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Original Research

Uncovering the Motives to Adopt Voluntary Environmental Management: An Organizational Legitimacy Perspective

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Abstract

In recent years, voluntary environmental management has gradually attracted the attention of entrepreneurs and researchers. As a typical form of environmental management, it clearly demonstrates the growth of corporate environmental awareness. Based on the perspective of organizational legitimacy, this study explored firms' motivations to adopt voluntary environmental management with the data of 104 Chinese manufacturers. The results from fuzzy set qualitative comparative analysis (fsQCA) showed that both internal and external legitimacy could lead to the implementation of voluntary environmental management. However, the stimulating effect of internal legitimacy on voluntary environmental management was greater than external legitimacy. In addition, there was a certain complementarity between internal legitimacy and external legitimacy. This study provided theoretical guidance for cultivating corporate environmental awareness and promoting the popularization of voluntary environmental management.

Keywords: organizational legitimacy, voluntary environmental management, environmental awareness, fsQCA

Introduction

With the development of society, an increasing number of firms recognize the importance of cleaner production and sustainability. In this context, voluntary environmental management (VEM) is sought after by manufacturing industry. According to Blackman [1], VEM refers to the environmental agreements, commitments, criteria, plans or behaviors initiated by industry associations, companies themselves or other entities. Different from mandatory environmental rules, firms can freely choose whether to participate these kinds of regulations [1, 2]. This means that the binding force of VEM mainly stems from subjective factors such as corporate social responsibility and strategic orientation. In general, VEM includes various forms, such as information disclosure, management certification, eco-labeling, and environmental agreements [2, 3]. Among them, ISO14001 certification is the most popular.

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Although VEM has been widely recognized by industries and a number of high-tech companies have joined them, considerable investment is required in their implementation processes. Taking the ISO14001 certification as an example, this kind of standard was first promulgated and implemented by the International Organization for Standardization in 1996. As a new way to improve the environmental performance of companies or other organizations, it defines the basic elements of an effective environmental system, including corporate environmental programs, target settings, implementation plans, performance monitoring tools, problem correction and system evaluation [4]. Due to the large number of elements covered, the process of ISO14001 certification is very cumbersome and requires a certain fee to be paid in terms of the actual situation of the enterprise. Then, the question arises as to why companies voluntarily implement such an environmental management system that does not have legal enforcement.

In view of the above problem, the existing research is mainly analyzed from two perspectives. From the perspective of economic benefits, some scholars believed that firms adopt VEM in order to promote their environmental awareness to the public, and thereby enhanced the corporate image and obtained a higher market share [5]. According to this logic, the conduct of VEM is because its overall benefits can offset the preliminary cost and even bring extra profits [1]. On the other hand, based on the perspective of institutional theory, relevant research indicated that the formulation of business decision did not depend solely on economic benefits. Factors such as government intervention, market demand, and social responsibility and expectations often played a more critical role [6]. Supporters of institutional-driven perspective believed that the emphasis of government on environmental regulation would spur firms to circumvent punishment through technological improvements and innovations [7, 8]. Under the impact of the institutional environment, the rewards that firms can get depends mainly on whether their behaviors and processes are appropriate and whether they can obtain support from external stakeholders [9, 10]. Since firms' VEM has strong social attributes, and its implementation results will directly affect external stakeholders. In this study, we attempt to explore the motivations of enterprises to adopt VEM from the perspective of institutional theory.

Several studies have discussed the stimulating effect of organizational legitimacy on firms' VEM. For example, Wang et al. [11] analyzed the determinants of firms' voluntary environmental commitment in terms of external legitimacy. They believed that, compared with mandatory rules, public pressure had a more significant effect on the voluntary compliance of enterprises. Ortas et al. [12] also explored the motivations of voluntary environmental behaviors with the consideration of institutional environment. They pointed out that external legitimacy and internal factors played equally important roles in corporate voluntary environmental behaviors. In addition, a few scholars highlighted that firms adopted VEM in order to obtain the advantages of institutional innovation [13]. Unfortunately, the above studies do not carefully classify and compare related legitimacy factors, thus it is difficult to recognize the key elements among them. Also, it should be noted that these studies are mainly limited to the explorations of heavy polluting industries, neglecting the discussions on the innovative effects of VEM in lightly polluting industries.

Considering these research gaps, this study constructed a novel theoretical framework to explore the legitimacy driving force of VEM from the dimensions of inside and outside. To test the proposed framework, we used fuzzy set Qualitative Comparative Analysis (fsQCA) to distinguish the effect of all related factors with the data from 104 Chinese manufacturers (including both heavy polluting industries and lightly polluting industries). By doing so, this research not only extended the theoretic field of environmental management, but also provided guidance for the cultivation of environmental awareness for manufacturers.

Organizational Environmental Legitimacy

According to the institutional theory, firms will gradually adapt to the macro-institutional environment in which they operate in the long-term business process. During this process, the organizational structure, strategic planning and business practices of enterprises will show the trend of assimilation. This phenomenon is resulted from organizational legitimacy. Generally, existing research defines organizational legitimacy as the process by which an organization obtains status authorization in a given context [9, 14]. The "legitimacy" referred to here is not in the traditional sense of compliance with the law, but emphasizes that the organization's business decisions are in line with the expectations and requirements of the public and stakeholders [9]. As for corporate environmental responsibility, passive implementation of mandatory environmental regulations is difficult to meet public expectations for environmental protection and sustainable development [15]. Therefore, firms need to take the initiative to adopt VEM to make up for the expected gap.

The effect of organizational legitimacy on corporate environmental behavior can be generated from the external pressure, such as industry standards and public pressure [9, 16]. Deephouse and Carter [14] pointed out that firms in the business process are generally affected by three kinds of external factors, namely, mandatory factors, normative factors and imitative factors. Meanwhile, some scholars believed that the external institutional factors do not necessarily

promote the assimilation of organizational behavior, and the driving force originating from firms' inside also played a key role. For example, even in the same external institutional context, the environmental behaviors adopted by enterprises might be significantly different. The research of Wesselink et al. [17] further showed that the environmental awareness of top management and the recognition of cleaner production within the firm directly affected the corporate's environmental behaviors and decision-making. This study deems that the VEM of enterprises is to obtain organizational legitimacy. Therefore, it is necessary to consider the role of external and internal factors at the same time.

The external legitimacy forces of VEM are mainly stemmed from the requirements and expectations of external parties. This study mainly refers to the viewpoint of [9], and divides the external legitimacy incentives of VEM into mandatory force, normative force and imitative force. Among them, the mandatory force refers to the compulsory pressure exerted on enterprises by the government or other organizations through the formulation of laws, regulations and policies [18]. The normative driving force usually has large differences, which are determined by the social expectation or business characteristics of the firm [16]. For example, the public often expect more environmental behaviors from enterprises and the retailers usually have certain requirements for the supplier's environmental management. Different from the above two, the imitative force is mainly rooted in the moral pressure faced by enterprises [9, 18]. That is, when the industry or the public is actively responding to environmental protection and sustainable development, a focal firm will keep as much as possible to the majority of other enterprises in order to maintain its social image.

On the contrary, the internal legitimacy incentives of VEM mainly come from the demands of firms' managers, stakeholders and other internal parties for organizational development. Through the investigation of Chinese industrial enterprises, Yang and Zhou [19] pointed out that the role of internal legitimacy in the voluntary compliance of firms was mainly determined by the following three driving forces. The first one is the strategy-oriented force, including the firm's overall environmental strategy and the attitude of the executive team to environmental protection and sustainable development. The second is the knowledge-oriented force, which mainly involves employees' education level and social responsibility awareness. The third is the experience-driven force, including the organization's production practices and past environmental experience. Berrone et al. [20] supplemented the viewpoint of Yang and Zhou [19], and they believed that in addition to the three driving forces, the implementation of VEM was also triggered by corporate social responsibility.

External Forces of VEM

Mandatory Force

The mandatory driving force is irresistible, and enterprises will inevitably be bound by the force in order to maintain normal operations. According to the viewpoint of Zeng et al [21], this study selected industrial regulation strength and regional control strength as the representative variables of mandatory driving force.

Industrial Regulation Strength

Generally, in the process of business operations, the mandatory driving force of enterprises is mostly derived from relevant laws, regulations and criteria. According to Yang and Wang [22], the warnings and punishments from the government or industry associations on firms' environmental behavior might drive firms to improve their own environmental performance through independent innovation and environmental management system. Judging from the classification of environmental regulations, the rules and policies formulated by government agencies and industry associations have the strongest regulatory effect. For heavy polluting industries, high sewage inputs will exert great pressure on their operation. Under such circumstances, many enterprises will take the initiative to adopt environmental behavior to reduce their long-term cost [8]. In addition, based on signaling theory, firms under strict industrial regulations may actively disclose their environmental governance performance and environmental behaviors in order to show their external legitimacy to the environmental departments and associations [23]. Therefore, we believe that high industrial regulation strength can encourage firms to adopt VEM.

Regional Control Strength

In addition to the mandatory driving force from the government and industry regulations, the environmental control strength of the firm's location will also have an impact on corporate voluntary environmental behavior [21]. In order to avoid the negative impact of the bad environmental performance on the whole region, the local governments or relevant departments will try to enhance the overall environmental performance of the local firms through various approaches [24], such as, setting extra sewage standards, increasing environmental subsidies, carrying out professional environmental training, and punishing unsuccessful enterprises. These regional controls may trigger local firms to conduct VEM to some extent. More importantly, as the environmental performance in the region increases, the overall environmental awareness and environmental governance capacity of the local

firms will also increase, which creates an intangible environmental pressure within the region [25]. Based on the above theoretical review, we believe that regional control strength is one of the mandatory forces for firms to conduct VEM.

Normative Force

Different from the mandatory factors, the normative driving force is mostly derived from the social or business conditions closely related to firms' production and operation, such as the industrial context, the environmental organizations, the public and the trade requirements. Drawing on the research of Li et al. [26], this study selected the social environmental expectation and the green trade barriers as the proxy variables of normative driving force.

Social Environmental Expectation

By collecting the social responsibility reports of listed companies, it can be found that most of firms that have disclosed environmental pollution information in the report belong to manufacturing, and the quality of environmental information disclosure is positively correlated with the pollution level of the industry. In fact, for heavy polluting enterprises, deliberately concealing environmental pollution information may reduce their social credibility, which is not conducive to firms' development [27]. Several studies indicated that, different from other companies, heavy polluting companies should face higher social environmental expectation, which stemmed from public requirement for environmental protection and from media concerns as well [28, 29]. Based on the theory of social responsibility, Ortas et al. [12] believed that self-environmental behavior of enterprises was closely related to the social expectation and responsibility they face, and those firms that were concerned by the society were more likely to adopt VEM. In terms of the above theoretical review, we believe that social environmental expectation can encourage firms to adopt VEM.

Green Trade Barriers

Apart from to the public expectation and social pressure, VEM is also affected by trade barriers and international requirements. Through the investigation of firms' supply chains, scholars found that many multinational companies required high environmental literacy in the upstream and downstream of their supply chains [30]. For example, both Ford and General Electric require their suppliers to have ISO14001 certification. As a traditional manufacturing country, China undertakes the production and processing of many trade products, and these products will inevitably encounter green trade barriers when exporting [31]. According to the exploration of corporate internationalization, Li and Jiang [32] found that the environmental awareness of Chinese enterprises was significantly related to the green trade barriers they face. Since Europe and the United States pay great attention to corporate environmental literacy, many companies would actively disclose their environmental information or put "green labels" on their products to enter the overseas market [31, 32]. Based on the above review, we propose that green trade barriers can trigger firms to adopt VEM.

Imitative Force

In the field of economics, decisions that consciously imitate other individuals or organizations are called "herd behavior". It is generally believed that this imitative behavior is mainly attributed to environmental uncertainty and the formation of information waterfalls [33]. According to institutional theory, the convergence between organizations is defined as "institutional isomorphism" [33, 34]. Under the complex external environment, the imitative driving force is the most important factor leading to institutional isomorphism. Through the investigation to Chinese industrial enterprises, Zeng et al. [21] found that mandatory and normative driving forces were the main external incentives of the initial stage of VEM, while the imitative driving force played a key role in maintaining corporate environmental behavior. Nikolaeva and Bicho [35] also believed that when the VEM was made into a potential system generally recognized by the industry, the firms in the industry would intentionally or unintentionally imitate the environmental behavior of the peers and regard it as a demand of organizational legitimacy. In terms of the above theoretical review, we believe that the popularity of VEM among peers can encourage firms to conduct VEM.

Internal Forces of VEM

Strategic-Oriented Force

Strategic orientation, as the directional principle of corporate decision-making, is regarded as one kind of business philosophy [36]. In general, the strategic orientation is mainly determined by the will of the executives as well as the nature and development purposes of the company [37]. Many enterprises try to shape their business environment by adjusting and improving the strategic orientation [36]. From the perspective of institutional theory, corporate strategic orientation can be seen as an internal driving force formed by counter-replication between internal factors [37]. This driving force can affect the firm's product innovation, R&D, market decisions and environmental behavior.

Wheelen et al. [36] believed that the role of strategic orientation in corporate environmental behavior could be manifested in many forms. For example, heavy polluting companies tend to reduce pollutant

emissions by improving production equipment, while strategic emerging firms tend to enhance environmental performance through technological innovation and process improvement [28]. Through the investigation to corporate environmental awareness, Gadenne et al. [38] found that when the implementation of environmental strategies was negative, the firm's voluntary environmental behaviors was often passive, and when executives present greater passion on environmental strategies, the corresponding environmental behaviors was generally voluntary and positive. Other studies also showed that corporate voluntary environmental actions were positively correlated with top managers' initiative of strategic orientation [25, 39]. Based on the above theoretical review, we propose that the implementation of environmental strategy can encourage firms to adopt VEM.

Responsibility-Oriented Force

It had been tested that corporate social responsibility would significantly affect their operations and decision-making [12, 40]. In the research of corporate social responsibility reports, Shaukat et al. [41] found that firms with strong social responsibility had relatively high environmental performance. The research of Jiménez-Parra et al. [42] on heavy polluting enterprises further revealed the positive influence mechanism of social responsibility on corporate VEM. In terms of the stakeholder perspective, Yu and Ramanathan [43] found that firms' emphasis on stakeholder interests would indirectly improve their environmental performance. This is due to the fact that many stakeholders have expectations for firms' VEM. Chuang and Huang [40] discussed the relationship between corporate social responsibility and environmental behaviors, they pointed out that firms with strong social responsibility would increase their green IT capital, which further triggered VEM and improved environmental performance. Based on the above theoretical review, we believe that corporate social responsibility is also an important incentive for firms to adopt VEM.

Knowledge-Oriented Force

According to organizational learning theory, firms' internal improvements and changes are closely related to their absorptive capacity, information literacy, and attitude toward new knowledge [44]. García-Peñalvo and Conde [45] found that in a dynamic organizational environment, the knowledge reserves and learning ability of employees had an important impact on business decision-making. This study defined the above traits as employee knowledge literacy. From an institutional perspective, the higher the overall knowledge literacy of the firm, the easier it is to form an institutional power based on shared values [46]. Therefore, a high level of knowledge literacy contributes to the implementation of corporate change. In terms of individual attitudes toward environmental protection, employees with better knowledge stock tend to have stronger environmental awareness and more environmental knowledge, and hold a deeper understanding of new ideas and systems [47]. In terms of the above theoretical review, we believe that employee knowledge literacy can encourage firms to adopt VEM.

Experience-Oriented Force

Based on organizational inertia theory, when the enterprise operating system enters a relatively normal state, the firm will prefer to carry out business activities along the existing path, except for the influence of external forces [48]. Ghattas et al. [49] found that firms' past experience had a significant impact on their subsequent management activities and business decisions, and changes that were compatible with organizational practices were often more easily accepted by employees. This path dependence is also reflected in corporate environmental behavior. For example, an enterprise that has passed ISO14001 certification is more likely to join a voluntary environmental agreement [50]. Blanco et al. [51] pointed out that firms were willing to adopt VEM, not only because of laws, regulations and environmental awareness but also due to the economic benefits behind it. In general, firms that have already implemented VEM will continue to maintain it because they can use the experience gained previously to achieve more efficient voluntary regulation with a lower cost [52, 53]. Based on the above theoretical review, we believe that past VEM experience can motivate firms to adopt new VEM.

Method and Data

Research Method: fsQCA

The traditional regression analysis method focuses on the "net effect" of the independent variable, that is, analyzing the direct effect of each independent variable on dependent variable after excluding the influence of other variables. However, this study was devoted to exploring the motivations of VEM and involved many factors which might have strong correlations between each other, thus it was more appropriate to use fuzzy set qualitative comparison analysis (fsQCA) to conduct empirical testing. In the field of social science, fuzzy set is a relatively new concept. This terminology was first proposed by Smithson [54], and then Ragin [55] combined it with qualitative analysis and constructed the basic principle of fsQCA. At present, this analytical method has been widely used in many research fields such as politics, sociology, and management [56].

fsQCA is rooted in Weber's experimental idea, that is, for **n** variables, there are **2n** possible logical observation levels, and the number of logical condition configurations is as high as **3n-1** [55]. We can judge

the most explanatory configuration by constraining two key parameters of Consistency and Coverage, and finally realize the theoretical explanation [54]. Consistency evaluates how well the logical conditional configuration matches the sample data. The closer the value is to 1, the higher the degree of consistency, and when the value is lower than 0.75, it can be considered that the corresponding configuration cannot be satisfied under the existing sample data. Coverage describes the degree to which each conditional configuration explains the results. This parameter can be used to distinguish the effects between different configurations [56]. Different from regression, fsQCA can analyze and compare the role of multiple factors on the outcome variable in the case of smaller samples [55].

Data Collection

This study considered Chinese manufacturing firms as research samples. Different from previous studies which mainly focused on the environmental behaviors of heavy polluting industries, we selected the sample from both heavy polluting industries and lightly polluting industries. In addition, to improve the availability of data, this study only targeted the listed firms. Considering the differences in China's regional economy and the distribution of manufacturers, we respectively selected 70, 70, 40, and 20 firms from the eastern, southern, northern, and western regions as observational samples. The 200 firms are from 24 cities which include both big cities (e.g., Beijing, Shanghai) and small ones (e.g., Hengyang, Liaocheng). The data collection process for this study was as follows. First, we used the questionnaire survey to obtain the indicators of internal legitimacy force and some basic information of listed firms. Then, through the retrieval of relevant databases and the collation of public information, we obtained the latest indicators of external legitimacy forces of firms that had participated in the survey. Finally, the VEM data of the target firms were collected from the website of the China National Certification and Accreditation Administration.

The strategy-oriented, responsibility-oriented and knowledge-oriented forces were measured by Likert 7-level scales, while experience-oriented force was captured by objective item. Before the questionnaire design, we collected and sorted the mature metrics in the fields of environmental strategic orientation, corporate social responsibility and employee literacy, and selected the scales closest to the research situation. After the metrics were determined, the "translation-back translation" method was used to improve the accuracy of the representation.

To avoid common method variance which can occur when the independent and dependent variables originate from the same source, we used dyadic data derived from two interval surveys. The first-round survey was initiated in April 2019. We connected one senior manager in the target firms and asked them to complete the questionnaire, which simply contained the basic information and the measurement of environmental strategic orientation and corporate social responsibility. Half a month later, 142 valid questionnaires were received. After three months (an appropriate interval for removing deviations), we asked another senior manager in the firms that offered effective responses in the first stage to answer questions regarding employee knowledge literacy and past VEM experience.

Table 1. Descriptive statistics of samples.

Variable	Option	Quantity	Percent	Variable	Option	Quantity	Percent
Gender	Male	123	59.1	Firm scale	Under 300	6	5.8
	Female	85	40.9		301-700	33	31.7
Age	Under 25	0	0		701-1000	37	35.6
	26-35	124	59.6		Over 1001	28	26.9
	36-45	69	33.2	Firm age	1-5 years	5	4.8
	Over 46	15	7.2		6-10 years	31	29.8
Education background	Under bachelor	21	10.1		11-20 years	50	48.1
	Bachelor	157	75.5		Over 20 years	18	17.3
	Master	27	13.0	Industry	High-end equipment manufacturing	21	20.2
	Doctor	3	1.4		New material	24	23.1
Seniority	1-3 years	0	0		Bio-pharmaceutical	19	18.3
	4-6 years	33	15.9		Metal smelting	19	18.3
	7-10 years	83	39.9		Petroleum processing	14	13.4
	Over 10 years	92	44.2		Food manufacturing	7	6.7

2 weeks later, 104 valid responses were acquired from the second-round survey; consequently, we collected integrated data of 104 listed manufacturers. The descriptive statistics of the valid sample are shown in Table 1.

Measures

Internal Legitimacy Forces

In view of environmental strategy orientation (*I1*), this study main referred to Banerjee et al. [53], and measured it with four items, all of which were scored using Likert 7-point item. To measure the corporate social responsibility (*I2*), this study used a mature scale proposed by Turker [57]. This scale had been widely used in the field of business ethics and corporate environmental behavior. As for the employee knowledge literacy (*I3*), this study mainly referred to the viewpoint of Wang [58], Chang and Hsu [59] and developed a scale with five items from the perspectives of the ability to use knowledge and the level of knowledge stocks.

The past VEM experience (*I4*) was measured with a dummy. If the firm conducted any other kinds of VEM before the implementation of ISO14001, it was recorded as "1", otherwise recorded as "0". The other VEM mainly included information disclosure, environmental agreements, forest certification and green product labels. The complete scales of the internal legitimacy forces were provided in Appendix 1.

External Legitimacy Forces

This study mainly defined the mandatory driving force faced by firms from two aspects. For the industrial regulation strength (*E1*), we referred to the point of Yuan and Xiang [60] and selected the ratio of the annual operating costs of wastes and the sum of pollution control investments to the total industrial output value as the metrics. All of these data were collected from China Industrial Database, which was one of the authoritative databases for industrial research. For the regional control strength (*E2*), we measured it with the 'Pollution Information Transparency Index' (PITI). PITI is provided by the Institute of Public & Environmental Affairs (IPE) and The Natural Resources Defense Council (NRDC) since 2008, and it reveals the transparency of pollution and policy information of respective cities and has been used as an important indicator of environmental governance [61].

Normative driving forces were also analyzed from two dimensions. For social environmental expectation (*E3*), existing research generally indicated that, due to the higher media exposure, social environmental expectation faced by heavy polluting enterprises was significantly higher than that of lightly polluting enterprises [28]. This study drew on the above viewpoint and measured the social environmental expectation with a dummy. If the enterprise belonged to the heavy polluting industry, it was recorded as "1", otherwise recorded as "0". For the green trade barriers (*E4*), there were currently no specific measures. Zhao [31] believed that the green trade barriers faced by enterprises were significantly positively correlated with their product export quotas. Therefore, this study used the proportion of products exported by the firm as a measure of green trade barriers.

Finally, we measured the popularity of VEM of the peers (*E5*) with the proportion of firms that had passed the ISO14001 environmental management system certification in the industry. This data could be obtained through the statistics and retrieval system of the website of China National Certification and Accreditation Administration.

VEM

In this study, we used "whether pass ISO14001 Environmental Management System Certification (*y*)" as a dummy variable to measure the willingness of a firm to adopt VEM. If the firm had passed ISO14001 certification, it was marked as "1", or marked as "0".

Analysis and Result

Data Test

This study used the consistency coefficient (Cronbach α) to measure the reliability of the scales of environmental strategy orientation and environmental experience. It can be seen from Table 2 that the C.R. values of the items are mostly greater than the reference value of 0.50, and the Cronbach α of each variable is above 0.7 as well, which shows that the measurement tools have high internal consistency, and the reliability of the scales meets the requirements. Since the measures of this study mainly drew on the mature scales that has sufficient content validity, thus we directly used the AMOS 17.0 software to test the construct validity. As shown in Table 2, the standardized path coefficients of each item are greater than the reference value of 0.5, and significant at the level of $p < 0.001$, indicating that the measurement scales of this study have good construct validity. In addition, the average extracted variance (AVE) of each variable exceeds the suggested thresholds of 0.50, and is greater than the square of correlation coefficients between variables, which shows that the research scales have a good discriminant validity.

Data Calibration

According to the conditions of the Boolean operation, the original data needs to be calibrated to a fuzzy set within the range of 0-1 before the analysis.

Table 2. The results of reliability and validity.

Construct	Item	Factor loading	AVE	*C.R.*	α	*α* if item deleted
Environmental strategy orientation (I_1)	*ESO1*	0.754	0.537	0.877	0.779	0.729
	ESO2	0.669				0.749
	ESO3	0.795				0.708
	ESO4	0.706				0.721
Corporate social responsibility (I_2)	*CSR1*	0.752	0.595	0.894	0.830	0.800
	CSR2	0.745				0.795
	CSR3	0.782				0.807
	CSR4	0.804				0.799
	CSR5	0.787				0.828
	CSR6	0.755				0.782
Employee knowledge literacy (I_3)	*EKL1*	0.824	0.611	0.881	0.800	0.754
	EKL2	0.815				0.774
	EKL3	0.829				0.735
	EKL4	0.685				0.754
	EKL5	0.744				0.781

This study used the following principles to calibrate the data. First, for the 0-1 variables, since the distribution has satisfied the requirement of Boolean operation, calibration is not required. Second, for variables that do not meet the requirements of Boolean operation, we referred to the study of Mendel and Korjani [62] and set the full membership value, the non-membership value, and the turning point based on the kurtosis and skewness of the standardized data. The threshold settings for each variable were shown in Table 3.

Empirical Test with FsQCA

This study used the fsQCA2.0 tool for empirical test. First, the necessity analysis for each single factor is conducted to examine the degree of explanation of the outcome variable by each factor. In fsQCA, if the consistency of the effect of Factor *X* on Result *Y* is higher than 0.7, it means that Factor *X* has a certain degree of explanation for Result *Y*. When the consistency is higher than 0.9, Factor *X* can be regarded as a necessary condition for Result *Y*. From the results in Table 4, it can be seen that the consistency of the five external legitimacy factors is between 0.7 and 0.9, which shows that these factors have a certain stimulating effect on the implementation of VEM, but they are not necessary conditions to drive VEM. Among the internal legitimacy factors, the consistency of environmental strategy orientation is higher than 0.9, indicating that this factor is a necessary condition

Table 3. The threshold settings of variables.

Variable name	Non-membership value	Turning point	Full membership value
Industrial regulation strength (E_1)	0.0001	0.0015	0.0109
Regional control strength (E_2)	30	55	77
Social environmental expectation (E_3)	0	-	1
Green trade barriers (E_4)	0.05	0.25	0.45
Peer VEM popularity (E_5)	0.05	0.35	0.80
Environmental strategy orientation (I_1)	2.5	5.1	7.0
Corporate social responsibility (I_2)	2.4	4.9	7.0
Employee knowledge literacy (I_3)	2.5	5.0	7.0
Past VEM experience (I_4)	0	-	1

Table 4. The necessity analysis of each single factor.

Variable	Consistency	Coverage
Industrial regulation strength (E_1)	0.83	0.74
Regional control strength (E_2)	0.74	0.59
Social environmental expectation (E_3)	0.82	0.67
Green trade barriers (E_4)	0.70	0.56
Peer VEM popularity (E_5)	0.76	0.69
Environmental strategy orientation (I_1)	0.93	0.86
Corporate social responsibility (I_2)	0.84	0.80
Employee knowledge literacy (I_3)	0.49	0.52
Past VEM experience (I_4)	0.79	0.71

for enterprises to carry out VEM. In addition, the consistency of corporate social responsibility and past VEM experience is higher than 0.7, implying that these two factors also have a certain degree of interpretation for VEM. However, the consistency of employee knowledge literacy is lower than 0.5, which shows that this factor cannot well explain the outcome variable. Overall, the external legitimacy factors all have a stimulating effect on the implementation of VEM, which initially confirms the basic deductions in Chapter 3. For the internal legitimacy factors, in addition to employee knowledge literacy, the other three factors have a positive effect on corporate VEM, thus most deductions in Chapter 4 can be initially confirmed.

The necessity analysis of each single factor can only reflect the explanation of a certain factor to the result, and cannot reflect the interrelation mechanism between the factors. Therefore, this study takes the external legitimacy forces and the internal legitimacy forces as the trigger conditions respectively, and further examines the configuration of those factors. According to Ragin [55], the threshold of consistency was set as 0.8, and the number of acceptable condition combinations was set as 1. The results of fsQCA were shown in Table 5.

The Configuration of External Legitimacy Forces

The configuration Pattern 1, 2 and 3 in Table 5 all take the external legitimacy factors as the trigger conditions. Among them, the configuration of Pattern 1 is $E_1 \cdot \sim E_2 \cdot E_3 \cdot \sim E_4 \cdot E_5$ (·denotes "and", ~ denotes "not"), with industrial regulation strength and peer VEM popularity as core conditions, and other factors as peripheral conditions. This trigger pattern corresponds to a consistency of 0.83, and the raw coverage reaches 0.25, which shows that industrial regulation strength and peer VEM popularity can encourage firms to adopt VEM. According to the configuration of Pattern 1, when the intensity of industry regulations is high, the popularity of VEM is high as well. Meanwhile, social environmental expectation plays a supporting role in it. This shows that for the industries with high social concern, mandatory industry standards can effectively enhance the voluntary environmental behaviors of the industry, which is consistent with the view of Stoever and Weche [8].

The configuration of Pattern 2 is $E_1 \cdot E_2 \cdot E_3 \cdot \sim E_4 \cdot E_5$, with regional control strength and social environmental expectation as core conditions, and other elements as peripheral conditions. The consistency and raw coverage of the trigger pattern are 0.86 and 0.21, indicating that the regional environmental governance and social environmental expectation are both the motivations for VEM. According to the study of Kagan et al. [24], the regional environmental regulation can reflect the initiative of the local government to protect the environment to a certain extent. Therefore, in this case, firms may be subject to stricter industrial criteria and greater social pressure, which is consistent with the configuration of Pattern 2.

Pattern 3 includes two trigger modes, and their core conditions are industrial regulation strength and social environmental expectation. Among them, the peripheral conditions of Pattern 3a include regional control intensity and peer VEM popularity, indicating that this type of enterprises is not only subject to strict industrial regulation and extensive social attention, but also faces a relatively high penetration rate of voluntary regulations in the industry. However, in this configuration, the role of green trade barriers is dispensable. Based on this, it can be speculated that this type of enterprises may belong to traditional heavy-polluting industries, which mainly target the domestic market. In the configuration of Pattern 3b, in addition to the intensity of industry regulations and social environmental expectations, it also includes the core condition of green trade barriers, suggesting that the social pressure of such enterprises not only stems from compulsory industry regulation, but also from a high level of green trade barriers. Therefore, it can be inferred that the firms meeting this configuration are multinational manufacturers. Furthermore, the configuration of Pattern 3b shows that green trade barriers also have a stimulating effect on VEM.

The Configuration of Internal Legitimacy Forces

The configuration Pattern 4 and 5 both take the internal legitimacy factors as the trigger conditions. Among them, the configuration of Pattern 4 is $I1 \cdot I2 \cdot \sim I3 \cdot I4$, with the environmental strategy orientation and corporate social responsibility as the core conditions. This trigger pattern corresponds to a consistency of 0.85 and an raw coverage of 0.37, implying that environmental strategy orientation and corporate social responsibility are both significant forces to VEM. From the configuration of Pattern 4, it can be seen that corporate environmental strategy orientation

Table 5. The fsQCA of external and internal legitimacy forces.

Conditions		Configuration (outcome: y)				
	P1	P2	P3a	P3b	P4	P5
External legitimacy forces						
Industrial regulation strength (E_1)	●	•	●	●		
Regional control strength (E_2)	⊗	●	•	⊗		
Social environmental expectation (E_3)	•	●	●	●		
Green trade barriers (E_4)	⊗	⊗		●		
Peer VEM popularity (E_5)	●	•	•	⊗		
Internal legitimacy forces						
Environmental strategy orientation (I_1)					●	●
Corporate social responsibility (I_2)					●	•
Employee knowledge literacy (I_3)					⊗	
Past VEM experience (I_4)					•	●
Consistency	0.83	0.86	0.81	0.82	0.85	0.87
Raw coverage	0.25	0.21	0.20	0.23	0.37	0.33
Unique coverage	0.05	0.02	0.03	0.05	0.10	0.09
Overall consistency	0.89				0.87	
Overall coverage	0.43				0.55	

Notes: ● denotes that the condition exists, ⊗ denotes that the condition is missing; big circles represent the core conditions, small circles represent the peripheral conditions, blanks represent that the condition is not considered.

is closely related to its sense of social responsibility. In addition, according to Schaltegger et al. [25], the initiative of corporate environmental strategy is often decided by the business context it faces. Therefore, most of the environmentally-oriented enterprises show continuous voluntary environmental behaviors, which is consistent with the configuration of Pattern 4.

In terms of the consistency and raw coverage of Pattern 5, it can be found that past VEM experience also encourage firms to adopt VEM. The biggest difference between Pattern 5 and Pattern 4 lies in the distinction in core conditions. Pattern 5 relies on the environmental strategy orientation and past VEM experience. This kind of enterprises have formed a relatively mature VEM system. However, Pattern 4 mainly results from the joint force of environmental strategy orientation and corporate social responsibility, thus it can be inferred that this kind of enterprises have not yet formed a standardized and voluntary environmental management system. In addition, Pattern 5 does not emphasize the assistance of employee knowledge literacy, which may be because that the experience-oriented environmental behaviors are more based on the implementation of corporate environmental practices.

It should be noted that when serving employee knowledge literacy as the core condition, the consistency of the trigger pattern fails to reach 0.80, indicating that employee knowledge literacy does not necessarily lead to the implementation of VEM. On the one hand, this may be due to the fact that it is one-sided to measure the knowledge literacy of employees based on their level of education [44]. On the other hand, it may be because firms with more high-skilled employees generally belong to technology-intensive industries, and their external legitimacy force is relatively weak [47].

The Integration of External and Internal Legitimacy Forces

In order to further investigate the synergy and correlation mechanism of the two kinds of legitimacy forces, this study selects three factors from each kind of legitimacy forces for analysis respectively. As in the fsQCA of external legitimacy forces, all trigger patterns require the existence of industrial regulation strength and social environmental expectation, and peer VEM popularity also exists in three trigger patterns as a core or auxiliary condition. Therefore, among the external legitimacy forces, this study selects industrial regulation strength, social environmental expectation and peer VEM popularity for analysis. Similarly, from the configuration of Patterns 4 and Pattern 5, it can be seen that among the internal legitimacy forces, employee knowledge literacy plays the least role. Therefore, the environmental strategy orientation, corporate social

Table 6. The fsQCA of the integration of external and internal legitimacy forces.

Conditions	Configuration (outcome: y)		
	P6	P7	P8
External legitimacy forces			
Industrial regulation strength (E_1)	●	⊗	●
Social environmental expectation (E_3)	•	●	
Peer VEM popularity (E_5)	•		•
Internal legitimacy forces			
Environmental strategy orientation (I_1)	•	●	●
Corporate social responsibility (I_2)	●	•	
Past VEM experience (I_4)		●	⊗
Consistency	0.85	0.87	0.82
Raw coverage	0.43	0.34	0.26
Unique coverage	0.11	0.13	0.06
Overall consistency	0.87		
Overall coverage	0.67		

Note: The meanings of the symbols in the table are the same as those in Table 5.

responsibility, and past VEM experience are selected for analysis. The results of fsQCA are shown in Table 6.

The core conditions of Patterns 6-8 in Table 6 include both external and internal legitimacy forces. Among them, the configuration of Pattern 6 is $E_1 \cdot E_3 \cdot E_5 \cdot I_1 \cdot I_2$, with the industry regulation strength and corporate social responsibility as the core conditions. This trigger pattern corresponds to a consistency of 0.85 and has the highest raw coverage (0.43) in these trigger patterns. It can be seen that the implementation of VEM is mainly driven by mandatory industry regulation and corporate social responsibility. In addition, in Pattern 6, social environmental expectation, Peer VEM popularity, and environmental strategy orientation are all important peripheral conditions, which implies that among the driving factors of VEM, internal and external legitimacy forces have a collaborative effect.

According to the consistency (0.87) and raw coverage (0.34) of Pattern 7, the configuration with core conditions of social environmental expectation, environmental strategy orientation and past VEM experience and peripheral condition of corporate social responsibility is also important trigger pattern of VEM. The difference between Pattern 7 and Pattern 6 is that the trigger conditions of the former are mainly internal legitimacy forces, while the trigger conditions of the latter are based on external legitimacy forces. By comparing the unique coverage of the two trigger patterns, it can be seen that the net effect of Pattern 7 is slightly stronger than Pattern 6. Therefore, we can infer that the stimulating effect of internal legitimacy forces on VEM is greater than that of external legitimacy forces.

The configuration of Pattern 8 is $E_1 \cdot E_5 \cdot I_1 \cdot \sim I_4$, with industrial regulation strength and environmental strategy orientation as core conditions and peer VEM popularity as peripheral condition. Although the consistency of this trigger pattern reaches 0.82, the unique coverage is only 0.06, which is the lowest among the three trigger patterns, indicating that Pattern 8 has relatively weak interpretation to the implementation of VEM. According to the configuration, this trigger pattern does not need the support of past VEM experience. Therefore, we can speculate that when companies first adopted VEM, they were mainly driven by industrial regulation strength and environmental strategy orientation.

Comprehensive Analysis

By comparing the configurations of Pattern 1 to Pattern 3, it can be found that Pattern 1 and Pattern 3b correspond to the highest unique coverage, that is, these two trigger patterns are more likely to encourage firms to adopt VEM. Accordingly, among the external legitimacy forces, the stimulating effects of industrial regulation strength and social environmental expectation are more significant. Among all the trigger patterns with external legitimacy forces as core conditions, green trade barriers only play roles in two patterns, indicating that green trade barriers have limited triggering forms and strength for corporate VEM. This may be due to the fact that companies have high bargaining power and autonomy when choosing trading partners.

Among the internal legitimacy forces, the core conditions in the two trigger patterns both include

environmental strategy orientation, which shows that in the internal legitimacy forces, environmental strategy orientation is the core forces to stimulate VEM. In addition, the unique coverage of Pattern 4 is higher than that of Pattern 5, indicating that the trigger pattern with corporate social responsibility and environmental strategy orientation as its core conditions is more likely to drive VEM. The reason for this result may be that the behavior caused by organizational conventions is not necessarily compatible with the development of the organization [49], and in the ever-changing business context, organizational practices and past experience only have limited support for business decisions.

The further comparison of the overall effects of the two driving forces shows that the overall coverage of internal legitimacy forces (0.55) is higher than that of external legitimacy forces (0.43). This shows that the effect of internal legitimacy forces is significantly higher than that of external legitimacy forces. In addition, the overall coverage (0.67) under the integration of the two forces is higher than the overall coverage when only internal or external legitimacy forces are used as trigger conditions. Therefore, it can be considered that the internal legitimacy forces are the primary motivation of VEM, while the external legitimacy forces are the secondary motivation, and the two kinds of driving forces are collaborative.

Discussion and Conclusion

Research Findings

First, the five external legitimacy driving forces all can encourage firms to adopt VEM. Among them, industrial regulation strength and social environmental expectation have the most significant effect, which indicates that mandatory rules and public expectations are the primary external drivers for firms to take environmental initiatives. This finding strongly refutes the view that mandatory regulations will reduce corporate environmental willingness [63]. On the other hand, green trade barriers have the least stimulating effect on VEM, suggesting that when conducting foreign trade, firms generally do not improve their environmental regulation behaviors due to the requirements of trade partners. In addition, since the external legitimacy factors have strong correlation between each other, therefore, when using external legitimacy to drive firms' VEM, it is necessary to comprehensively grasp the influence of the above four factors in order to maximize the utility.

Second, among the four internal legitimacy forces involved in the research, environmental strategy orientation, corporate social responsibility and past experience have significant stimulating effects on VEM, while employee knowledge literacy does not necessarily motivate firms to adopt environmental initiatives. This finding can explain to some extent "why some large companies have not adopted VEM". In addition, as can be seen from Table 5, although environmental strategy orientation is the core element of internal legitimacy forces, the roles of the three forces are complementary. On the one hand, environmental strategy orientation is correlated with corporate social responsibility. On the other hand, the organizational convention formed by years of regulatory experience help to maintain the subsequent environmental strategies [52].

Third, the internal legitimacy forces have greater stimulating effects on VEM than external legitimacy forces. This shows that in the institutional incentives of VEM, internal legitimacy forces occupy a dominant position. In addition, comparing Table 5 and 6, it can be seen that the interpretation of VEM is the strongest when the two driving forces are integrated, which further shows that there is collaborative effect between the two driving forces.

Implications and Policy Recommendations

For corporate managers, it is imperative to build an environmental strategy that is compatible with the development of the enterprise [19]. On the one hand, firms should actively cultivate the overall environmental literacy of employees within the organization, and root the environmental awareness into the organizational culture [38]. On the other hand, firms should take the initiative to environmentally-friendly R&D activities. For heavy polluting firms, more attention should be paid to the improvement of sewage equipment. For lightly polluting firms, efforts should be made on the ecological and energy-saving nature of products. In addition, managers need to strengthen the maintenance and improvement of organizational environmental convention. When the institutional conditions faced by firms are relatively stable, they can adopt maintenance strategies, give full play to the role of organizational convention, and take advantage of past experience to achieve low-cost VEM [51]. When the institutional conditions faced by firms change rapidly, the existing environmental conventions should be reviewed in time, and firms' environmental regulation strategies should be adjusted based on external institutional changes.

For policy makers, the following two aspects should be noted. First, it is of great significance to develop appropriate environmental policies and regulations to stimulate firms' environmental awareness. Acting as the main driving force of external legitimacy, environmental rules and policies must be consistent with the environmental governance level of enterprises. For heavy polluting industries and regions, on the one hand, it is important for governments to accurately grasp the setting of pollution discharge standards to avoid damaging firms' environmental enthusiasm.

On the other hand, it cannot be ignored to formulate supporting environmental subsidies to alleviate the financial pressure of enterprises and assist enterprises in environmental technology improvement [24]. Second, in order to improve the efficiency and effectiveness of environmental control, governments must pay attention to the incentive effect in regulation, and give full play to the positive factors within firms to promote their environmental awareness [8]. For example, local supervision departments can strengthen communication with business managers, and assist them to develop environmental strategy orientations that are compatible with firms' development.

Limitations and Directions for Future Research

The implications of our research should be considered within the confines of the limitations. One limitation is that this study only explores the motivations of VEM from the perspective of institutional legitimacy, ignoring the role of other types of factors, such as the need for business transformation [64] and the pursuit for long-term profit [51]. Future research can search the incentives of VEM from these perspectives. Second, this study measures VEM with the status of ISO14001 certification, which does not fully reflect the VEM situation of firms. This is because some firms may conduct VEM through environmental agreements or commitments [50]. Therefore, further research needs to define the VEM with the consideration of these indicators. Finally, this study does not consider industry differences when analyzing the legitimacy forces of VEM. Future research can try to compare the compositions of VEM's motivations among different industries.

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Conflict of Interest

The authors declare no conflict of interest.

Appendix: scales for internal legitimacy forces

Environmental strategy orientation [from Banerjee et al. (2003)]

1. Our firm has integrated environmental issues into our strategic planning process.
2. In our firm, quality includes reducing the environmental impact of products and processes.
3. At our firm we make efforts to link environmental objectives with our other corporate goals.
4. Environmental issues are always considered when we develop new products.

Corporate social responsibility [from Turker (2009)]

1. Our company makes investment to create a better life for future generations.
2. Our company contributes to projects that promote the well-being of society.
3. Our company policies encourage the employees to develop their skills and careers.
4. Our company respects consumer rights beyond the legal requirements.
5. Our company always pays its taxes on a regular and continuing basis.
6. Our company communicate openly and honestly with shareholders.

Employee knowledge literacy [from Wang (2009), Chang and Hsu (2015)]

1. At work, our employees are quick to identify the information they need to complete tasks.
2. At work, our employees can effectively obtain the knowledge they need to complete tasks.
3. At work, our employees often use the knowledge they gain to make innovation.
4. Our company often trains employees' professional skills.
5. Our company attaches great importance to the assessment of employees' knowledge base.

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