In addition, there are significant regional differences in the impact of environmental regulation on FDI. Environmental regulation is positively correlated with FDI in eastern China, negatively correlated with FDI in central China and negatively correlated with FDI in Western China. Most of the environmental regulation used in previous studies is restrictive-type policy tool, so the stronger the environmental regulation is, the less FDI will be attracted, under the hypothesis of pollution haven. However, international Environmental Management System is an incentive-type environmental regulation, it is additive rather than subtractive for investors. As a consequence, authentication of international environmental management system should attract more FDI. FDI has proven to have a significant impact on economy, environment and technology, and green transformation of enterprises is an integration of green behaviors that takes green innovation technology as the leading factor and achieving of economic and environmental win-win as the aim. Hence, the following assumptions are put forward:

H3. Foreign direct investment plays a mediating effect between international environmental management system and green transformation of enterprises.

Although there are few researches on the interaction between opening up and green transformation of enterprises, there are many researches on the impact of open policy on the elements of the green transformation of enterprises. The economic effect of opening up is most valued by academia. Xie et al. (2018) studied the causality among opening up, financial

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development and economic growth in China, and proved that there is a two-way causality between opening up and economic growth, financial development and economic growth, both financial development and opening up contribute to economic growth, but economic growth will inhibit opening up. The economic effect of opening up has passed the verification, but its environmental effect has been criticized by people. Environmental problems often accompany with energy consumption (Zhang, 2008; Katircioglu, 2014, Ju et al, 2017). Kyophilavong et al. (2015) proved that there is a long-term co-integration relationship among opening up, economic growth and energy consumption and they are Granger causalities each other. Alkhateeb & Mahmood (2019) further proved that changes in opening up and economic growth will have a significant positive effect on energy consumption in the short and long term. Energy consumption will increase with the increase of economic growth and opening up, thus adversely affecting the environment further. Opening up will aggravate environmental pollution without the environmental regulations, which coincides with the hypothesis of pollution refuge and so on. In addition, the higher the degree of opening up, the more the international exchange of production factors, technologies and ideas. Aguilera-Caracuel et al. (2012) believed that Chinese enterprises learning advanced foreign technologies and management methods in international trade, in order to enhance it's international image and the level of technological innovation. Opening up affects the main components of green transformation of enterprises, such as economy, environment, technology and ideological exchange. Therefore, it is believed that opening up has certain influence on green transformation of enterprises, which may be positive, negative or complicated. On the way to expand the opening up, trade barriers are a stumbling block for enterprises to export trade and the country to open to the outside world. Zhuang & Moore (2015) thought that technical barriers, green barriers, retaliatory economic sanctions and religious barriers are the main obstacles to poultry exports of US. Bianco et al. (2016) also reached a similar conclusion by studied on the world wine trade. They believed that the trend of tariff reduction will be compensated by stricter technical barriers and green barriers. The certification of international environmental management system is equivalent to obtaining a global green certificate, to help enterprises and the country to break down green barriers and expand opening up policy. Therefore, the following assumptions are made:

H4. Opening up plays a mediating effect between international environmental management system and green transformation of enterprises.

3.2. Model

It can be seen that international environmental management system not only has direct effect on green transformation of enterprises directly, but also has indirect effect through environmental awareness, foreign direct investment and opening up according to the theoretical analysis. Referring to the theory of Wen &Ye (2014), the research steps in this paper are as follows.

(1) For H1, model 1 is constructed to verify the total effect of international environmental management system on green transformation of enterprises, as shown in formula (1).

$$LnEGT = \beta_0 + cLnIEMS \tag{1}$$

EGT implies the green transformation of enterprises, *IEMS* implies the international environmental management system, and *c* implies the total effect of international environmental management system on green transformation of enterprises.

(2) This paper constructs three single-variable mediation models and studies the mediation effect of single mediation variable respectively. Formulas (2) form model 2, which represents a

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mediation model with environmental awareness (EA) as mediation variable; Formulas (3) form model 3, which represents a mediation model with foreign direct investment (FDI) as mediation variable; Formulas (4) form model 4, which represents a mediation model with opening up (OU) as mediation variable.

$$\begin{aligned} LnEA &= \beta_1 + a_1 LnIEMS \\ LnEGT &= \beta_2 + c'_1\ LnIEMS + b_1 LnEA \end{aligned} \tag{2}$$

$$\begin{aligned} LnFDI &= \beta_3 + a_2 LnIEMS \\ LnEGT &= \beta_4 + c'_2\ LnIEMS + b_2 LnFDI \end{aligned} \tag{3}$$

$$\begin{aligned} LnOU &= \beta_5 + a_3 LnIEMS \\ LnEGT &= \beta_6 + c'_3\ LnIEMS + b_3 LnOU \end{aligned} \tag{4}$$

Among them, *EA* represents environmental awareness, *FDI* represents foreign direct investment, *OU* represents opening up, a_1b_1, a_2b_2 and a_3b_3 represent the indirect effects of models 2, 3 and 4 respectively, and the direct effects of international environmental management system in this three models, including c_1', c_2' and c_3', and $c = c'_4 + a_1 b_{41} + a_2 b_{42} + a_3 b_{43}$.

(3) A multiple mediation model is built to verify H2, H3 and H4, and make a comparative analysis with the single-variable mediation model. Model 5 is constructed with environmental awareness, foreign direct investment and opening up as intermediary variables, as shown in Figure 1, which consists of formulas (5).

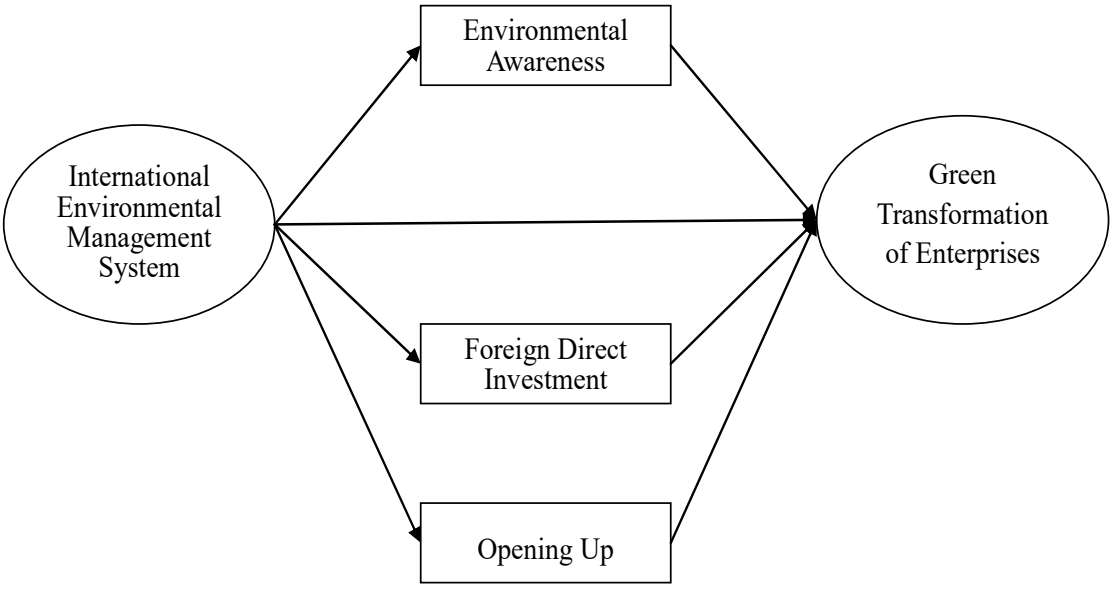

Fig 1. Model 5

$$\begin{aligned} LnEA &= \beta_1 + a_1 LnIEMS \\ LnFDI &= \beta_3 + a_2 LnIEMS \\ LnOU &= \beta_5 + a_3 LnIEMS \\ LnEGT &= \beta_0 + c'_4\ LnIEMS + b_1 LnEA + b_2 LnFDI + b_3 LnOU \end{aligned} \tag{5}$$

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a_1b_{41}, a_2b_{42} and a_3b_{43} represent the indirect effects of environmental awareness, foreign direct investment and opening up respectively, c'_4 represent the direct effects of international environmental management system in models 5, and $c = c'_4 + a_1b_{41} + a_2b_{42} + a_3b_{43}$.

3.3. Index and Data

3.3.1. Index

Explanatory Variable: As for green transformation of enterprises, scholars used comprehensive index system to evaluate its level mostly in the past, and the data were obtained through questionnaires, interviews and expert scoring. Although this variable can be expressed comprehensively, its subjective factors have great influence and the objectivity of evaluation results is limited. This paper intends to use the number of invention patent applications to represent the green transformation of enterprises, since the central role of green technological innovation in the green transformation of enterprises. The number of invention patent applications of enterprises above designated size is finally selected to represent the green transformation of enterprises based on the availability and reliability of data.

Core Explanatory Variables: International environmental management system, an abstract management concept, needs to be quantified in order to further analyze economic phenomena and build models. This paper intends to use the number of enterprises certified ISO14001 to represent international environmental management system, as ISO14001 standard is an important component of international environmental management system and is the most widely used environmental project.

Mediation Variables: according to theoretical analysis, three mediation variables are set up: environmental awareness (EA), foreign direct investment (FDI) and opening up (OU). Among them, environmental awareness is to be expressed by the total investment in industrial pollution control. The more investment in pollution control, the stronger environmental awareness will be. Foreign direct investment is expressed by the total amount of FDI. Opening is expressed by the ratio of total import and export to gross domestic product according to Xie et al. (2018).

3.3.2. Sample Selection

ISO14001 is the core part of the international environmental management system. Certification of international environmental management system mainly refers to ISO14001 certified. According to the ISO website, China has become the country with the largest number of ISO14001 certified enterprises in the world since 2007, and surpasses other countries. The number of enterprises certified ISO14001 in 2017 is shown in Figure 2. The Chinese number is about 7 times the second. The overall number of Chinese enterprises that certified ISO14001 is on the increase, as can be seen from Figure 3, especially after 2012, the number has increased rapidly. The reasons for this phenomenon may be as follows. Firstly, China is in an important stage of pursuing high-quality economic development and industrial structure upgrading, so enterprises with clean, efficient and green are needed to support its transition. Secondly, Chinese enterprises are moving from home to the international with the increasing degree of economic globalization. In order to better integrate into the international economic environment and improve their international competitiveness, international standards are needed to create corporate image. Finally, China is the second largest economy in the world with a large number of Chinese enterprises. Therefore, China has a large number of ISO-certified enterprises. Based on the above reasons, this paper chooses China as a sample for empirical research.

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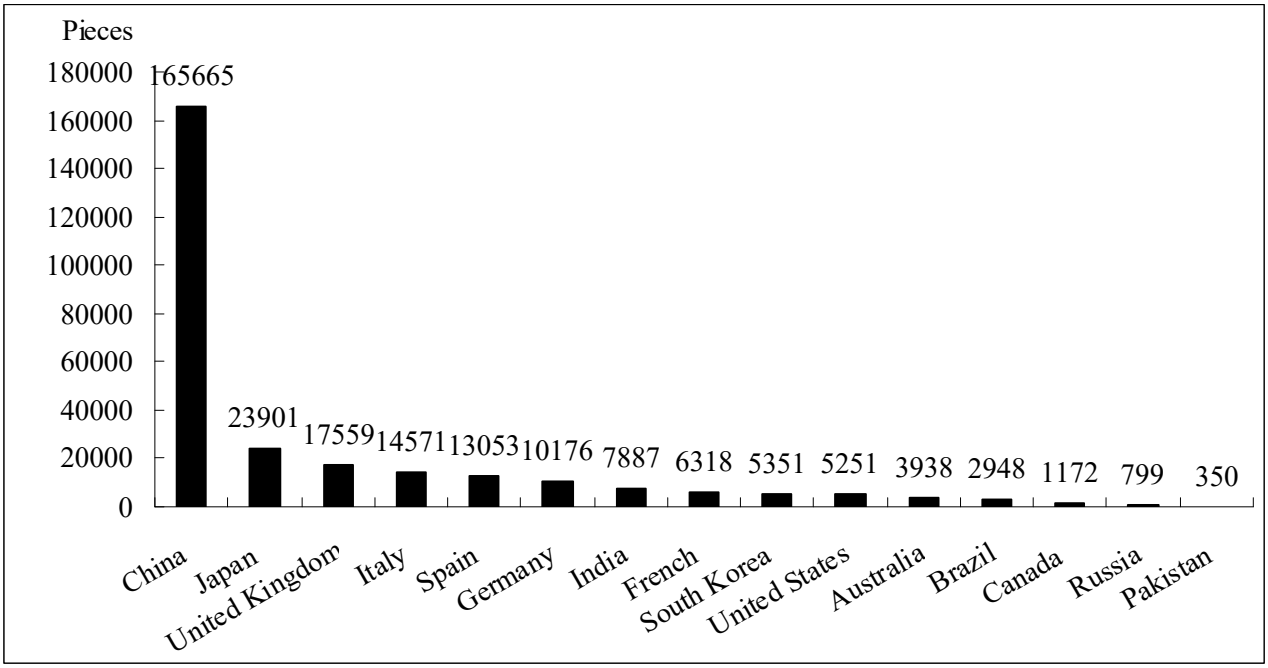

Fig 2. Number of enterprises in countries certified ISO14001 in 2017

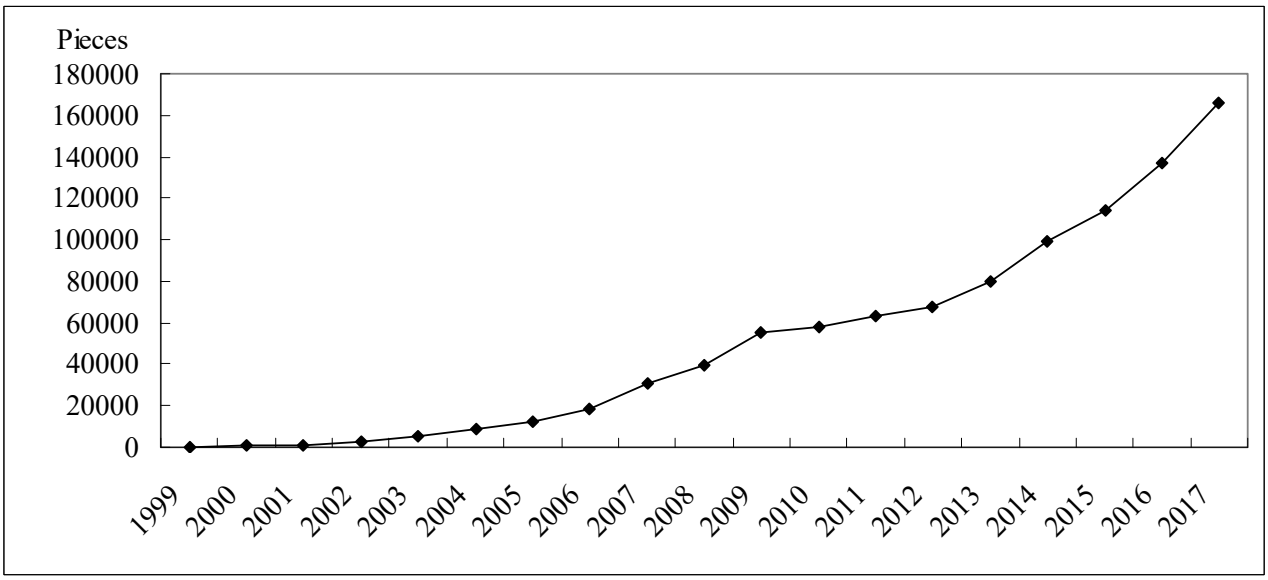

Fig 3. Number of enterprises certified ISO 14001 in China 1999-2017

3.3.3. Data

This paper selects time series data from 1999 to 2017 in China for empirical research. Among them, the number of enterprises certified ISO14001 comes from ISO website and China National Accreditation Committee for Conformity Assessment. The number of invention patent applications by enterprises above designated size, investment in industrial pollution control, total import and export, gross domestic product and FDI come from China Statistical Yearbook. The default data are supplemented by linear interpolation method. The original data are shown in Table 1. The data processing and analysis in this paper are completed by SPSS22.0.

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Table 1. Raw data

Years	Number of invention patent applications by enterprises above designated size (Pieces)	Number of enterprises certified ISO14001 (Pieces)	Investment in industrial pollution control (10,000 Yuan)	Total import and export (100 million Yuan)	Gross national product (100 million Yuan)	Foreign direct investment (10,000USD)
1999	1862	222	1527000	29896.23	90564.4	4031900
2000	2792	510	2347895	39273.25	100280.1	4071500
2001	3625	1085	1745280	42183.62	110863.1	4687800
2002	5770	2803	1883663	51378.15	121717.4	5274300
2003	9395	5064	2218281	70483.45	137422	5350500
2004	20456	8862	3081060	95539.09	161840.2	6063000
2005	18292	12683	4581909	116921.8	187318.9	6032500
2006	25685	18842	4839485	140974.7	219438.5	6302100
2007	36074	30489	5523909	166924.1	270092.3	7476800
2008	59254	39195	5426404	179921.5	319244.6	9239500
2009	92450	55316	4426207	150648.1	348517.7	9003300
2010	72523	58116	3969768	201722.3	412119.3	10573500
2011	134843	63460	4443610	236402	487940.2	11601100
2012	176167	67874	5004573	244160.2	538580	11171600
2013	205146	80292	8496647	258168.9	592963.2	11758600
2014	239925	98979	9976511	264241.8	641280.6	11956200
2015	245688	114303	7736822	245502.9	685992.9	12626700
2016	286987	137230	8190041	243386.5	740060.8	12600100
2017	320626	165665	6815345	278101	820754.3	13103500

4. Results and Discussion

This paper refers to the theory of Wen & Ye et al. (2014) to test the total effect, direct effect and intermediate effect of target variables. First, the significance of the total effect *c* is tested. If it is significant, the argument is based on the mediating effect. If it is not significant, the argument is based on the suppressing effect. Secondly, Bootstrap method is used to test the indirect effect. If the result is significant, the mediating effect holds, otherwise, the mediating effect does not hold. Finally, the significance of direct effect is tested. If it is not significant, it is a complete mediating effect, and if it is significant, it is a partial mediating effect. After the test is completed, report the total effect, direct effect and intermediary effect in each intermediary model.

4.1. Total Effect Test

Model 1 is used to test H1, i.e. the total effect of international environmental management system on the green transformation of enterprises. As shown in Table 2, international environmental management system effect green transformation of enterprises significantly and positively. For every 1% increase in enterprises that certified the international environmental system, the green transformation of enterprises increases by 0.8383%, H1 is supported, and the total effect *c* is 0.8383. In order to getting the certification of international environmental management system, the enterprise needs to adopt various technologies and management measures to meet the requirements of international standards, adopt clean energy, renewable raw materials, advanced green technologies, green processes and processes to reduce environmental pollution in the production process, optimize the organizational structure and management system, guide the behavior of enterprise personnel with green

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thinking, and take green innovation as the core competitiveness. The process of certification is also part of the green transformation of enterprises. Therefore, international environmental management system can accelerate the green transformation of enterprises.

Table 2. The results of model 1

Statistic	LnIEMS	R^2	ΔR^2	F
Value	0.8383***	0.9533	0.9506	347.3***

Note: *** indicates significant at 1% level.

4.2. Intermediate Effect and Direct Effect Test

In order to test the mediation effect and direct effect of each mediation model, this paper uses the Process plug-in developed by Hayes to carry out percentile Bootstrap test, sets the sampling number to 5000, and selects a 90% confidence interval. If there is no zero value between LLCI and ULCI of the tested effect, the result is significant, otherwise the result is not significant (Hayes, 2013).

(1) Single-variable mediation model

The test results of the three single variable mediation models are shown in Table 3. Only FDI plays a significant mediating role, while environmental awareness and opening up are not significant. In model 3, the indirect effect of FDI accounts for about 60%, which indicating that FDI is one of the most important ways for international environmental management system to promote green transformation of enterprises. The direct effect of the international environmental management system on green transformation of enterprises is significant, indicating that there are other mediation variables besides FDI. In model 2, the direct effect of international environmental management system accounts for more than 80%. In model 3, due to the negative effect of opening up on the green transformation of enterprises, the direct effect of the international environmental management system is greater than the total effect. If the mediating effect is established, model 3 is a suppressing effect model.

Table 3. Bootstrap test of single-variable mediation models

		Value	Bootstrap SE	LLCI	ULCI	Relative effect
Model 2	Total Effect	0.8383	0.0450	0.7601	0.9166	100%
	Direct Effect	0.6919	0.1008	0.5158	0.8679	82.54%
	Indirect Effect of EA	0.1464	0.0897	-0.0344	0.2559	non-significant
Model 3	Total Effect	0.8383	0.0450	0.7601	0.9166	100%
	Direct Effect	0.3397	0.0868	0.1882	0.4912	40.52%
	Indirect Effect of FDI	0.4986	0.0703	0.3847	0.6074	59.48%
Model 4	Total Effect	0.8383	0.0450	0.7601	0.9166	100%
	Direct Effect	0.8491	0.0302	0.7964	0.9017	101.29%
	Indirect Effect of OU	-0.0108	0.0429	-0.0669	0.0624	non-significant

(2) Multiple mediation model

The direct and indirect effect test results of model 5 are shown in table 4. Environmental awareness plays a significant mediating role. H2 is supported, and its mediating effect accounts for 13.71% of the total effect. The certification of international environmental management system is a process of learning and receiving environmental information for the country, enterprises and consumers. Relevant departments of the state need to be familiar with the evaluation standards in order to exercise the right to authentication. Enterprises must master the contents of international standards in order to conduct authentication. Consumers

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acquisition the relevant information in consumption. The dissemination, exchange and implementation of environmental information generate pro-environmental behaviors by strengthening environmental awareness, thus promoting the green transformation of enterprises. FDI plays a significant mediating role, H3 is supported, and its proportion of indirect effect is 42.76%. Certified international environmental management system is the proof of quality and performance of product, green technology, status of enterprise. The more certified enterprises, the stronger the competitiveness of the country in the global green economy competition, and the higher the possibility of obtaining greater benefits. Therefore, more FDI is attracted. High-quality FDI, such as capital investment and technology investment, promote green transformation of enterprises by providing material, technical, talent and other supports for green transformation of enterprises. The difference between the indirect effect of environmental awareness and FDI is -2.836, but the difference is not significant, which shows that environmental awareness and FDI are equally important, just difference in size. The mediation role of opening up is not significant and H4 is not established. The possible explanation is that China exports a larger scale of intermediate and primary products and products with low and medium technology content compared with developed countries such as the United States and Japan, thus it is less restricted by the international environmental management system. The greater the degree of opening up, the greater the economic benefits the enterprises will obtain, and the demand for high-quality green development will be reduced. Therefore, opening up will have a negative impact on green transformation of enterprises.

Table 4. Bootstrap test of multiple mediation model

		Value	Bootstrap SE	LLCI	ULCI	Relative effect
Model 5	Total Effect	0.8383	0.0450	0.7601	0.9166	100
	Direct Effect	0.3686	0.1222	0.1534	0.5839	43.97
	Total Indirect Effect	0.4697	0.1335	0.2723	0.6878	56.03
	Indirect Effect of EA	0.1150	0.0531	0.0215	0.1935	13.71
	Indirect Effect of FDI	0.3585	0.1291	0.1566	0.5733	42.76
	Indirect Effect of OU	-0.0038	0.0264	-0.0285	0.0315	non-significant
	EA-FDI	-2.836	0.1699	-0.5567	0.0013	
Model 6	Total Effect	0.8383	0.0450	0.7601	0.9166	100
	Direct Effect	0.2378	0.0858	0.0873	0.3883	28.37
	Total Indirect Effect	0.6005	0.0874	0.4721	0.7409	71.63
	Indirect Effect of EA	0.1180	0.0527	0.0217	0.1957	14.08
	Indirect Effect of FDI	0.4825	0.0804	0.3644	0.6040	57.56
	EA-FDI	-0.3645	0.1041	-0.5302	-0.2049	

(3) Model Adaptation

Based on the above results, it can be seen that opening up does not play a significant role in both single-variable and multiple mediation models, so opening up has be eliminated to improve the accuracy of the model. A multiple mediation model, model 6, is built based on environmental awareness and FDI, as shown in Figure 4. According to Bootstrap test results, as shown in Table 4. The direct effect of the international environmental management system has decreased by 15.6% compared with model 5, which further indicates the possibility of suppressing effect of opening up. The mediating effect of environmental awareness is still significant, with the mediating effect accounting for 14.08%, 0.37% higher than model 5, a very small floating range. The mediating effect of FDI is still significant and the proportion of the effect rises to 56.03%, rise 13.27% compared with model 5. The reasons maybe that FDI and opening up is both international economic activities, and there should be a certain interaction

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among them. Therefore, removing the factors of opening up will result in a substantial change in the mediating effect of FDI. The difference between environmental awareness and FDI has changed from insignificant to significant after the adaptation, which indicates that the path of FDI is more important than environmental awareness. The direct effect of the international environmental management system is 0.2378, and it is significant at the level of 1%, which indicates that there are still other intermediaries besides FDI and environmental awareness that influence the promotion of the international environmental management system on green transformation of enterprises, and further exploration can be made in the future.

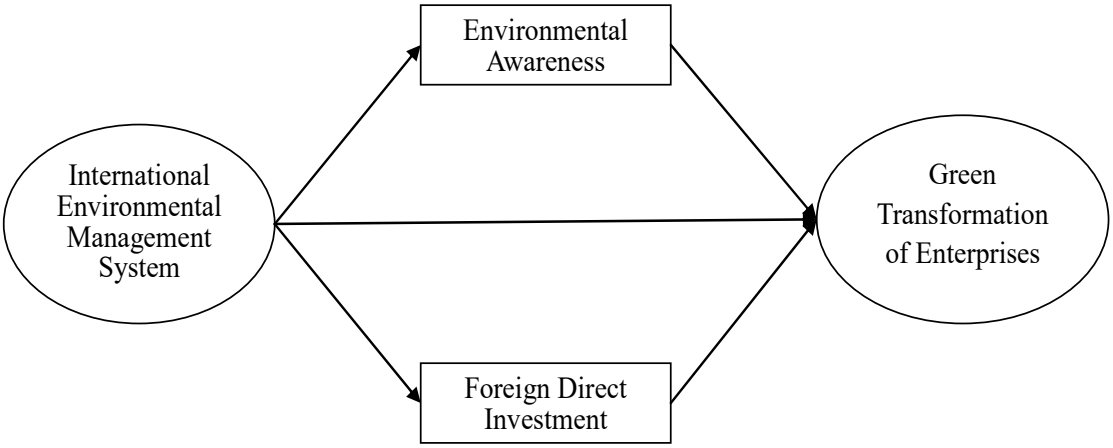

Fig 4. Theoretical structure of model 6

5. Conclusions and Policy Implications

In this paper, the following conclusions are obtained through empirical research.

(1) International environmental management system can effectively promote green transformation of enterprises. This conclusion is in line with the "Porter Hypothesis" -- appropriate environmental regulations can promote technological innovation and bring profits to enterprises. Through certification of international environmental management system, enterprises can improve their green technological level, green production efficiency, international environmental reputation and other green competitiveness, thus obtaining dual economic and environmental performance and realizing green transformation of enterprises.

(2) International environmental management system affects the green transformation of enterprises indirectly through environmental awareness of relevant personnel or organizations. The enterprise adjusts its internal organization, production, sales, technology, talents and other related components according to international environmental standards to make it cleaner, more efficient, environmentally friendly and in line with certification standards. Environmental awareness of relevant personnel in the enterprise has been strengthened through conscious learning and subtle influence. Environmental awareness promotes the green behaviors of enterprise managers, technicians and other related parties, thus promoting the green transformation of enterprises.

(3) International environmental management system affects the green transformation of enterprises through FDI indirectly. The certification of international environmental management system can improve the competitiveness of products the image in the world, so then attract more high-quality international investment. Advanced concepts, technologies and talents that come with international investment are powerful driving forces for green transformation of enterprises.

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(4) Opening up cannot be used as a path for environmental management system to promote green transformation of enterprises. Opening up has a significant negative impact on the green transformation of enterprises, indicating that the existing industrial structure and foreign trade structure of China are not conducive to the green transformation of enterprises. Because of the international environmental management system has no significant influence on opening up, the mediation role of opening up is not established.

Based on the above analysis results, this paper puts forward the following suggestions to accelerate the green transformation of enterprises.

(1) On the level of macro. First of all, the government should start with FDI with the most obvious mediation effect, attract foreign investment selectively, attract foreign investment actively while avoid foreign investment with high pollution and energy consumption, and avoid becoming a pollution refuge. Second, incentive mechanisms should be set up, such as preferential treatment of certification fees, subsidies, bonuses, setting project thresholds, etc., to guide enterprises to certify the international environmental management system. Third, exports of resource-intensive products should be reduced, and exports of technology-based and environment-friendly products should be increased. Finally, relevant departments should do a good job in the publicity of the international environmental management system, make public of the information of the certificated enterprise in time. Environmental awareness be strengthened through the widely dissemination of environmental information, the necessity and importance of green behavior be carry out ideologically, so as to promote the green transformation.

(2) On the level of medium. Enterprises are the executors of the certification of international environmental management system and the green transformation, and are the key to the coordinated development of economy and ecology. First of all, enterprises must understand the importance and feasibility of the international environmental management system correctly. Enterprises certify the international management system actively when conditions are ripe to improve their hard and soft power. When enterprises are short of funds, talents and other resources to participate in certification, they should try their best to carry out production and management according to the standards of the international environmental management system to prepare for serious work in the future. Secondly, enterprises should take the initiative to step onto the international stage in the right time. On the one hand, the big cake of the international economy could be shared. On the other hand, more foreign capital could be attracted to make the domestic cake bigger. Finally, the enterprise should strengthen the personnel environment knowledge, especially the senior management personnel. Managers understand environmental information, strengthen environmental awareness and then produce green behaviors, and transmit green concept and green behavior to the entire enterprise through the organizational structure quickly.

(3) On the level of micro. Consumers are the most terminal on the demand side, the fundamental source of corporate profits, and the main driving force for corporate green transformation. The primary task of consumers is to establish the concept of green consumption and increase the demand for green products and services, thus forcing enterprises to accelerate the green transformation. Secondly, consumers should play the role of public supervision. On the one hand, it is to supervise the legitimacy and effectiveness of the certification process, so as to ensure that enterprises that pass the certification are really green enterprises that meet the requirements of environmental management. On the other hand, it is to supervise whether the certified enterprises implement environmental management standards in daily production, sales and service. Finally, consumers should improve their green cultivation and knowledge reserves, arm behaviors with green thought, to lay a solid foundation for participating in green development of social.

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