The Adoption and Outcomes of ISO 14001 across Korean Business Firms

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Abstract

Environmental sociologists and organizational scholars have recently been interested in the origins of voluntary environmental programs and their various outcomes. Similarly, this dissertation examines the adoption of ISO 14001 known as the most famous voluntary environmental program and its consequence in the Korean context. More specifically, I situate the motivation to adopt ISO 14001 and its various outcomes in the context of two theoretical frameworks: resource-based view and institutional theory. I begin by using event-history modeling to examine firms' adoption of ISO 14001 in Korea between 1996 and 2011. I find that both resource-based and institutional factors have influenced the diffusion of ISO 14001. By exploring time-related effects, I also find that while resource-based factors are important in the early periods of the diffusion, institutional factors become important in the later periods of the diffusion. I then explore the effects of ISO 14001 on pollutant emissions among facilities in Korea from 2004 to 2011. Using data from the Toxic Release Inventory (TRI) program of Korea, I find that the adoption of ISO 14001 does not affect the changes of emission performance from 2004 to 2011. This finding indicates that ISO 14001 has been adopted as a symbol to show off organizational commitment to societal requests for environmental responsibility, but not as an instrument to become greener. Moreover, this finding suggests that the institutional context favorable to the diffusion of ISO 14001—in particular, the Korean government's active involvement in the diffusion of ISO 1400—is not likely to lead to the improvement in environmental quality. I conclude the dissertation with a discussion of what these two studies tell us about corporate social responsibility in Korea and, broadly, East Asia.

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CHAPTER 1

INTRODUCTION

Why do some Korean[1] firms emphasize their environmental responsibility and superior environmental performance? And do firms in Korea that emphasize this identity actually perform better, in terms of their impact on the environment, than they did in the past? To tackle those questions, I examine the adoption of the voluntary environmental programs (hereafter VEP) known as ISO 14001 and the changes in pollutant emission levels across ISO 14001-certified facilities, using a sample of Korean manufacturing firms. This study shows how market forces and institutional contexts have encouraged the organizational adoption of ISO 14001 and how the VEPs affect emission performance in the Korean context. In this chapter, I outline why the VEPs are important, what ISO 14001 is, and how and why the Korean case contributes to the literature.

Voluntary Environmental Programs

Recently a major change in environmental regulations has occurred in terms of governmental and private sector involvement (Moon and deLeon, 2007). This change is the emergence of VEPs. The well-known VEPs include ISO 14001, 33/50, Green Lights, LEED (Leadership in Energy and Environmental Design), and Energy Star Buildings. VEPs are introduced as part of governments' environmental reform efforts to "promote innovation and flexibility, increase community participation and partnerships, improve compliance with environmental laws, and cut red tape and paper work" (Moon et al., 2013; Bartley, 2007). Instead of compelling an improvement in environmental performance through explicit governmental controls and regulations, VEPs encourage

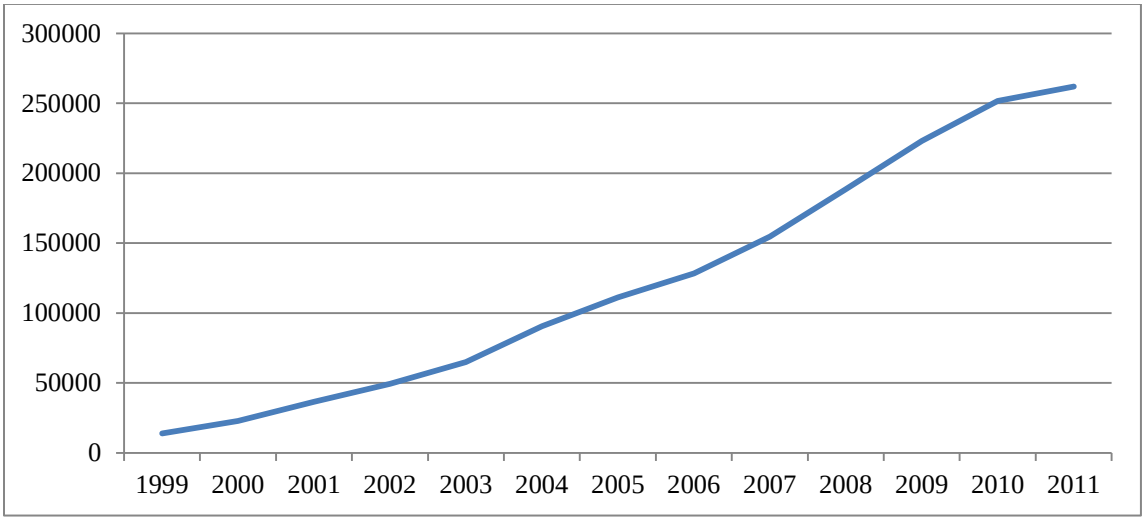
[1] Throughout, Korea refers to the Republic of Korea (South Korea).

firms to voluntarily set up their own environmental goals beyond legal compliance, and to attempt to achieve their objectives. The major assumption of VEPs is that firms' stakeholders, who cannot otherwise directly observe participants' environmental performance, will nonetheless be encouraged to reward the firms' environmental action beyond legal compliance by awarding good-will, regulatory relief, higher market shares, consumer loyalty, and higher product prices. VEPs are, therefore, said to be designed to achieve firms' both environmental and economic goals (Moon et al., 2013; Prakash and Potoski, 2012).

Scholars claim that the rise in VEPs such as ISO 14001, 33/50, and Green Lights is associated with dramatic shifts in the regulatory processes. These shifts were away from the traditional command and control strategies based on fixed standards enforced by the state toward social control strategies, such as markets and social mechanisms, the provision of information, and informal shaming processes (Bartley, 2003; Delmas, 2002). This new regulatory process is called self-regulation, which can be observed on an industry level or simply within an individual firm (Gunningham and Rees, 1997). In recent decades, this transition from government direct control to self-regulation has been increasingly practiced and observed around the globe (Delmas and Montes-Sancho, 2011; Prakash and Potoski, 2013). The emergence of VEPs is a representative example of this transition toward the new regulatory process. Researchers have begun to investigate why organizations adopt VEPs and how organizations that adopt VEPs actually change their behaviors (Bartley, 2007; King et al., 2005; Toffel, 2006; Potoski and Prakash, 2005a, 2005b).

In this dissertation, I focus on ISO 14001, one of most well-known VEPs. Among various VEPs, ISO 14001 is the most common VEP throughout the world. As of 2012, more than 250,000 facilities throughout the world have been certified to ISO 14001. Figure 1.1 displays how ISO 14001 has diffused across the world over time. However, this program is very recent and there is much to learn about its functions and outcomes. In this dissertation, I investigate how ISO 14001 diffuses across firms and whether this particular VEP leads to an improvement in environmental performance. The findings are expected to provide environmental sociologists and organizational scholars with an informative source regarding diffusion patterns and outcomes of VEPs.

Figure 1.1: Diffusion of ISO 14001 across the World



(Source: ISO-Survey, 2012)

ISO 14001 as the Particular VEP of My interest

ISO 14001 is one of the most broadly diffused and well-regarded VEPs. The International Organizations for Standardization (hereafter ISO) developed the ISO 14000 series of VEPs based on the need expressed at the United Nations Conference on Environmental and Development (UNCED) in Rio de Janeiro in 1992 for improved

environmental quality. The need for a new VEP was also confirmed by the General Agreement on Tariffs and Trade (GATT) Uruguay Round Ministerial Decision on Trade and the Environment in 1994. In 1996, the ISO issued the first edition of the ISO 14000 series, a set of guidelines for developing environmental management systems and pro-environmental practices.

This ISO 14000 series was divided into six sections and each section covers different VEPs. The sections include: 1) environmental management systems (ISO 14001 and 14004); 2) environmental auditing (ISO 14010 to 14012); 3) environmental labeling (ISO 14020 to 14025); 4) environmental performance evaluation (ISO 14031); 5) Life Cycle Assessment (ISO 14043); and 6) environmental aspects of product standards (ISO 14060). Among these various programs, ISO 14001 is the only certifiable one (Delmas, 2002; ISO, 2014).

ISO 14001 dictates requirements for an organization's structures, responsibilities, practices, procedures, processes, and resources, with the goal being that responsible environmental management is institutionalized within organizations. The underlying logic is that if organizations set out to manage environmental matters systematically and comprehensively, they can be expected to learn about production processes that result in pollution, take action against them, and perform better than firms that do not do so (Coglianese and Nash, 2001; Delmas and Montes-Sancho, 2011). To be more specific, ISO 14001 requires each organization to undertake the following: develop environmental policies with a commitment to continuous improvement of environmental quality; identify all of its environmental aspects and then prioritize them based on the significance of their environmental impacts; establish environmental objectives and targets; develop

work procedures to control environmental aspects; train employees in these procedures; demonstrate a commitment to comply with environmental laws and regulations; conduct self-assessment audits; and periodically review their management systems (Delmas, 2002; Toffel, 2006; Bansal and Hunter, 2003; King et al., 2005).

ISO 14001 focuses on management processes rather than specific environmental outcomes. All of these processes aim to achieve continuous improvement and mean that the environmental management systems must be communicated to trained and empowered employees; a firm's procedures must also be documented in order to be certified and to maintain ISO 14001 certification. Although the rules of ISO14001 are set up by ISO, the VEP requires that each firm must pass an independent third-party audit. This step signals credibility. However, the requirements of ISO 14001 are viewed as being less stringent than other VEPs. This VEP only requires disclosure of the firm's environmental policy, while other VEPs such as FSC (Forest Stewardship Council)[2] and EMAS (Eco-Management and Audit Scheme)[3] are awarded based on firms achieving a specific level of environmental outcomes. In contrast, once a firm meets the management system requirements required by the ISO, organizations can register their conformance with the processes and be certified. This lesser stringency is arguably one of the reasons why firms often decide to be certified by ISO 14001 rather than by other VEPs.

The financial cost of applying for the ISO 14001 is significant, while the benefits are often still unclear (Moon et al., 2013; Delmas, 2002; Delmas and Montes-Sancho, 2011). The fee for ISO 14001 certification ranges from $50,000 for small facilities to

[2] FSC is a global forest certification system, established as a response to the concern over global deforestation. Please visit the website (http://us.fsc.org) to access detailed information.
[3] The Eco-Management and Audit Scheme (EMAS) is the European voluntary environmental management instrument. Please visit (http://ec.europa.eu/environment/emas) to access detailed information.

more than $200,000 for larger facilities. Scholars have suggested that ISO14001 certification could be beneficial at three points. First, ISO 14001-certified firms might experience a decrease in the cost of their regulatory fines, as well as a decrease in their environmental liabilities. Second, ISO 14001 certification procedures might ultimately lead to operational efficiencies by involving employees in the design and implementation of the program. Last, the certification to ISO 14001 may signal to external stakeholders that the company is committed to improving its environmental performance. For example, ISO 14001 can be employed to signal to the government that the company is on the right track to reduce its impact upon the environment, thus helping the company build better relationships with the government and perhaps positioning the firm for new government contracts. However, all these benefits are just "potential" benefits not necessarily "realized" benefits. The potential benefits are very difficult to evaluate, and thus studies on the actual outcomes of ISO 14001 adoption are also very limited (Delmas, 2002).

The Korean Case

Previous studies on VEPs have focused on business organizations in the U.S. and Europe and have given little attention to business organizations in countries in East Asia such as Korea and Japan. Although scholars have mapped the differences between institutional contexts in countries in East Asia and the West (Orrú et al., 1991; Whitley, 1991), there has been little research done on how the VEPs have diffused and what the outcomes of VEPs have been in East Asian contexts (Christmann and Taylor, 2001; Welch et al., 2002; Nakamura et al., 2001). Scholars, therefore, agree that there is an urgent need for more research in order to expand the scope of understanding of the adoption and outcomes of VEPs in different national contexts (Matten and Moon, 2008;

Toffel, 2006; Delmas and Montiel, 2008; Welch et al., 2002). This dissertation uses Korea, one of major countries in East Asia, as its case of interest. This dissertation utilizes a method of analysis that can be adapted to further research into other East Asian societies.

The remainder of this dissertation is divided into four chapters. In the second chapter, I begin with a literature review of the studies regarding the adoption and outcomes of VEPs. The third chapter presents empirical analysis of the adoption of ISO 14001 across Korean manufacturing firms from 1996 to 2011. The fourth chapter presents another empirical study of whether ISO 14001-certified facilities reduce pollutant emissions more successfully than non-certified facilities. These two empirical chapters are written as "stand alone" papers. In the fifth chapter, I conclude this dissertation with a discussion of what these two empirical studies tell us about corporate social responsibility (hereafter CSR) and East Asian societies, especially Korea.

CHAPTER 2

LITERATURE REVIEW

Theories of Voluntary Environmental Programs and Outcomes of their Adoption

In this chapter, I review previous studies on voluntary environmental programs (hereafter VEPs) to provide an overview of the subject and evaluate previous findings. Before doing so, I categorize the studies of VEPs into two major strands: adoption of the VEPs, and outcomes of the adopted VEPs. I review each of them in brief, as follows. There are two theories that seem useful for the study of the adoption of VEPs: these two perspectives have different expectations about what conditions lead to the adoption of VEPs. I discuss the two theoretical perspectives in detail later in this chapter, but briefly introduce them below.

Resource-Based View claims that firms' internal resources and capabilities play an important role by producing variation in their competitiveness (Barney, 1991). According to this theory, firms are likely to adopt VEPs to obtain sustained competitive advantages. That is, firms adopt VEPs to acquire a green reputation and also improve operational efficiency, which results in attracting environmentally conscious consumers and investors' attention and their investment (Bansal, 2005; Russo and Fouts, 1997).

Institutional theory focuses on the aspects of the dominant social order called institutions rather than focusing on an individual organization's needs. In this approach, a specific institutional context greatly affects the cost and potential benefits of firms' adoption of VEPs, and this plays an important role in diffusing VEPs across organizations or globe. In the next section, I review previous studies on VEPs in more

detail. Previous studies also employ these theories to understand the adoption and outcomes of VEPs. However, I found that the findings of previous research are limited to Western societies and heavily dependent on cross-sectional analysis.

Recent Studies of the Adoption of Voluntary Environmental Programs

Since VEPs are recently new, there is not a long history of academic studies on them. However, some studies ask why business organizations (or nation-states) adopt VEPs such as ISO14001, Responsible Care, Green Lights, and Energy Star. To answer the question, such studies depend on a resource-based view or institutional theory suggested above. Below, I briefly describe the significant studies (see Table 2.1) and their findings (see also Table 2.2), before making some comments on the value of the previous studies.

Table 2.1: Previous Studies on the Adoption of Voluntary Environmental Programs

Author	Year published	Data sources	Target VEP	Sample (N+ data span)	Population
Christmann and Taylor	2001	Survey used	ISO 14001	101 Chinese managers participating in two seminars on standards-based management practices conducted by Asia Pacific Economic Cooperation (APEC) in May 1999	Multinational and domestic firms in China
Nakamura, Takahasi, and Vertinsky	2002	Survey used	ISO 14001	193 firms in large Japanese firms in manufacturing sectors	Manufacturing firms in Japan
Welsch, Mori, and Aoyagi-Usui		Survey used	ISO 14001	364 ISO14001-certified manufacturing facilities and 445 non ISO 14001-certified facilities	Manufacturing facilities in Japan
Bansal and Hunter	2003	COMPUSTAT	ISO 14001	197 facilities of 90 firms that had been ISO 14001 certified in the U.S. by 1998	ISO 14001 certified firms in the US by 1998
King, Lenox, and Teraak	2005	TRI data set + Dunn & Bradstreet Million Dollar Directory Data set	ISO 14001	7,899 facilities that reported annual emission to the TRI program from the years 1995-2001	U.S. manufacturing facilities regulated under U.S. state and federal air pollution regulations from the years 1995-2001

Darnall	2006	Dunn & Bradstreet Million Dollar Directory Data set + National Database on Environmental Management System + Survey	ISO 14001	49 surveyed U.S.-based publicly traded firms with ISO 14001 certified facilities (response rate=39.3%) in 2000	U.S.-based publicly traded firms with facilities identified as having certified to ISO 14001 by December 1999
Moon and deLeon	2007	COMPUSTAT	Green Lights	Standards & Poors (S&P) 500 firms	Firms located in the U.S.
Delmas and Toffel	2008	TRI data set + Survey	ISO 14001 and Government Voluntary Environmental Programs	500 surveyed facilities in heavily polluting sectors that reported annual emission to the TRI program in 2001	U.S. facilities in heavily polluting sectors (SIC 26; SIC 28; SIC 29; SIC 33; SIC 35; SIC 36; SIC 37; and SIC 49)
Moon	2008	COMPUSTAT	Green Lights	Standard & Poor's (S&P) 500 firms	Firms located in the U.S.
Delmas and Montiel	2009	ELM Guide Automotive Supplier Database	ISO 14001	3,152 automotive suppliers from the years 2000-2003	Automotive suppliers located in Mexico, Canada, and the U.S. from 2000-2003

Table 2.2: Significant Results from Previous Studies of the Adoption of Voluntary Environmental Programs

	Dependent variable used in study				
Independent variables	**ISO 14001**	**Government voluntary environmental program**	**Energy Star for the Building**	**Responsible Care**	**Green Lights**
Resource-Based View					
Operational efficiency					
-Size (Firm or Facility)	King, Lenox and Teraak; Nakamura, Takahasi, and Vertinsky		Moon	King and Lenox	
-Firm performance			Moon		
-Capital investment intensity	Darnall		Moon		
Information asymmetries					
-Distance to customers (Proximate with final customers)	King, Lenox and Teraak		Moon		Moon
Green Reputation					
-Sector emission					
-Environmental disaster	Bansal and Hunter				
-Recognizable brand name					
Institutional Theory					
Regulatory pressures					
-Stringent pollution policies (state or federal)	Darnall; King, Lenox and Teraak	Delmas and Toffel	Moon		Moon
-State spending on pollution control programs			Moon		
-Community environmental pressures	Darnall	Delmas and Toffel	Moon		
Normative pressures					
Quality management	Welsch, Mori, and				

professionals (ISO 9001)	Agoyagi-Usui		
-Export orientation	Christianman and Taylor; Bansal and Hunter		
-Organizational age	Delmas and Toffel		
Mimetic pressures			
Prevalence among peers	King, Lenox and Teraak		
Control Variables			
Size (Firm or Facility)			
Industry sectors	Darnall; Christianman and Taylor; King, Lenox and Teraak	Moon	Moon
Past management standard experience	Darnall; Bansal and Hunter; King, Lenox and Teraak		

Key Studies

Christmann and Taylor (2001)

The impact of globalization on the natural environment is not still clear. Proponents of globalization suggest that globalization would institutionalize environmental improvement because global ties increase self-regulation pressures across industries even in low-regulation countries. In contrast, opponents of globalization suggest that globalization is detrimental to the natural environment because it promotes the relocation of polluting industries from countries with high environmental regulations to those with low environmental regulations. Using survey data from 101 firms in China, Christmann and Taylor test whether the predictions of these two contradictory perspectives affect the diffusion of the VEPs called ISO 14001. They find that multinational ownership, multinational customers, and exports to developed countries like Japan, Europe, and North America result in the adoption of ISO 14001.

This finding shows that globalization encourages firms in developing countries to be green and suggests the perspective of proponents of globalization. However, their study has a number of limitations. First, the authors did not measure the actual adoption of ISO14001, but only managers' intention to adopt ISO 14001. Second, their way of data collection looks arbitrary, so that their results do not seem to reflect the population of firms in China. Specifically, they collected data through a survey of Chinese managers participating in APEC in Shenzhen and Shanghai in China. However, they did not explain at all why or how those managers could be a representative sample of the entire population of Chinese business firms.

Third, their data is collected at one time and it fails to capture the dynamic process involved in the adoption of VEPs. Fourth, they assume that the adoption of ISO 14001 automatically leads to an increase in environmental improvement. They do not consider the possibility that firms might adopt ISO 14001 in a symbolic way without the actual intention to fully implement the program in their operational processes.

Nakamura, Takahasi, and Vertinsky (2001)

Nakamura and his colleagues examine the determinants that led Japanese manufacturing firms to 1) incorporate environmental goals in their decision, 2) obtain ISO 14001, and 3) to become early adopters of the VEP. To find these determinants, they depend on two types of decision-making models. In the first type, they expect that the large Japanese manufacturers would adopt ISO 14001 to maximize firm profits from operations (profit maximization model). In the second type, they expect that the manufacturing firms would adopt ISO 14001 when the firm's managers consider ISO 14001 an instrument to improve the firm's profits (utility maximization model). Using survey data from 193 firms in the Japanese manufacturing firms, they find that two decision-making models explain the degree to which the formal environmental policy is integrated into general corporate policies and receives support from the firm's top management. Also, they find that these two decision-making models explain why firms choose to obtain ISO 14001 and the firm's propensity for early adoption of ISO 14001. They argue that the utility maximization model adds to the profit maximization model traditionally used for firms' environmental behavior.

These findings show how and why manufacturing firms in Japan adopt ISO 14001. However, the above study has a number of limitations. First, the authors ignore how

Japanese institutional contexts affect firms' managers' decision to adopt ISO 14001. Institutional contexts are able to penetrate manager's perceptions and affect their preference (Meyer and Rowan, 1977), but they do not consider the effects of institutional contexts. Second, the response rate of their survey is just 32%, and this could cause a sample selection problem.

Welsch, Mori, and Aoyagi-Usui (2002)

This study raises three questions: 1) What factors facilitate Japanese firms to adopt ISO 14001? 2) Do the factors of adoption differ by industries? 3) To what extent is it possible to differentiate the early adopters and second adopters? To address those questions, the authors use national survey data collected in 1999. Their results indicate that Japanese facilities adopt ISO 14001 to respond to social pressures including regulatory and media pressures and societal expectations of social responsibility. Also, the results show that types of significant social pressures to predict the adoption of ISO 14001 differ by industries, and early adopters and second adopters appear to be fundamentally different types of organizations driven by different internal and external factors.

This study shows how and why facilities in Japan adopt ISO 14001. Unlike Nakamura et al. (2001), they consider institutional and cultural factors to be important predictors of the adoption of ISO 14001. However, their data only observe three years of the diffusion of ISO 14001 so that they are unable to examine how ISO 14001 is institutionalized across Japanese firms.

Bansal and Hunter (2003)

Bansal and Hunter use a unique matched pair design (N=46) to examine firms' motivation of early adoption of ISO 14001. They suggest two different and competing hypotheses for firms' strategic early adoption of ISO 14001. Their first hypothesis suggests that firms might seek to adopt ISO 14001 to reinforce their present strategic position. In other words, firms have adopted ISO 14001 to enhance their competitive advantage in their current markets. Their second hypothesis suggests that a firm might adopt ISO14001 to reorient its market strategies. Firms, in other words, can be certified to ISO 14001 to change their market strategies and identity, and thus disseminate information about their changes.

Bansal and Hunter find that firms that are early certified to ISO 14001 have significantly higher environmental legitimacy. In other words, they find that ISO 14001 only diffuses across firms that already have a high environmental reputation. Therefore, they conclude that firms that are already perceived to be environmentally legitimate have adopted this VEP, which means that ISO 14001 might not achieve its objective that ISO 14001 should assist firms' sustainable development. These findings suggest that early movers to ISO 14001 are likely to reinforce their present market positions, but not reorient them.

Although Bansal and Hunter successfully contribute to the study of the motivations of early movers to ISO 14001, they are unable to show the historical transformation of firms' motivations for adopting ISO 14001. Their study was conducted within two years of the release of ISO 14001, and their findings were thus only limited to very early adopters. Therefore, the motivations of later adopters of ISO 14001 are not

examined in their study, so that it is difficult to generalize their findings to include late movers to ISO 14001.

King, Lenox, and Teraak (2005)

This study, based on a sample of U.S. manufacturing facilities tracked by the TRI (Toxic Release Inventory) program during 1995-2001, aims to find the link between ISO 14001 adoption and the theory of information asymmetries. King and his colleagues argue that facilities have been certified to ISO 14001 to reduce informational asymmetries between suppliers and customers. Specifically, they offer evidence that ISO 14001 can be an efficient tool that reduces information asymmetries between suppliers and customers, especially when organizations' potential buyers are physically and culturally distant. ISO 14001 can be a tool that reduces the transaction costs occasioned by reducing the effort needed to search for credible suppliers.

The major distinction of this study is its data structure and attention to information asymmetries. The authors studied 7,899 facilities drawn from the combination of TRI program and Dunn & Bradstreet dataset from 1995 to 2001. They also merged industry-level data from the Bureau of Economic Analysis and the Census of Foreign Trade to the facility data. Thanks to the nature of their dataset, they could measure the geographical distance from a facility to domestic and international buyers. Also, they could create unique measures of the degree to which an organization has ongoing vertical relationships with its buyers.

Their study claims that organizations adopt ISO14001 in order to reduce information asymmetries between supply chain partners and customers. Their results confirm the existing notion that VEPs provide credible environmental information about

hard-to-observe organizational attributes with customers. However, their findings are limited only to the early diffusion periods (within 6 years of the diffusion of ISO 14001). Because their data span is short, they fail to observe the relationship over time.

Darnall (2006)

Darnall examines why parent companies would mandate—rather than simply encourage —their associated facilities to adopt ISO 14001. To answer this question, she challenges the existing notion that the organizational decision to adopt ISO 14001 only occurs at the facility level. Instead, she suggests that parent companies have a central role in the associated facilities' decision to adopt ISO 14001. Then, she relies on institutional theory and the resource-based view to investigate the reason why firms would mandate their associated facilities to adopt ISO 14001 rather than encourage them. She surveys facilities in 135 firms that have at least one ISO 14001-certified facility.

Her findings are significant on two points. First, she finds that the parent company plays a fundamental role in certification decisions, although ISO 14001 certification officially occurs at the facility level. Her results offer the evidence that nearly half of U.S. firms have some types of corporate mandates for ISO 14001 certification. Second, she finds that corporate-level decisions are influenced by institutional pressures as well as the possibility of increasing and achieving economic returns and competitive advantage. Previous studies have employed either institutional theory or RBV to explain ISO 14001 adoption. Darnall's findings offer evidence that both theoretical perspectives have merit in explaining ISO 14001 adoption. She helps develop firm level analysis of ISO 14001 diffusion, but her contribution is limited by her research design. The response rate of her survey is only 39.3%, and this might cause the results to be misleading.

Moon and deLeon (2007)

Moon and deLeon examine why firms adopt the Green Lights (GL) program. Two theoretical perspectives—resource-based view and institutional theory—are employed to answer why a firm joins a GL program. The resource-based view suggests that firms adopt VEPs to increase their market competiveness. In contrast, institutional theory emphasizes the influence of institutional contexts on firms' decision to adopt the VEP. Moon and deLeon use Standard & Poor's 500 (S&P 500) firms as their sample frame. Their findings show that both theoretical perspectives support firms' adoption of GL program. This study offers evidence that VEPs can be driven by strategic responses to market pressures as well as by firms' motivation to obtain institutional legitimacy.

Moon and deLeon discuss the importance of market strategies and institutional contexts for firms' adoption of VEPs. However, their contribution is limited by their research design. They employ S&P 500 firms, which are primarily large firms in the U.S. This sampling frame lacks the capacity to make generalizable claims about all types of firms. Second, they use a cross-sectional analysis, which does not allow them to observe the corporate decisions over the entire period. To fully support their claims, event-history analysis would have been more appropriate.

Delmas and Toffel (2008)

Delmas and Toffel suggest that differences in the influence of corporate departments lead facilities to prioritize different external pressures, and thus adopt different VEPs. They argue that organizations channel pressures from market and non-market constituents to different functional departments, and that these functional departments, in turn, influence managers' perceptions and responses to the institutional

pressures. Specifically, they assume that legal affairs and marketing departments differ significantly in both their cultural frames and the external constituents with which they interact. On the one hand, the legal affairs departments are typically involved in regulatory compliance activities and handling complaints from local communities, activist groups, and the media. Therefore, plant managers with influential legal affairs departments are more receptive to external pressures exerted by constituents of their non-market environments such as government agencies and NGOs. On the other hand, the marketing departments are involved in market environments, and therefore plant managers with influential marketing department are more receptive to external pressures from constituents of their market environments such as customers and buyers.

They find that organizations with influential marketing departments are more likely to adopt ISO 14001, while organizations with influential legal affair departments are more likely to adopt government-initiated voluntary program and less likely to adopt ISO 14001. Delmas and Toffel collected 3,160 facilities tracked by the TRI program during 1996-2000, and conducted a mail survey to gather facility-level data. Their results confirm their hypotheses and significantly contribute to the environmental management literature by showing how structural factors within firms influence their choices of environmental strategies. Also, they successfully offer evidence that institutional pressures are mediated through organizational characteristics.

Moon (2008)

Moon examines firms' motivation for participation in Green Lights program at different diffusion stages among Standards & Poor's (S&P) 500 firms. He disaggregates corporate GL participation behaviors into early and later participation. He uses an

institutional theory to describe different motives and objectives at different times. He finds that while firms are more likely to be driven by market motives at an early diffusion stage, they are more likely driven by institutional motives at a late diffusion stage. Specifically, firms join GL program to promote market competiveness in the early period, whereas they join the program to improve their relationships with regulatory agencies and relieve regulatory pressures in the later period.

Moon discusses the importance of various corporate motives for environmental self-regulation programs at different time periods. However, his contribution is limited by his use of S&P 500 firms that are primarily large in the U.S. This sampling frame fails to generalize his findings into all types of firms in the U.S. Second, he employs cross-sectional analysis, using multinomial logistic regression. This research design does not allow him to directly observe corporate decisions to join GL program longitudinally. Event-history analysis would be appropriate to fully support his claim.

Delmas and Montiel (2008)

Delmas and Montiel investigate why suppliers comply with or resist the pressures of their customers to adopt ISO 14001 in the North American automotive industry. Using 3,152 automotive suppliers, they suggest that the effectiveness of customers' pressures is dependent on the nature of the relationship between suppliers and customers. Relying on transaction cost theory and information theory, they find that younger suppliers, suppliers with highly specialized assets, suppliers headquartered in Japan, and suppliers reporting to TRI program are likely to adopt ISO 14001 to reduce transaction costs and information asymmetry. More specifically, they find that a dependent relationship between suppliers and customers can produce high transaction costs, which results in suppliers' compliance

with customers' requests. Also, they find that the physical distance to customers often leads to information asymmetry between suppliers and customers.

Delmas and Motiel argue that suppliers are likely to adopt ISO 14001 to signal their good environmental behavior to customers in order to reduce transaction costs and information asymmetry originating from the nature of their relationship with customers. Their findings contribute to the literature at two points. First, their results show that transaction costs and information theories can be complementary to explain the adoption of ISO 14001. In other words, their study indicates that both post-contractual relationship management (managing transaction costs) and pre-contractual asymmetry helps explain the adoption of ISO 14001. Second, this study shows that the effects of customer pressures vary according to the characteristics of the relationship between suppliers and customers. As opposed to previous studies suggesting that environmental self-regulation programs could not diffuse without explicit sanctions, this study claims that within a specific industry and context, customer pressures can be effective to induce the diffusion of environmental self-regulation programs such as ISO 14001.

Recent Studies of the Outcomes of Voluntary Environmental Programs

Many scholars have also attended to various outcomes of VEPs. In particular, they are interested in discovering whether the adoption of VEPs actually affects pollutant emission, regulatory compliance and financial performance. Most of the outcome studies of VEPs have been also dependent on resource-based view and institutional theory, as suggested above. Below, I briefly discuss how these two theories provide different expectations regarding the outcomes of VEPs.

The Resource-Based View expects that the adoption of VEPs reduces pollutant emissions and promotes regulatory compliance. In addition, resource-based view scholars expect that the adoption of VEPs affects financial performance in a positive way (Hart, 1995; Russo, 2009; Moon et al., 2013; Potoski and Prakash, 2005; Cañón-de-Francia and Garcés-Ayerbe, 2009). The process of certification often entails developing new routines and skills, which create rare and inimitable resources inside the organization. As a result, the organizations certified to VEPs such as ISO 14001 can develop efficient operational processes and build a green reputation, and thus lead to product differentiation relative to competitors, which results in strong market competitiveness. Specifically, organizations change their routines and adopt efficient operational processes during the process of certification to VEPs. Such programs can be achieved by making better use of existing materials or by replacing them with those producing less pollution. In sequence, this improvement in emission performance allows firms to improve their resource efficiency and thus curtail operational costs by reducing pollution abatement costs (Porter and van der Linde, 1995; Russo, 2009). In addition, VEPs encourage firms to collaborate with local communities where the firms operate in selecting environmental goals and strategies, thus creating the possibility that the firms will address a broader array of environmental impacts and make improvement that go beyond compliance with regulations (Kwon et al., 2002; Coglianese and Nash, 2001).

In contrast, *institutional theory* expects that the adoption of VEPs does not affect any environmental outcome. In other words, VEPs actually fail to change organizational routines because they are adopted as symbols just to show off firms' commitment to environmental issues. As a result, the adoption of VEPs would not affect pollutant

emission, regulatory compliance, and financial performance (Toffel, 2006; Short and Toffel, 2010; King and Lenox, 2000; Moon et al., 2013). In the next section, I review previous studies on various outcomes of VEPs in more detail.

Table 2.3: Previous Studies on the Outcomes of Voluntary Environmental Programs

Author	Year published	Data sources	Target VEP	Sample (N+ data span)	Effect	Population
King and Lenox	2000	TRI data set	Responsible Care	22,476 observations at the facility level and 12,829 observations at the firm level (1987-96)	Negative selection	Facilities and firms in chemical industry in the U.S.
Kwon, Seo, and Seo	2002	Survey used	ISO 14001	138 facilities among the facilities designated as 'Environmental-Friendly Company' in 1999	Positive impact on regulatory compliance	Facilities designated as 'Environmental-Friendly Company'
Potoski and Prakash	2005b	TRI data set + Dun &Bradstreet's Million Dollar Directory	ISO 14001	3,709 facilities tracked by TRI and classified as major sources under federal clean air laws (1995-2001)	Positive impact on regulatory compliance	Facilities regulated under U.S. state and federal air pollution regulations

Toffel	2006	TRI data set + US EPA's Risk-Screening Environmental Indicator 2.1 Model	ISO 14001	7764 manufacturing facilities tracked by TRI	Negative impact on pollutant emission	Manufacturing facilities within the U.S. that have reported to TRI (SIC 28 and 34-37)
Russo	2009	TRI data set + Interview	ISO 14001	242 interviewed facilities from the set of 1104 facilities in the electronic industries tracked by TRI (response rate =31.3%)	Negative impact on pollutant emission	Facilities in electronic industries in the U.S.
Moon et al.	2013	COMPUSTAT	Green Lights	Standard & Poor's 500 firms	Positive impact on ROA	Large firms in the U.S.

Key Studies

King and Lenox (2000)

King and Lenox claim that the effects of industry self-regulation programs are still controversial and ambiguous. Proponents of industry self-regulation programs claim that the programs can be effective because they institutionalize environmental improvement across firms with membership in the programs. Specifically, proponents suggest that institutional forces across industry can control corporate action through three channels. First, industry associations could penalize non-conforming firms by making their name public. Second, norms and values of industry self-regulation can penetrate the structure of participating firms, and this would lead to environmental improvement. Last, self-regulatory institutions can shape firm behaviors by disseminating information on best practices.

In contrast, opponents claim that the programs become victims of the opportunistic behavior of firms if explicit sanctions are not executed. Opponents argue that industry self-regulation without explicit sanctions can be a smokescreen by reducing observable differences among good and poor performers. They also argue that if industry self-regulation programs cannot prohibit bad performers from becoming members of the program, these actors might join to hide their poor performance. As a result, membership in an industry self-regulation program can reveal "adverse selection."

Using an industry self-regulation program called the Responsible Care program, King and his colleagues examine whether the self-regulation program distinguishes adopters as having superior environmental performance. They find that effective industry

self-regulation such as the Responsible Care program is difficult to maintain without explicit sanctions. Consistent with self-regulation opponents' expectations about "adverse selection," firms with a high level of pollution hold membership in a Responsible Care program, perhaps to hide their poor performance. As the number of heavy polluters increases in the program, firms with good environmental performance, as a result, give up their membership in a Responsible Care program to avoid being tarred with the same brush. These findings clearly show that industry self-regulation programs without explicit sanctions fail to distinguish firms with good environmental performance from those with poor performance. Therefore, these findings confirm critics' ideas that self-regulation without explicit sanctions does not complement government public regulation. Their study also significantly contributes to the literature by implying that many firms adopt industry self-regulation programs in a ceremonial way, without actually changing their operational processes.

Kwon, Seo and Seo (2002)

This study examines the impact of ISO 14001 on regulatory compliance by Korean facilities. Kwon and his colleagues compare regulatory compliance of facilities that have been certified to ISO 14001 with those that have not. Survey data from 138 facilities designated as environmental-friendly companies (the Korean government-sponsored VEP) in 1999 are collected. The authors find that annual regulation violation rates in ISO 14001-certified facilities are lower than non-certified facilities.

Based on these results, the authors conclude that ISO 14001-certified facilities are more likely to comply with environmental regulations. ISO 14001 continuously requires

the certified facilities to be evaluated through ongoing monitoring and periodic audits. This finding shows that monitoring reduces the possibility of the violation of environmental regulations by Korean facilities. However, their study has an important limitation. The authors collected data from facilities designated as 'Environmental-Friendly Company' in 1999. The 'Environmental-Friendly Company' is the Korean government sponsored VEP. Only facilities that fulfill various requirements of environmental performance can be designated as the environmental-friendly company. Therefore, the results are only applied for the facilities that achieve a certain level of environmental performance, but not all facilities.

Potoski and Prakash (2005b)

Potoski and Prakash examine why facilities adopt ISO 14001 and whether the adoption of ISO 14001 actually improves regulatory compliance with the U.S. Clean Air Act. They hypothesize that federal and state-level government involvement can spur facilities to join ISO 14001. Also, they hypothesize that ISO 14001-certified facilities are more likely to comply with U.S. Clean Air Act than non-certified ones.

The authors rely on the emission information reported to EPA's TRI program and the 3,709 facilities' information from the Dunn & Bradstreet dataset to examine their hypotheses. They use a treatment-effects model to account for the effect of non-random assignment among ISO 14001 certified and non-certified facilities. In other words, this treatment model is used to reflect the fact that facilities with ISO 14001 differ in many ways from those without the VEP.

The authors find that facilities receiving more regulatory inspections are significantly more likely to join ISO 14001. Also, their results offer evidence that joining ISO 14001 improves facilities' regulatory compliance beyond what likely would have occurred if the facilities had not joined. Based on these findings, they suggest that ISO 14001 can be a club that provides non-rival but potentially exclusive benefits to firms, while producing general public goods like a cleaner natural environment and better compliance with the law.

Their findings describe the nature of ISO 14001 as a club that constrains members' behavior. They successfully show that joining ISO 14001 actually improves facilities' regulatory compliance. However, the contribution of this study is somewhat limited by the lack of theoretical justification for joining ISO 14001. In other words, the authors do not provide a strong theoretical explanation for joining ISO 14001 in the first place.

Toffel (2006)

Toffel claims that prior studies of VEPs fail to determine whether ISO 14001 adopters actually have superior management practices or performance. In this paper, he conducts a quasi-experimental evaluation to determine whether ISO 14001 succeeds in distinguishing adopters as having superior environmental performance. Using a sample of 7,764 manufacturing facilities in the U.S., he examines whether facilities' annual pounds of toxic emission is contingent on ISO 14001 adoption.

Toffel's study is notable for his research design. He uses a quasi-experimental research design (difference-in-difference analysis) with a propensity matching score method that considers the selection effect. This approach compares the performance of a

treatment group (ISO 14001 certified facilities) to a control group (non-certified facilities).

He finds evidence that ISO 14001 actually attracts companies with superior environmental performance. This suggests that third-party certification such as ISO 14001 might be a critical element to ensure that voluntary management programs legitimately distinguish adopters from non-adopters, and thus can be used to resolve information asymmetries about difficult-to-observe management practices. In addition, he finds that adopters actually reduce their level of pollutant emission. He suggests that ISO 14001 enables employees to identify pollution prevention opportunities by empowering them to offer recommendations for environmental protection because ISO 14001 requires organizations to train all employees whose work creates a significant impact on the natural environment.

His research design (difference-in-difference with propensity matching) is really interesting. However, he does not consider the nature of TRI program effectively. The TRI program sets an upper limit on what could be discharged without having to report a spill to the EPA. The upper limit depends on toxicity of a given substance: the more toxic the substance, the lower the limit. Because of this problem, this TRI data has limited information on emission, but Toffel does not address this problem.

Russo (2009)

Russo explores whether ISO 14001 improves environmental performance by reducing toxic emissions. He suggests two hypotheses, depending on the dynamic

capability model. These hypotheses are developed to account for how early adoption of ISO 14001 and experience with the VEPs influence emission levels.

To test his hypotheses, he uses 242 facilities in the electronics industries. His data covers the years from 1996 to 2001. His main data source is TRI. Russo's study is worth noting for his research design because he addresses the data problem of TRI data in a clever way. An important problem using TRI arises from the lack of data for emission due to the 'reportable quantity' rule of the EPA. In other words, the chance that emission is not reported is tied to the amount of emission per se: unless a facility processes more than 25,000 pounds of chemicals, it does not report to TRI. Because of this problem, this data has much missing information. To address this problem, he uses a Tobit analysis with fixed effects that accommodate censored data. His results suggest that early adopters report lower emission. Also, he finds that the longer a facility operates under ISO 14001, the lower its emission. This research design and these analytical strategies are very clever. However, his data just cover a very short time span and does not observe whether the adoption of ISO 14001 actually has a long-time effect.

Moon et al. (2013)

Moon and his colleagues categorize various theoretical approaches to the association between environmental protection and economic performance into two approaches: the Win-Win approach and the Win-Lose approach. Then they examine whether environmental protection is positively related to economic profits. The Win-Win approach regards environmental policies including VEPs as an impetus for innovative processes. Therefore, innovation can reduce pollution by updating inefficient operational

processes, which leads to market competitiveness in the context of the global market (Porter and van der Linde, 1995). In contrast, the Win-Lose approach suggests that the implementation of new environment protection policies incurs additional costs for firms, and results in decreasing competitiveness (Jappe et al., 1995).

To solve this theoretical controversy, Moon et al. investigate whether one of the voluntary environmental management programs called Green Lights actually contributes to economic performance. For this, they construct a quasi-experimental research design to account for the effects of non-random assignments for Green Lights participants and non-participants. Their probit model predicts corporate participation in the Green Lights program, and the OLS regression model predicts the extent to which this participation increases ROA. Their results provide support for the Win-Win approach. These results imply that environmental management programs such as Green Lights can help promote or secure a green reputation for firms and their products and services. Their results are interesting. However, their cross-sectional research design does not allow researchers to observe the association between VEPs and the change in long-term financial performance.

Problems with the Previous Studies of Voluntary Environmental Programs

My study of the adoption and the environmental outcomes of ISO 14001 in Korea contribute to these previous studies at three points. First, most previous research has focused on business organizations in the U.S. and Europe but has paid little attention to business organizations in East Asian countries such as Korea, Japan, and China. According to the ISO survey of 2012, East Asia represents about 40% of the total

certification to ISO 14001. However, only a few studies investigate why organizations in this region have adopted ISO 14001 (Christmann and Taylor, 2001; Welsch et al., 2002; Nakamura et al., 2001) and whether ISO 14001-certified facilities improve their environmental performance (Kwon et al., 2002). In particular, the studies have ignored how institutional contexts affect the diffusion and outcomes of ISO 14001. My study investigates Korea, one of the major countries in Asia as a case of interest, and such a study begins to help fill this missing link.

Second, most of the studies about the diffusion of VEPs have mainly utilized cross-sectional data. These studies tend to ignore the political and historical context of the diffusion of VEPs. Also, these cross-sectional studies raise questions about causality. I examine ISO 14001 diffusion across Korean manufacturing firms during 1996-2011. By observing firms from 1996 to 2011, my study examines how and to what extent social contexts influence firms' adoption of VEPs, and thus this study contributes to the literature on VEPs.

Third, the impact of VEPs on environmental outcomes is still under debate. Most outcome studies have focused on early periods of the emergence of the programs. These studies do not answer the question about whether the certified facilities during later periods actually improve their environmental performance. My study investigates the effects of ISO 14001 adoption during later periods (2004-2011), and thus it also contributes to the literature.

CHAPTER 3

BUSINESS FIRMS' ADOPTION OF THE VOLUNTARY ENVIRONMENTAL PROGRAMS: THE CASE OF ISO 14001 IN KOREA

INTRODUCTION

Why do some firms invest in "greener" technologies and emphasize their environmental responsibilities? Also, why have some firms pursued additional certification or recognition for their pro-environmental practices? Since environmental problems such as overpopulation, climate change, environmental degradation, and pollution have attracted global attention, various Voluntary Environmental Programs (hereafter VEPs) have emerged and become diffused worldwide during the last decade. The VEPs signal organizations' attentiveness to and commitment to these environmental issues. This is also true in Korea.

The number of Korean firms that have adopted a range of VEPs to guide their corporate social and environmental responsibility has been increasing. For example, as of 2011, the total number of ISO 14001-certified facilities in Korea was 8,481, so that the country ranked 6th in the world at that time. Besides ISO 14001, the VEPs include the UN Global Compact, Energy Star, LEED, Global Reporting Initiative, and so on. These programs are quite new, and our understanding of how they become diffused over time still is not adequate or clear. In particular, we still have little understanding of how those programs are diffused within specific national institutional environments or cultures (Delmas and Montes-Sancho, 2010; Matten and Moon, 2008; Delmas and Terlaak, 2002).

In this chapter, I examine the diffusion of ISO 14001, the most popular VEP, across Korean manufacturing firms. I address the following two research questions: "What are the factors that facilitate Korean firms' adoption of ISO 14001?" and "How do these factors differ in the early stage of diffusion as compared to the later stage of diffusion?" To answer these questions, I apply Resource-Based View (hereafter RBV) and institutional theory, developed in research on U.S. and European samples, to the analysis of Korean firms. Scholars have depended on these perspectives to understand the factors that promote firms' adoption of various VEPs (King et al., 2005; Moon and Bae, 2011; Moon and DeLeon, 2007; Delmas and Montes-Sancho, 2011). Each theoretical perspective has also been used to study many company policies and practices tied to corporate social responsibility (CSR) and to employee rights and HR policies in the U.S. and European countries (Bartley, 2007; Kelly and Dobbin, 1999; Bansal and Hunter, 2005; Delmas and Montiel, 2008; Osterman, 1995).

An important line of research on VEPs finds that organizations' adoption of VEPs is affected by 1) the extent to which the programs generate positive and financial opportunities for a firm and 2) how institutional environments prompt firms to adopt these programs. These factors may be interrelated. To be more specific, business-strategy scholars claim that some organizations have adopted the VEPs to increase their "green reputation" in their markets and to improve their operational efficiency (Bartley, 2007; Christmann and Taylor, 2001; King et al., 2005). Institutionalists claim that institutional environments greatly affect the costs and potential benefits of firms' adoption of ISO 14001, and, importantly, that organizational response to institutional environments varies

according to the visibility of an organization and to that organization's connection to the institutional environment (Delmas, 2002; Delmas and Montes-Sancho, 2011; King et al., 2005).

This chapter contributes to the literature on VEPs at two points. First, this chapter adds to the literature on VEPs by examining the predictors of firms' adoption of ISO 14001 in a different social context, and thereby extends Western-oriented findings of the diffusion of VEPs to East Asian countries. More broadly, this chapter aims to expand the understanding of CSR in East Asian countries. Many previous studies on ISO 14001 have focused on business organizations in Western societies and have devoted a little less attention to business organizations in East Asia. As of December 2010, 49.8% of all ISO 14001-certified facilities are located in East Asia (ISO, 2010). However, there are only a few studies investigating how firms in East Asian countries have adopted this VEP (Christmann and Taylor, 2001; Welch et al., 2002; Nakamura et al., 2001). Organizational scholars, therefore, agree that there is a clear need for more research to understand how ISO 14001 has been adopted in East Asian countries (Matten and Moon, 2008; Toffel, 2006; Delmas and Montiel, 2008; Welch et al., 2002).

My second contribution is that I use a longitudinal dataset, which allows me to compare the early stage of diffusion to the later stage of diffusion. Most of the studies about VEPs have focused on the early adoption of the programs but have rarely taken a longer longitudinal approach covering at least a decade of data (Bansal and Hunter, 2003; Delmas and Montes-Sancho, 2011). Due to the absence of longitudinal data, scholars have had difficulty fully examining how institutional contexts affect the diffusion of

VEPs. In comparison, the range of the time period included in my analysis on the firms' adoption of ISO 14001 is from 1996 to 2011, which is the longest time period among ISO 14001 studies. I use event-history modeling to uncover the importance of factors that facilitate the ISO 14001 diffusion across Korean manufacturing firms. Also, I enrich RBV and institutional theory by integrating two theoretical perspectives in a single framework; I highlight the fact that while strategic motives encourage firms' adoption of ISO 14001 in an early stage of diffusion, institutional context plays a major role in promoting firms' adoption of ISO 14001 in a later stage (Tolbert and Zucker, 1983; Bansal, 2005).

Next, I develop and test hypotheses related to RBV and the institutional theory on firms' adoption of the VEP known as ISO 14001. Then, I discuss the impact of firms' strategic motivation and institutional contexts in Korea on their adoption of ISO 14001 and compare my findings to ones from studies of firms in Western countries.

THEORY AND HYPOTHESES

I depend on two major theories to explain firms' adoption of the VEP known as ISO 14001. I describe both briefly, before providing more detailed information and identifying hypotheses for my analysis. The first theoretical perspective is the resource-based view (RBV). This perspective claims that firms' internal resources and capabilities play an important role by producing a variation in their competitiveness in markets (Barney, 1991). According to this theory, firms join VEPs as a strategy to respond to the market. VEPs help firms obtain sustained competitive advantages. That is, firms adopt

ISO 14001 to maintain or acquire a green reputation and promote management efficiency, and to attract environmentally conscious consumers and investors. The second theoretical perspective is institutional theory. This theory suggests that institutional context affects firms' decisions, in part by significantly influencing the perception about the costs and potential benefits of firms' adoption of ISO 14001 (Delmas, 2002). Most of the studies rely on either of the two theories to explain the diffusion of ISO 14001. In this chapter, I will try to integrate the two theories in a single framework.

The Resource-Based View

RBV scholars argue that a firm's resources with distinctive attributes and capabilities would lead to its competitive advantage (Barney, 1991; Wernerfelt, 1984). In other words, this theory seeks to understand the relationship among a firm's resources and its competitive advantage. The resources include tangible assets, such as its financial assets, physical plant and equipment, and raw materials and also intangible assets, such as its reputation, culture, and intellectual property (Barney, 1995). Competitive advantage occurs when an organization acquires or develops a combination of resources that enable it to outperform its competitors. This includes lower costs and differentiation as two important sources of valuable resources (Porter and Van der Linde, 1995). RBV scholars argue that a firm can enjoy competiveness when its resources generate positive value and financial opportunities.

RBV provides useful insights into how ISO 14001 can be a valuable resource that promotes firms' competitive advantages at two points (Hart, 1995). First, ISO 14001

attracts the attention of both environmentally conscious consumers and investors, and thus help the firm build a green reputation. The "green market segment" in the world has been increasing, and a green reputation can generate positive market value by adding price premiums.[4] Second, the adoption of ISO 14001 contributes to developing a firm's operational efficiency. In other words, ISO 14001 enables firms to reduce operation and production costs through improving management processes (Arora and Cason, 1996; Reinhardt, 2000; Welch et al., 2000, Moon and deLeon, 2007). The question remains, though: *which* firms are most likely to adopt ISO 14001, the most popular and famous VEP, to achieve a green reputation and lower cost? I suggest below several hypotheses related to this question.

Chemical industries are usually regarded as "dirty." Individual chemical firms are likely to be subjected to strong demands to "be green" (relative to others in the manufacturing sectors), in order to enhance their reputation. In an effort to clean up the industry's negative image, firms in these industries are likely to adopt VEPs such as ISO 14001 (Bansal, 2005; Bartley, 2007). In addition, firms in the industry are likely to process considerable amounts of natural resources like oil and gas. Therefore, such firms are likely to adopt ISO 14001 to enhance their operational efficiency, and achieve subsequent reductions in production costs. Therefore, I hypothesize that the following:

Hypothesis 1: A firm in a chemical industry is more likely to adopt ISO 14001.

Previous studies have found that firms depending on capital-intensive projects are likely to generate more pollution because they use a large portion of capital to buy

[4] Please visit the website (http://green.kocham.net) to access detail information about green markets in Korea.

expensive machines. Therefore, those firms are expected to process natural resources and to emit pollutants that have a significant impact on the local community (Hart, 1995; Bansal, 2005; Russo and Fouts, 1997). Also, these studies show that operational costs of firms depending on capital intensive projects are relatively high. Therefore, firms with a high level of capital investment intensity are likely to acquire a green reputation in order to attract the attention of environmentally conscious consumers and investors, as well as to reduce operational cost. Therefore, I suggest a following hypothesis:

Hypothesis 2: A firm with more capital investment intensity is more likely to adopt ISO 14001.

RBV scholars argue that a firm can sustain its competiveness when its resources are rare. In other words, a firm can enjoy its competiveness for long periods only if the resources are not easy to copy and substitutable. RBV scholars, therefore, emphasize that a firm sustains its competitive advantage when resources are not imitable and substitutable.[5] RBV provides valuable insights into how ISO 14001 can be a nonimitable resource that sustains firms' competitive advantages (Hart, 1995). As indicated above, the adoption of ISO 14001 may not be an option for every firm. The cost of ISO 14001 is quite significant, and the investment in ISO 14001 might not have an immediate pay-off. Only firms with enough slack resources are able to make an investment in adopting ISO 14001. Therefore, I suggest a following hypothesis:

Hypothesis 3: A firm with superior financial performance is more likely to adopt ISO 14001.

[5] Priem and Butler (2001) criticized RBV with 1) its tautological argument; 2) the problem of equifinality; 3) underdeveloped theory of the role of product market; and 4) its limited applicability.

Institutional Theory

RBV as outlined above assumes a rational evaluation of business needs and the costs of ISO 14001. However, the central argument of institutional theory is that organizations sometimes do things that are not only aligned with a rational evaluation of their needs, but are also aligned with social rules, values, and cognitive assumptions (Selznick, 1966; Stinchcombe, 1965; Meyer and Rowan, 1977; North, 1990; DiMaggio and Powell, 1983). In other words, organizations respond to institutional environments at play in the larger culture. They conform to social expectations about what good firms are supposed to do, such as complying with laws, following 'best practices' and 'modern' management advice, and adopting 'taken-for-granted' management practices. The result is a striking isomorphism of organizational structures (Meyer and Rowan, 1997; DiMaggio and Powell, 1983; Scott, 2007).

Institutional scholars have theorized about institutional processes that give rise to organizational conformity to social legitimacy and expectations. In particular, DiMaggio and Powell (1983) identify three types of institutional pressures that lead organizations to structural homogeneity: coercive, normative, and mimetic pressures. Coercive pressures arise from both formal and informal rules and have force, sanction, persuasion, expedience, and invitation as their forms (DiMaggio and Powell, 1983; Scott, 2007). Normative pressures primarily emerge from educational processes and professional networks (DiMaggio and Powell, 1983; Scott, 2007). Academic institutions such as universities and colleges train managers and staffs to follow socially legitimate values

and norms. Professional networks such as professional associations and industry trade associations spread taken-for-granted values and norms to their member organizations, and this contributes to shaping organizational structures and behaviors. Mimetic pressures arise when organizational environments are poorly understood. To cope with environmental ambiguity, organizations are likely to imitate other successful organizations in their field (DiMaggio and Powell, 1983). These three types of institutional pressures are ideally distinguishable, but they often cannot be readily discriminated from one another in empirical analyses (Scott, 2007). Institutional theory is appropriate to understanding the diffusion of ISO 14001. Institutional theory suggests that decision-makers are inclined to rely on their routines, societal values and expectations, and taken-for-granted assumption when they consider adopting new organizational practices and policies (March and Simon, 1958; DiMaggio and Powell, 1983). The relevant institutional contexts in Korea and hypotheses are described below.

The Korean government established "The Promotion Act for Conversion to Environmental-Friendly Industry Structure (PACEFIS)" in 1995. This law was established in response to the following: UNCED in Rio de Janeiro in 1992 for improved environmental quality; GATT Uruguay Round Ministerial Decision on Trade and the Environment in 1994,; the related launch of ISO 14001 by ISO (Park, 2012). PACEFIS is the Korean law, stipulating that public and private sectors are supposed to commit themselves to environmental issues and responsibilities, and act accordingly. This law also frames environmental management as a legitimate and desirable organizational innovation to fulfill environmental responsibilities (Lee and Rhee, 2005). The law,

therefore, includes the definition of environmental management[6] and lays out basic rules to promote environmental management across public and private sectors. This law legitimates firms' adoption of VEPs including ISO 14001 (18th article). Furthermore, this law encourages the Korean government to establish policies to promote 'environmental management' and induce its diffusion in Korea (15th article).

Although PACEFIS is not legally binding, this law creates social expectations about corporate and governmental commitment to environmental issues. The social expectations act as a focal point around which firms constrain their behavior (McAdams and Nadler, 2004). Once the social expectations are created, various social constituents such as governments and institutional investors encourage firms to fulfill the expectations and evaluate them based on their decision to meet them or not (Kagan et al., 2003). In addition, PACEFIS conveys the message that firms certified to ISO 14001 are fulfilling these social expectations (Park, 2012). In other words, this law conveys a strong signal about the significance and social value of ISO 14001.

Vulnerability to Environmental Uncertainty

Previous studies suggest that newer organizations are sensitive to environmental uncertainty, and they are more likely to adopt new structures and practices to cope with this (Stinchcombe, 1965; Singh et al., 1986; Dobbin and Sutton, 1998). Newer firms are, in general, exposed to "liability of newness" (Haveman, 1993). Such firms are much more vulnerable to environmental uncertainty than older firms because their service and

[6] The 3rd article in PACEFIS in 1995 defines 'environmental management.' According to this law, environmental management means the management activities by enterprises so as to be adequate for the efficient management of environmental elements to achieve environmental-friendly management goals.

products might not be socially recognized. To reduce this environmental uncertainty and obtain social recognition, the newer firms make a greater effort to comply with social expectations. As ISO 14001 has been regarded as legitimate over time since the establishment of PACEFIS in Korea, newer firms are likely to join ISO 14001 to conform to the normative expectations (Boiral, 2012). Therefore, I expect that when a firm is newer, it is more likely to adopt ISO 14001. Accordingly, I predict that:

Hypothesis 4: A newer firm is more likely to adopt ISO 14001.

Financial Leverage

Since the establishment of PACEFIS in 1995, investors' attention to environmental protection and environmental sustainability has also increased over time. Various investors such as banks and pension companies have begun to consider a firm's environmental performance to be a significant indicator when they evaluate the firm's financial management risk and even their performance (Oh et al., 2011; Liu and Anbumozhi, 2009). Therefore, firms that depend more on debt financing will be more likely to strive to improve their environmental performance. Accordingly, I can suggest the following hypothesis:

Hypothesis 5: A firm with higher level of debt is more likely to adopt ISO 14001.

Governmental Incentives

As noted above, the Korean government took the initiative to promote firms' adoption of ISO 14001 by legislating PACEFIS in 1995. In response to this law, the Korean government offers various incentives for firms seeking ISO 14001. There are a range of types of incentives, but these incentives are categorized into four types: tax

credits[7], subsidies, technical assistance, and special consideration for certified firms that are applying for a government sponsored program. For tax credits, the Korean government provides 3 to 5% tax credit for the certification fee for small-medium firms seeking ISO 14001. For subsidies, small-medium firms have been provided by the Korean government with a maximum of $7,000 as subsidies for the fee of ISO 14001.[8] For technical assistance, small-medium firms have been provided with diverse information about international management standards and programs and have learned about certification processes through the Small and Medium Business Administration. For special consideration with contracts, ISO 14001-certified firms can be provided with 'extra points' when they seek a government-sponsored VEP known as the "Environmental-Friendly Company."[9] In addition to these four types of governmental incentives, construction firms certified to either ISO 14001 or ISO 9000 can also acquire special consideration[10] when their performance is evaluated by Korean government. However, the scope of my analysis only focuses on firms in manufacturing industries, and the firms in my dataset would not be influenced by this incentive.

[7] This incentive is based on the 'Special Tax Treatment Control Law,' which has been enforced since 2002. This law was reformed to respond to the establishment and changes of PACEFIS.

[8] Small-medium firms have been also provided with subsidies from local governments. The amount of subsidies differs in administrative regions. "Gyeonggi-do" was the first local government which begun to offer subsidies for small-medium firms seeking VEPs. This local ordinance has spread across Korean local governments since 2000. As of 2011, 11 out of 16 local governments provide subsidies with small-medium firms seeking management programs like ISO 14001.

[9] Firms seeking the program called "Environmental-Friendly Company" are evaluated on their 1) environmental management system, 2) emergency reaction, 3) compliance with environmental laws, and 4) release of environmental information. ISO 14001-certified firms are automatically treated as meeting the first and second of these requirements.

[10] If a firm is certified to management program from ISO, the firm can acquire about 2% 'extra points' when the Korean government evaluates their performance. This incentive is based on the "Construction Technology Management Act," which has been enforced since 2001.

The Korean government concentrates most of its incentives on small-medium firms seeking ISO 14001 (Park, 2012). Small-medium firms are apt to be a laggard in adopting new management practices and policies because they are less likely 1) to have sufficient resources and 2) to have information about new practices (Kelly, 2010; Baek and Kelly, 2014). These incentives help small-medium firms to be certified to ISO 14001 in two ways. First, the governmental incentives help small-medium firms to afford the certification fee through tax credits and subsidies. Second, the Korean government informs small-medium firms of the existence of ISO 14001. Furthermore, the Korean government informs firms that ISO 14001 is a desirable VEP to fulfill their environmental responsibilities, and provides technical assistance to small-medium firms. These incentives, therefore, increase the scope of possible alternatives that firms can consider when developing their environmental management systems to fulfill their environmental responsibility. In addition to the incentives for small-medium firms, the special consideration for certified firms that are applying for the title of "Environmental-Friendly Company" clearly signals that this program is legitimate since the government endorses it.

Most of the government incentives for ISO 14001 benefit small-medium firms. I, therefore, expect that as many small-medium firms are likely to adopt ISO 14001 as large size firms because the incentives help the small-medium firms to overcome their insufficient resources and their lack of information about the program. Accordingly, I suggest a following hypothesis:

Hypothesis 6: The variable indicating 'Small-Medium Firms' overrides the effect of firm size.

<u>Global Institutional Pressures</u>

In addition to changing the domestic institutional environment, institutional pressures can also originate from trade relations. VEPs including ISO 14001 are part of the international environmental discourse (Delmas and Montes-Sancho, 2011; Bartley, 2007; Potoski and Prakash, 2013), and I can surmise that Korean firms depending on foreign markets are more likely to have these 'internationally desirable' management practices (Lee and Rhee, 2005). I expect that firms depending on foreign markets are likely to be influenced by international norms (Christmann and Taylor, 2001), and thus these firms are likely to adopt ISO 14001 in response to the global institutional pressures. Accordingly, I suggest the following hypothesis:

Hypothesis 7: A firm more dependent on foreign markets is more likely to adopt ISO 14001.

How Effects Differ over Time

RBV and institutional theory both provide distinct insights into why firms adopt ISO 14001. The integration of these two theoretical logics in a single framework can further expand the understanding of a firm's adoption of ISO 14001. Most studies of VEPs have taken exclusively either an RBV (Hart, 1995; Russo and Fouts, 1997) or an institutional perspective (Hoffman and Vantresca, 1999); few have tried to integrate these two logics. Yet previous studies about diffusion of other organizational policies and practices have offered a number of important insights into this issue.

In particular, Tolbert and Zucker (1983) suggest that the motivation of adopters changes across diffusion periods. According to their study about civil service reform, Tolbert and Zucker (1983) found that early adopters of the reforms were motivated to overcome administrative problems, and ultimately to improve technical gains from the reforms. Yet, as the reforms spread across cities, they came to be 'taken for granted,' and the cities that had not yet adopted the reforms were regarded as illegitimate ones. Simply speaking, they found that later adopters are primarily interested in social legitimacy, while early adopters of management practices tend to seek technical gains from adoption. A range of studies have supported their insight (Westphal et al., 1997; Delmas and Montes-Sancho, 2011; Moon, 2008; Edelman, 1990; Baron et al., 1986; Burns and Wholey, 1993). Westphal, Gultai, and Shortell (1997)'s study on TQM (Total Quality Management) adoption suggested similar findings. They also found that while early adopters of TQM were motivated by efficiency concerns, later adopters of the practices were primarily motivated by legitimacy concerns.[11]

RBV emphasizes the association between valuable resources and the performance of firms. In other words, RBV scholars claim that valuable resources inside a firm can distinguish the firm from others and increase its efficiency and performance. This ultimately leads to a superior competitive advantage (Barney, 1991). In this perspective,

[11] Some scholars criticize this two-stage institutionalization model because it conceptualizes institutional and technical forces as separate and distinct. They argue that technical considerations are also embedded in institutional forces. These scholars challenge this two-stage institutionalization model by assuming that institutional environments are fragmented and contested. In addition, the institutional environments are thought of as being influenced by multiple and competing logics. However, the history of Korean manufacturing industries is quite short, so that institutional environments are still immature. This condition coincides with Tolbert and Zucker's assumption of institutional environments (newly forming organizational fields). Therefore, my analysis follows the two-stage model.

the adoption of ISO 14001 can be considered the imitable and non-substitutable resource that can obtain green reputation and increase operational efficiency. Therefore, I can suggest that the motivation of early adopters of ISO 14001 may be primarily explained by RBV. However, as ISO 14001 spreads across Korean manufacturing firms, it may lose its status as an imitable and non-substitutable resource. Instead, ISO 14001 would come to be 'taken for granted,' and the adoption of ISO 14001 would be regarded as desirable and legitimate. Therefore, I can hypothesize the following:

Hypothesis 8: While the variables associated with RBV will be significant to explain the early periods of the diffusion process, the variables associated with institutional theory will be significant to explain the later periods of the diffusion process.

DATA AND METHOD

Data

In order to test the hypotheses developed in the previous sections, and in particular, to explore how resource-based and institutional factors influence firms' adoption of ISO 14001, I have selected Korean manufacturing firms listed in the Korean stock market as of 2011 for my sample frame. My choice of manufacturing firms is related to the fact that as of 2009, 87.9% of ISO 14001-certified firms fall into manufacturing industries.[12] The total number of manufacturing firms in Korea is 8,648 as of 2011, but my analysis is limited to manufacturing firms listed in the Korean stock

[12] The most recent data about the distribution of ISO 14001-certified facilities across industries in Korea were available for 2009.

market.[13] Most financial and corporation-level data (e.g., the number of employees, the firm's net income and total assets, capital investment intensity, the size of exports) are only available for the listed firms. The number of firms included in this sample is 1,168. The final analytical sample after deleting cases with at least one missing value from the independent variables was 982 firms with complete information.

Data are collected for the period ranging from 1996 to 2011. I use a database developed by the Korea Information Service Value (KISVALUE) to construct this sample and retrieve financial information and operating characteristics. KISVALUE is a business information service offered by the NICE credit rating agency in Korea, equivalent to Standard & Poor's or Moody's in the United States. Corporate profiles and financial information data offered by KISVALUE are equivalent to COMPUSTAT data for U.S. listed firms. The KISVALUE database covers firms listed in the Korean stock market and non-listed firms that are required by law to file accounting documents with the government (even though they are not listed in a stock exchange). However, as mentioned earlier, the financial information of non-listed companies in KISVALUE has too many missing values to include them in my final dataset.

Dependent Variable

My dependent variable is whether a firm adopts ISO 14001 between 1996 and 2011. Given that my hypotheses are motivated by firm-level characteristics, my analyses are conducted at the firm level. While the certification to ISO 14001 occurs at the facility

[13] Among manufacturing industries, I dropped a firm classified as 'tobacco' industry and 4 firms classified as 'Miscellaneous' Industries.

level, firms (headquarter offices) usually decide whether to pursue the ISO 14001 program. Once firms decide to adopt ISO 14001, they mandate or encourage their associated facilities to be certified to ISO 14001 (Darnall, 2006; Delmas and Toffel, 2008). This is particularly true in Korea. Decision-making in Korean firms is very hierarchical and top-down. In other words, any major decision is dependent on top management in Korean firms (Witt and Redding, 2013). Because of this, facility managers in Korea likely have quite limited discretion for decision-making. Therefore, facilities in a firm are likely to be certified to new management programs such as ISO 9001 or ISO 14001 only if the firm makes a decision to join those management programs in Korea (Hwang et al., 2014; Darnall, 2006).

I operationalize a firm's adoption as the first year that one of the firm's associated facilities adopted the ISO 14001.[14] A firm may have several facilities, and the facilities can be certified to ISO 14001 at different dates. The first decision to be certified to ISO14001 can reflect changes in firm-level strategies. Therefore, once a firm obtains the first certification, the second and the third certification can be obtained easily (Cañón-de Francia and Garcés-Ayerbe, 2009). I confirmed my perspective on the importance of first certification in an interview with an ISO 14001 expert in Korea.[15] According to this interview, Korean firms decide about the adoption of VEPs at the level of the firm and tend to mandate that associated facilities of the firm be certified to the programs. The

[14] There is no the official record of how many facilities are denied certification to ISO 14001. There are few reported cases of failure of certification to ISO 14001. I could find only one case in which a firm failed to acquire ISO 14001 because it did not have ties to management consultants who could advise on certification requirements.

[15] This interview was conducted at Jan. 4th, 2013. The interviewee was a lead auditor and quality management team manager at Korean Foundation for Quality. The Korean Foundation for Quality is the largest consulting firm registered to Korean Accreditation Board (KAB).

dependent variable is coded as 1 for the firm in the first year that one of its associated facilities adopted the ISO 14001. The year of the firm's first adoption of ISO 14001 is used to create the event marker that receives a value of zero for years that the organization is at risk of adoption and a value of 1 for the year of the adoption.

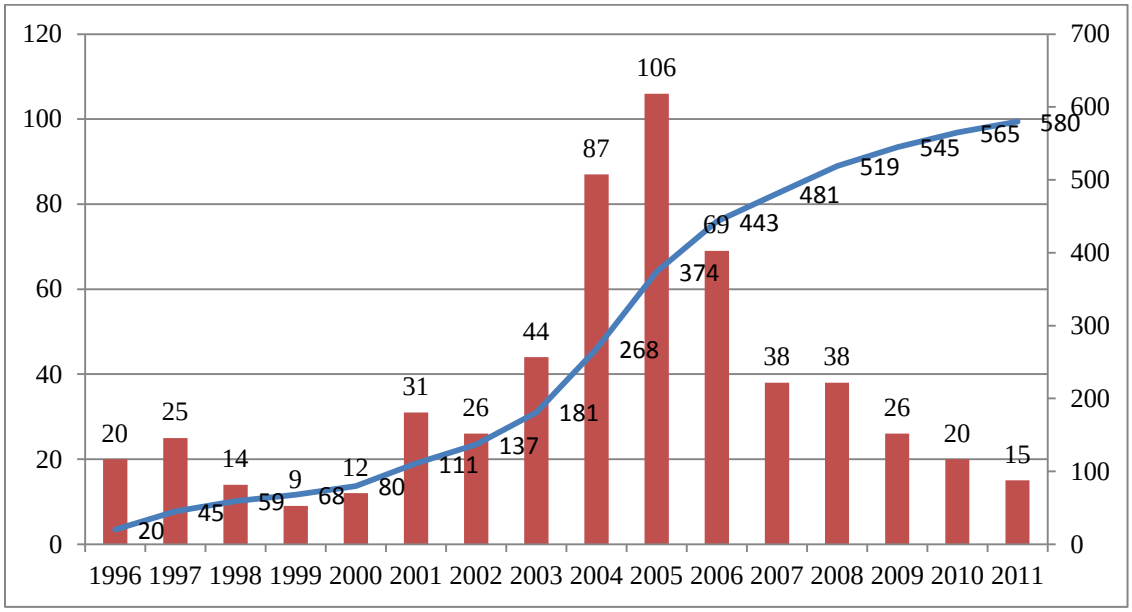
Data on firms' adoption of ISO 14001 are obtained primarily from the ISO 14001 certification data published by the Ministry of Knowledge and Economy in Korea, the only official government data source for ISO 14001. However, these data only cover certification information from 1996 to 2004. In order to obtain additional information on ISO 14001 certification from 2005 to 2011, I also use three additional credible sources: each firm's homepage, company profiles offered by 'Maeil Business News'[16] newspaper, and an ISO certification database from the Korean Accreditation Board (KAB) website (www.kab.or.kr). Those databases supplement information about the first certification date for 2005 to 2011. However, one complication is that KAB only shows the most recent certification, which may be a recertification date rather than the original certification date. When coding adoptions for 2005 to 2011, I found 12 different cases where there were certification dates across the three data sources. In that case, I use the earliest date tied to that firm as the first ISO 14001 certification date.

As noted above, I investigate the first firm-level certification to ISO 14001 instead of the facilities' decision. Given that my hypotheses are motivated by firm-level characteristics, the analysis is appropriate at the firm level not the facility level. Also, there is simply better data on firms' adoption of ISO 14001. In U.S. studies, scholars

[16] This is one of most representative financial newspapers in Korea.

have used facility information registered in the TRI dataset from 1996 to the present to investigate the diffusion of ISO 14001 or other environmental certifications. However, I have found that facility data are not available in Korea. Although Korea also has the TRI dataset, this dataset has only covered facility information from 1999 to the present. This dataset does not cover facility information from 1996 to 1998, which is a key period for understanding the early adoptions of this program, and a comparison of the data I have collected and TRI Korean data suggest that the TRI Korean dataset is spotty from 1999 to 2004. Additionally, the facility size information is not annually available in that dataset.

Figure 3.1: The Annual and Cumulative Number of ISO 14001 Adoption in Korea



Instead of facility data, the data used here come from firms listed as of 2011. Listed firms report most financial and corporation level information (e.g., the number of employee and sales), and I can access the data through KISVALUE. Figure 3.1 displays

the annual and cumulative number of ISO 14001 adoption in Korean manufacturing firms. 59% of the firms in my sample adopted ISO 14001 by 2011.

Analytical Strategy and Estimation

I model a firm's adoption of ISO 14001 using event-history methods. Event-history analysis produces strong evidence of how a range of independent variables affect the rate of certain events such as firms' adoption of ISO 14001. This statistical model is well suited to investigating discrete events, such as management practice and policy adoption that vary in timing and may be censored (not observed during the interval under observation). I employ an exponential model, assuming that changes in the hazard rate are contingent on changing covariates, rather than some inexorable trend during historical time (Frank et al., 2000; Schofer, 2003). I estimate the models using a maximum likelihood method, carried out with the 'streg' procedure in the statistical program STATA 10.0. This statistical model follows:

$$h(t) = \exp(\beta_0 + \sum \beta_k X_{ki})$$

where *h(t)* represents the hazard rate of ISO 14001 adoption occurring in a given year *i* as a function of covariates X_k.

To create the event history format dataset, I extract corporate information about each firm for each year from 1995 to 2011 through the KISVALUE database. KISVALUE provides an identifier file allowing me to match my dependent variable with the extracted dataset. In the event history analysis, I use the spells during which the organization is at risk of adoption of the certification, and I delete the records for years after the firm adopts ISO 14001. This means that the number of records can vary across

firms. In the specification of this event-history analysis, "the hazard rate is the limit of the probability that an event will occur at a particular time to a particular individual, given that the individual is at risk at that time" (Allison, 1984: pp. 14-22). My dataset includes 982 firms. This analysis relies on the 9,947 at-risk firm-years with complete data for the variables of interest.

Independent Variables

RBV provides valuable insights into how a firm perceives ISO 14001 as a strategic means to promote its competitiveness (King et al., 2005; Moon and DeLeon, 2007). I create three measures to consider RBV: 1) chemical and petroleum industries; 2) capital investment intensity; and 3) financial performance (Darnall et al., 2008; King et al., 2005; Moon and DeLeon, 2007; Moon, 2011). I use a firm's KSIC to determine if the firm belongs to the chemical and petroleum industry. Capital investment intensity is measured using the percentage of total assets to total sales of a firm (Bansal, 2005). This indicates how much a firm has capital management capabilities. KISVALUE provides annual information on total assets and total sales. Financial performance is measured by return on assets (ROA), which is commonly used to measure a firm's financial performance. The information on ROA comes from KISVALUE. The first measure is a dummy variable. Capital investment intensity and ROA are time-varying variables.

I use four measures to assess institutional pressures toward the firm's adoption of ISO 14001: 1) firm age; 2) financial leverage; 3) small-medium firms and 4) the relative size of export volume. The age of the firm is measured by the number of years since the date of establishment of the firm. Financial leverage is measured using the percentage of

total debt to total assets of a firm. This variable indicates how a firm depends on stakeholders such as banks and pension companies (Liu and Anbumozhi, 2009). Small-medium firms are measured using whether a firm is covered by 'Small Medium Enterprises Basic Law.' The Korean government established 'Small Medium Enterprise Basic Law' in 1966 to facilitate the business of small-medium firms. In this law, the Korean government defines what small-medium firms are. Firms covered in this law could benefit from the Korean government through tax breaks and various incentives. KISVALUE provides information about whether a firm is covered by this law, and I can figure out whether a firm is 'legally' a small-medium firm. This variable is coded as 1 for small and medium firms, otherwise 0.[17] The relative size of export volume is measured using the percentage of annual export volume of firms to annual total sales of firms.[18] KISVALUE provides information about firms' establishment date, annual debt, and annual export volume. To ensure that causes precede the effects, all variables are lagged by one year (Box-Steffensmeier and Jones, 2004).[19]

Control Variables

I include two control variables to assess alternative explanations. First, I consider firm size to control for the size effect. Larger firms are more likely to be certified to ISO 14001 because they have more resources and bigger capacity (Kalleberg and Van Buren,

[17] This variable should be time varying covariate, but KISVALUE provides the most recently updated status of firms. That is, KISVALUE does not provide old information about whether a firm was a small and medium firm. However, according to government reports, only 4 firms were promoted from small and medium firms to large firms between 1996 and 2010. Therefore, I believe that firm status is not time varying, and I use the most updated status as a time-constant covariate.

[18] I also impute the measure for the relative size of export volume based on a year. Through this imputation process, 1,536 observations have increased. Before and after the imputation process, the significance of independent variables also does not change.

[19] There are no firms that are established and adopt ISO 14001 in same year.

1996). Firm size is usually measured using the total number of employees. KISVALUE provides information about the annual total number of employees of firms. I also employ a natural logarithm of this measure to accommodate right skewness. The information on the annual total number of employees of a firm comes from the KISVALUE.

Second, I consider the adoption of ISO 9001 to control for the effect of past experience with certifiable management standards. Many previous studies – conducted with U.S. and Western European samples – have shown that a firm's adoption of ISO 9001 predicts the adoption of ISO 14001 because they share a high level of commonalities (Delmas and Montes-Sancho, 2011; Darnall, 2006; King et al., 2005; Corbett and Kirsch, 2001; Delmas and Montiel, 2008; Moon and DeLeon, 2007; Potoski and Prakash, 2005). Specifically, management consultants who encourage organizations to adopt ISO 9001 also prompt the organizations to join ISO 14001 because ISO 14001 is a "low hanging fruit" for the ISO 9001 certified-organizations (King and Lenox, 2001).

Table 3.1: Descriptive Statistics, Full Sample (1996-2011)

Variable	Obs	Mean	Std. Dev.	Min	Max
Resource-Based View					
Chemical Industry	9947	0.07	0.25	0.00	1.00
Capital Intensity	9947	1.59	9.00	0.14	677.04
ROA	9947	0.03	0.16	-6.30	1.81
Institutional Perspective					
Firm Age	9947	2.78	0.91	0.10	4.73
Financial Leverage	9947	52.38	26.35	0.76	377.88
Small-Medium Firms	9947	0.48	0.50	0.00	1.00
Export	9947	22.48	28.77	0.00	100.00
Control Variables					
Firm Size	9947	5.21	1.17	0.00	10.95
ISO 9001	9947	0.50	0.50	0.00	1.00

A firm's adoption of ISO 9001 is measured in a similar way as my dependent variable. That is, this variable is measured by the first year that one of a firm's facilities adopted ISO 9001. Like my dependent variable, this variable is obtained from three different sources: 1) each firm's homepage; 2) company profiles offered by 'Maeil Business Newspaper,' and 3) the ISO certification database from the Korean Accreditation Board (KAB) website (www.kab.or.kr). Table 3.1 displays the descriptive statistics of those independent and control variables. This is a description of the means for all years and all firms.

Analysis

I conduct three sets of statistical models. Each set of analysis includes two different statistical models. Two variables (small-medium firms and firm size) are expected to have a high level of correlation, and I plug each variable one at a time into a statistical model. The first set of analyses includes the entire period (1996-2011). The next set of analyses includes the take-off period from 1996 to 2003. The last set of analyses includes the later period from 2004 to 2011. According to the literature of diffusion study, I have chosen the cut-off year for the take-up phase versus the later phase of the diffusion of firm's adoption of ISO 14001. Many studies simply used mid-points of the observed period as a cut-off year to distinguish the early and later adopters (Westphal et al., 1997; Toffel, 2006; Moon, 2008). To conform to those studies, I also used the mid-point of observed period (2004) as a cut-off year. In addition, 2004 was the year ISO revised ISO 14001 and it was translated into Korean. It indicates that after 2004, ISO

14001 entered a mature phase of existence. Table 3.2 displays the results for these analyses.

Table 3.2: Event History Analysis of Adoption of ISO 14001 in Korean Manufacturing Firms

	1996-2011		1996-2003		2004-2011	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Resource-Based View						
Chemical Industry	0.294*	0.299*	0.763***	0.767***	-0.004	-0.005
	(0.146)	(0.146)	(0.205)	(0.203)	(0.216)	(0.216)
Capital Investment Intensity	0.001	0.001	-0.108	-0.105	0.010	0.009
	(0.004)	(0.004)	(0.119)	(0.111)	(0.007)	(0.007)
ROA	0.526	0.579	1.326*	1.255*	0.735	0.712
	(0.353)	(0.339)	(0.598)	(0.561)	(0.382)	(0.372)
Institutional Theory						
	-	-			-	-
Firm Age	0.289***	0.171***	-0.146	0.192	0.392***	0.357***
	(0.054)	(0.050)	(0.109)	(0.105)	(0.062)	(0.058)
Financial Leverage	-0.003	-0.001	-0.003	0.001	0.006**	0.006**
	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)
Small-Medium Firms	—	-0.223*	—	-0.503**	—	-0.237*
		(0.087)		(0.171)		(0.103)
Export	0.007***	0.008***	0.002	0.006*	0.008***	0.009***
	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)
Control Variables						
Firm Size	0.236***	—	0.489***	—	0.142**	—
	(0.040)		(0.061)		(0.053)	
ISO 9001	1.185***	1.219***	1.125***	1.243***	0.837***	0.853***
	(0.102)	(0.102)	(0.173)	(0.170)	(0.127)	(0.127)
	-	-	-	-	-	-
Constant	4.150***	3.278***	6.324***	4.727***	3.168***	2.451***
	(0.228)	(0.215)	(0.424)	(0.427)	(0.306)	(0.251)
Observations	9,947	9,947	5,618	5,618	4,329	4,329

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

In addition, I tried another cut-off year. Studies in the diffusion of management practices categorize corporate participants into various groups according to the timing of each firm's participation relative to the percentage of the total population that joined new programs (Rogers, 2010; Mahajan et al., 2000; Delmas and Montes-Sancho, 2011). In particular, Rogers (2010) classifies the "early majority" as the first 50 percent of adopters. In my case, I use the 50-percent ISO 14001 adopter threshold to differentiate between early adopters and later ones.

Table 3.3: Event History Analysis of Adoption of ISO 14001 in Korean Manufacturing Firms Using the Alternative Cut-Off Year

	1996-2011		1996-2008		2009-2011	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Resource-Based View						
Chemical Industry	0.294*	0.299*	0.338*	0.334*	-0.385	-0.336
	(0.146)	(0.146)	(0.151)	(0.151)	(0.602)	(0.602)
Capital Investment Intensity	0.001	0.001	0.001	0.001	0.041	0.046
	(0.004)	(0.004)	(0.004)	(0.004)	(0.071)	(0.068)
ROA	0.526	0.579	0.578	0.615	0.421	0.472
	(0.353)	(0.339)	(0.385)	(0.370)	(0.768)	(0.799)
Institutional Theory						
Firm Age	-0.289***	-0.171***	-0.268***	-0.136*	-0.542***	-0.540**
	(0.054)	(0.050)	(0.058)	(0.053)	(0.162)	(0.165)
Financial Leverage	-0.003	-0.001	-0.004*	-0.002	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)
Small-Medium Firms	—	-0.223*	—	-0.276**	—	0.422
		(0.087)		(0.093)		(0.279)
Export	0.007***	0.008***	0.007***	0.008***	0.004	0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)
Control Variables						
Firm Size	0.236***	—	0.252***	—	-0.132	—
	(0.040)		(0.042)		(0.142)	
ISO 9001	1.185***	1.219***	1.250***	1.290***	0.536	0.509
	(0.102)	(0.102)	(0.108)	(0.108)	(0.305)	(0.306)
Constant	-4.150***	-3.278***	-4.261***	-3.324***	-1.442	-2.373***
	(0.228)	(0.215)	(0.238)	(0.229)	(0.938)	(0.674)

Observations	9,947	9,947	8,655	8,655	1,292	1,292

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

By 2008, 519 of 982 firms had adopted ISO 14001; those firms are classified as early adopters. On the other hand, 61 firms had adopted ISO 14001 between 2009 and 2011, and those firms are classified as later adopters. The results from the analyses using the alternative cut-off year appear in Table 3.3.

RESULTS

Table 3.2 presents the effects of independent variables on the firms' adoption of ISO 14001. Model 1 and Model 2 present the entire period from 1996 to 2011. Model 3 and Model 4 present the period between 1996 and 2003, capturing early adopters of ISO 14001. Model 5 and Model 6 present the period from 2004 to 2011, capturing later adopters of ISO 14001. This analysis strongly suggests that Korean firms have adopted ISO 14001 to utilize as a competitive resource as well as to respond to institutional pressures. In addition, the results clearly show that firms' motivation to adopt ISO 14001 differs between the early and later periods of the diffusion process.

Hypothesis 1 states that firms in the chemical industry are more likely to adopt ISO 14001. The effect of the variable representing chemical industry is significant ($p<.001$) in the early periods (Model 3 and Model 4) and the effect disappears in the later periods of the diffusion process (Model 5 and Model 6). Hypothesis 1 is, thus, partially confirmed that firms in the chemical industry actively seek ISO 14001 to acquire a green

reputation and management efficiency early on. Hypothesis 2 predicts that firms with capital-intensive projects are likely to adopt ISO 14001. However, the results do not support this prediction. The variable indicating capital investment intensity is not significant in any period. Hypothesis 3 states firms with superior financial performance are likely to adopt ISO 14001. The results partially support this hypothesis with coefficients that are positive and significant ($p<.05$) but only in the early periods.

Hypothesis 4 predicts that newer firms are likely to adopt ISO 14001. The variable indicating firm age is negative and significant ($p<.001$) only in the later periods. This partially confirms Hypothesis 4. Hypothesis 5 states that firms with higher level of debt are likely to adopt ISO 14001. The variable representing the debt financing is positive and significant ($p<.01$) only in the later periods. Hypothesis 6 states that small-medium firms are likely to adopt ISO 14001 as the same rate as larger firms, and the variable representing small-medium firms overrides the effect of firm size. In Table 3.2, the variable indicating small-medium firms is negative and strongly significant in Model 2, Model 4 and Model 6.[20] These results show that small-medium firms are less likely to adopt ISO 14001 than larger firms. This indicates that government incentives for small-medium firms fail to override the effect of firm size on ISO 14001 adoption. This result, therefore, does not support Hypothesis 6. I demonstrate that government incentives are not effective to encourage small-medium firms to adopt ISO 14001. Hypothesis 7 predicts that firms more dependent on foreign markets are more likely to adopt ISO

[20] I drop the variable indicating firm size from the statistical models in Model 2, Model 4 and Model 6 in Table 5. The variable representing small-medium firms can be expected to have high correlation with the firm size.

14001. The variable indicating the relative size of export volume is positive and significant ($p<.001$) only in the later periods. These results partially support Hypothesis 7.

Hypothesis 8 suggests that a firm's motivation to adopt ISO 14001 differs in the diffusion periods. As predicted in Hypothesis 8, the RBV variables are only significant in explaining the firms' early adoption of ISO 14001, whereas variables in institutional theory are only significant to explain the firms' later adoption of ISO 14001. This suggests that firms' motives for the adoption of ISO 14001 change as the program becomes widely recognized. In other words, the inimitable and non-substitutable values that encourage firms to adopt ISO 14001 at the early diffusion periods would disappear as many other firms have joined this VEP over time. Instead, firms recognize that ISO 14001 is a desirable and legitimate VEP to fulfill corporate environmental responsibility in the later periods. Thus, the results strongly support the prediction of Hypothesis 8.

In terms of control variables, this study confirms that firm size and a firm's ISO 9001 adoption are positively associated with the adoption of ISO 14001. However, the effects of firm size and a firm's ISO 9001 adoption shrink over time. This indicates that firms adopted ISO 14001, regardless of the amount of their holding resources and their past experience of similar types of management programs.

Table 3.3 also presents the effects of the independent variables on the firms' adoption of ISO 14001 using another cut-off year. Alternative cut-off year uses 2008 to distinguish early and later diffusion. This cut-off year is chosen to reflect Roger's (2010) claim that "early majority" should be classified as the first 50 percent of adopters. I use 2008 to differentiate between early adopters and later ones. By 2008, 519 of 982 firms

had adopted ISO 14001; those firms are classified as early adopters. On the other hand, 61 firms had adopted ISO 14001 between 2009 and 2011, and those firms are classified as later adopters. The analyses in Table 3.3 also confirm that variables in RBV are significant to explain the adoption of ISO 14001 only in the early periods, as predicted Hypothesis 8. However, it does not capture the effect of institutional variables on the adoption of ISO 14001 in later periods well. These results might be affected by the fact that the later periods using alternative cut–off year do not include a sufficient number of events (i.e., ISO 14001 adoption) because it includes only three years of data.

CONCLUSION

Many previous studies on ISO 14001 have mainly focused on business organizations in Western societies and have given a little less attention to business organizations in East Asia. Although around half of ISO 14001-certified facilities are located in Asia, there are only a few studies investigating how firms in East Asian countries have adopted ISO 14001. Furthermore, most studies of VEPs have focused on the early adoption of the programs but have rarely investigated the later adoption (Bansal and Hunter, 2003; Delmas and Montes-Sancho, 2011). Due to the limited availability of longitudinal data, scholars have had difficulty in fully understanding how VEPs diffuse over time.

This chapter fills in these gaps in the literature by documenting how the number of ISO 14001 adopters increases from 1996 to 2011 across listed manufacturing firms in

Korea, one of the major countries in East Asia. My statistical results support various hypotheses from RBV and institutional theory quite well. The statistical results suggest that firms adopt ISO 14001 to utilize a competitive resource as well as to respond to institutional pressures. In addition, the results suggest that firms' motivation to adopt ISO 14001 differ in the diffusion periods. The motivation of early adopters of ISO 14001 is primarily explained by RBV, but the motivation of later adopters of ISO 14001 is explained by institutional theory.

This finding confirms Tolbert and Zucker (1983)'s finding that a firm's motivation to adopt organizational policies differs in the diffusion periods. At the same time, this present study has implications for RBV and institutional theory. Most studies of ISO 14001 have taken either the position of RBV (Hart, 1995; Russo and Fouts, 1997) or institutional theory (Hoffman and Vantresca, 1999). However, this present study combines the two theoretical perspectives in a single framework. This finding also implies that firms sometimes adopt ISO 14001 as a symbol. In particular, firms adopt ISO 14001 to simply conform to institutional pressures rather than to fulfill their needs in the later periods. Therefore, I expect that a dissonance between ISO 14001 adoption and actual environmental outcomes (e.g., pollutant emissions and legal compliance with the Clean Air Act or other environmental laws) might happen in these periods.

DISCUSSION

More broadly, my research findings contribute to the understanding of VEPs, especially ISO 14001 in a comparative context. Many previous studies on ISO 14001

have focused on business organizations in Western societies. Those studies have mainly focused on the U.S. and countries in the European Union (EU). This Korean context can be compared with Western societies. Previous studies show that firms in countries in the EU benefit from a very favorable institutional environment for the adoption of ISO 14001. Particularly, ISO 14001 in countries in EU can grow on the ground of another VEP known as EMAS. This program was introduced in 1993 by the European Commission. There have been strong regulatory commitments to promote the diffusion of EMAS[21] that require firms to achieve a certain level of environmental performance in the countries in the EU (Kollman and Prakash, 2002). This program provides firms in the EU with some experience in VEP standardization. As a result, this institutional context in the EU favors the development and diffusion of ISO 14001 by creating the perception that ISO 14001 is a legitimate and desirable VEP (Delmas, 2002). In contrast, prior studies suggest that there is no regulatory commitment for the diffusion of ISO14001 in the U.S. The regulatory environment in the U.S., therefore, fails to create the perception that ISO 14001 is legitimate, unlike the countries in the EU. As a result, this VEP is still questioned and has not yet become the norm in the U.S. Scholars suggest that this is because there is an adversarial culture between the regulatory agency and the industry in U.S., and this culture hampers the diffusion of ISO 14001 (Delmas, 2002; 2002; Kollman and Prakash, 2002).

The Korean context is also favorable to the development and diffusion of ISO 14001. Just as the countries in the EU created the perception that ISO 14001 is legitimate

[21] Regulatory flexibility is provided with EMAS-certified firms in countries in EU because EMAS is granted a high credibility by the European Commission.

and desirable on the grounds of the government regulation called EMAS, the Korean government established a law (PACEFIS) that promoted the adoption of VEPs, including ISO 14001 in 1995. This law eventually created the social expectation that ISO 14001 was the preferred way to signal a firm's commitment to environmental issues. We then see a rapid increase of ISO 14001 adopters. As noted in Table 3.4, Korea and the countries in the EU have ISO 14001-ceritified facilities more than the U.S. As opposed to 7,034 sites in Germany and 11,479 sites in Korea as of 2012, there are just 5,699 sites in the U.S. that are ISO 14001 certified. When considering the number of ISO 14001 certified sites in relation to each country's gross domestic product derived from purchase power parity calculation (GDP at PPP) [22], these differences become even more significant (Delmas, 2002). While this relative term in Korea and Greece are 6.6 and 1.8, respectively, the relative term in the U.S. is just 0.3.

Table 3.4: ISO 14001 Adoption across the EU, Korea and the U.S.

Country	The number of sites as of 2012	The number of sites per $Billions of 2012 GDP at PPP
Germany	7034	2
France	7975	2.5
Belgium	1026	2.1
Greece	657	1.8
Korea	11479	6.6
U.S.	5699	0.3

[22] Kollman and Prakash (2002) used the GDP estimates derived from purchasing power parity (PPP) calculation. Using GDP at PPP is useful when comparing differences in economic output between countries more than nominal value of GDP. This is because PPP considers relative costs and the inflation rates of the countries, not just using exchange rates that might distort the real differences in income.

However, this study cannot compare each country in the EU to Korea. According to the ISO survey of 2012, Korea has more ISO 14001-certified facilities than any country in the EU. It would be very interesting to study why Korea has more ISO 14001-certified sites than the countries in the EU and how their institutional environments differ. Both institutional environments encourage firms to be certified to ISO 14001. However, more studies are needed to fully understand which aspects of the institutional environment in Korea are stronger than in the countries in the EU.

CHAPTER 4

The Impact of ISO 14001 on Pollutant Emissions: An Empirical Analysis of ISO 14001 in Korea

INTRODUCTION

In this chapter, I examine the impact of ISO 14001 on pollutant emissions across Korean manufacturing facilities. In the past years, ISO 14001 has attracted the attention of corporations as the 'pollution prevention' approach has replaced the 'end of pipe' approach (Klassen and Whybark, 1999; Bartley, 2007). This situation also occurs in Korea (Lee and Rhee, 2005). As suggested in the previous chapter, ISO 14001 has also been regarded by firms as a legitimate and desirable VEP to fulfill societal requests for environmental responsibility in Korea. As a result, 285,844 facilities across the world have adopted ISO 14001 as of 2012. In Korea, 11,479 facilities have been certified to ISO 14001 as of 2012 (ISO, 2014).

Most previous studies on ISO 14001 have focused on its diffusion across countries and within a nation-state (Christmann and Taylor, 2001; King et al., 2005; Moon and deLeon, 2007; Delmas and Montes-Sancho, 2011; Postoski and Prakash, 2013). There are only a few empirical studies about the impact of ISO 14001 on environmental performance, and those studies to date have yet to establish the conditions under which the adoption of ISO 14001 affects environmental performance (Toffel, 2006; Potoski and Prakash, 2005a, 2005b; Russo, 2009). In this chapter, I address the following research question: "Does the adoption of ISO 14001 lead to reductions in the level of pollutant

emissions among later-adopting organizations?" To tackle this question, I apply resource-based view (hereafter RBV) and institutional theory, developed in research on U.S. and European samples, to the analysis of Korean manufacturing facilities. Confronting this question, this chapter adds to the literature of VEPs by examining the impact of ISO 14001 on the level of pollutant emissions in Korea. There are only a few studies on the impact of VEPs on environmental performance using a sample of organizations in East Asia (Kwon et al., 2002; Fryxell et al., 2004). In particular, there is no study about the effects of ISO 14001 on pollutant emissions using a sample of organizations in East Asia.

As found in the previous chapter, the institutional context in Korea is favorable to firms' adoption of ISO 14001. In particular, the Korean government has actively promoted the diffusion of ISO 14001 to improve environmental quality since 1996. In this context, I am wondering if the favorable institutional context to the diffusion of ISO 14001 in Korea actually leads to the improvement in environmental quality. This chapter extends to Korea the Western-oriented findings of the impact of VEPs on environmental performance.

To investigate the effects of ISO 14001 on pollutant emissions, I depend on the Toxic Release Inventory (TRI) program of Korea. This program provides information about pollutant emissions and facility details. Previous empirical studies of the impact of VEPs on environmental performance conducted in the US have also used data in TRI of the US (Russo, 2009; Toffel, 2006; King and Lenox, 2000). However, the emission information in TRI of Korea was very spotty until 2004. In addition, the emission information of highly toxic chemical substances categorized into Type 1 has substantial

missing information. To secure a feasible analytical sample, I only focus on the effects of ISO 14001 on the emissions of relatively low toxic chemical substances categorized into Type 2 during the late stage of the diffusion of ISO 14001 in Korea. I will explain the data limitations of TRI of Korea in more detail later.

The remainder of this chapter is divided into four sections. First, I develop hypotheses related to RBV and institutional theory on the impact of VEPs known as ISO 14001 on the change of pollutant emissions. Then, I suggest data, variables, and analytical strategy and test hypotheses. Finally, I discuss the impact of VEPs on later adopters' emission performance in Korea.

THEORY AND HYPOTHESES

Outcome studies on the VEPs have paid attention to discovering whether the adoption of VEPs actually affects pollutant emissions (Potoski and Prakash, 2005a; Toffel, 2006; Russo, 2009), regulatory compliance (Potoski and Prakash, 2005b; Short and Toffel, 2010) and financial performance (Moon et al., 2013). This chapter will focus on the impact of ISO 14001 known as one of most famous VEPs on pollutant emissions. The outcome studies of the VEPs have been mainly dependent on two theoretical perspectives: RBV and institutional theory, as employed in the previous chapter. Below, I briefly discuss how these two theories provide different expectations of the effects of VEPs on the pollutant emissions. Then, I suggest two hypotheses about changing levels of pollutant emissions by the adoption of ISO 14001.

The Resource-Based View (RBV)

RBV scholars have expected that the adoption of ISO 14001 reduces the level of pollutant emissions. In addition, they expect that ISO 14001 affects regulatory compliance and financial performance in a positive way (Hart, 1995; Russo, 2009; Moon et al., 2012; Potoski and Prakash, 2005a, 2005b; Cañón-de-Francia and Garcés-Ayerbe, 2009). They argue that the certification process of ISO 14001 often entails developing new routines and skills, which create rare and inimitable resources inside the organization. ISO 14001 does not require the certified facilities to achieve a certain level of environmental outcomes. Instead, the new routines and skills help ISO 14001-certified facilities to reduce pollutant emissions.

Toffel (2006) suggests that the adoption of ISO 14001 reduces pollutant emissions in four ways. First, this VEP requires organizations to re-assess all aspects of operational and managerial processes in the environmentally friendly perspective. International Organization for Standardization (ISO) requires organizations seeking ISO 14001 to develop a comprehensive inventory of all the ways in which organizational activities may impact the environment, to rank their significance in terms of potential environmental impact, and to develop procedures to control those aspects with a highly significant environmental impact (ISO, 2014; Toffel, 2006). This process allows organizations to consider environmentally friendly management as one of their managerial priorities.

Second, ISO encourages organizations seeking ISO 14001 to train their employees whose work is likely to impact on the environment. This training helps the employees to better identify pollution prevention opportunities in their facilities (Darnall et al., 2000; Rondinelli and Vastag, 2000). Third, ISO encourages employees to engage one another and their top managers to more efficiently transfer information and the tacit know-how within facilities, and this includes new ideas to prevent waste and pollution across various production and operation process stages. In particular, ISO encourages organizations seeking to ISO 14001 to use cross-functional teams to implement the program. Such teams facilitate employees' engagement within organizations.

Fourth, ISO requires organizations seeking ISO 14001 to maintain environmental management tasks as their top priority though its review process. ISO 14001 requires adopters to conduct periodic internal audits to ensure that their employees are following the documented environmental procedures. Also, this VEP requires adopters to carry on the documented objectives and requires the senior management to periodically review their environmental management systems and their outcomes (ISO, 2014; Toffel, 2006). Through these four actions, ISO 14001-certified facilities may develop new routines and skills that offer innovative opportunities to improve environmental outcomes. These internal routines and skills facilitate the certified facilities to better identify environmental improvement opportunities, and this results in reduction in pollutant emissions, although ISO 14001 does not actually require the facilities to achieve a certain level of emissions. Therefore, I can hypothesize that:

Hypothesis 1: Facilities that adopt ISO 14001 are more likely to reduce the level of pollutant emissions.

Institutional Theory

Unlike RBV, institutional theory expects different outcomes of the adoption of ISO 14001. Institutionalists claim that organizations adopt management practices and policies in response to institutional pressures (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Kelly and Dobbin, 1999). They argue that organizations are motivated to adopt VEPs such as ISO 14001 and Green Lights to maintain social legitimacy. In other words, institutionalists suggest that VEPs are just symbolically adopted to show off legitimacy and desirability of organizations seeking VEPs, but not to fulfill their actual needs (Toffel, 2006; Short and Toffel, 2010; Moon and deLeon, 2007). I, therefore, expect that there might develop a dissonance between ISO 14001 adoption and environmental performance. In other words, the adoption of ISO 14001 would not have significant impact on environmental performance.

In particular, this theory is applied to the later stage of diffusion process well. Just as Tolbert and Zucker (1983) suggest that the motivation of adopters differ in the diffusion periods, I expect that later adopters just adopt ISO 14001 symbolically. Tolbet and Zucker (1983) argue that later adopters adopt management policies and practices to respond to institutional pressures, while early adopters adopt them to fulfill actual needs of organizations. Therefore, facilities that adopt ISO 14001 at later periods might not reduce their pollutant emissions because they are more likely to adopt the VEP to show

off their commitment to environmental responsibility than early ones. As I said above, this present study only covers the later stage of ISO 14001 diffusion process. Accordingly, I can hypothesize the following:

Hypothesis 2: Facilities that adopt ISO 14001 do NOT reduce the level of pollutant emissions.

DATA AND METHODS

Data

To test my hypotheses regarding the impact of ISO 14001 on pollutant emissions, I collect comprehensive data from various publicly available sources. I focus on the five heavy polluting industries including textile (except apparel), chemical and chemical products (except pharmaceutical and medicinal chemicals), rubber and plastic products, basic metal products, and electronic components, computer, radio, television, and communication equipment and apparatuses.[23] I focus on the facilities in the five industries within Korea that have reported emissions of toxic chemical substances to the TRI program of Korea. As I said, I narrowed down my analytical sample to the facilities in the five industries within Korea that have reported emissions of toxic chemical substances categorized into Type 2 to TRI of Korea between 2004 and 2011. This is because TRI of Korea has the following two types of data limitations.

First, the coverage of TRI of Korea has changed over time. The reporting of emission to TRI of Korea has occurred since 1999. However, data have been only

[23] I select these five industries based on industry level pollutant emissions. This selection is comparable to Postoski and Prakash (2005a), Russo (2009) and Toffel (2006).

publicly available since 2001. The coverage of TRI of Korea was very limited in 2001, but has annually expanded by 2004. The number of chemical substances covered by TRI of Korea was extended from 80 in 2001 to 388 in 2004. Also, the scope of facility size covered by TRI of Korea was extended from facilities with at least 100 employees in 2001 to those with at least 30 employees in 2004. As a result, the number of facilities and chemical substances that are covered by the TRI of Korea increased dramatically in 2004. Since 2004, Korean facilities that manufacture, process or use any of the listed chemical substances in amounts greater than threshold quantities, have at least 30 full-time employees, and those that install have been required to report their emissions and transfers of polluting chemical substances to TRI of Korea.[24] To maintain consistent sample selection criteria, I limit the scope of my observations to the period between 2004 and 2011.

Second, another constraint arises from the lack of data for emissions. In other words, TRI of Korea has substantial missing information. Reporting of emission to TRI of Korea is contingent on the toxicity of chemical substances and the level of emissions per se. The Ministry of Environment in Korea categorizes all chemical substances into two groups, based on their toxicities: Type 1 and Type 2. Chemical substances in Type 1[25] have a relatively high level of toxicity, while chemicals in Type 2 have rather low

[24] This regulation is based on Toxic Chemicals Control Act and Statistics Act in Korea.

[25] Chemical substances categorized into Type 1 include Formaldehyde, Diethylstilbestrol, Benzene, Vinyl chloride, Ethylene oxide, Chloromethyl methyl ether, Ideno[1,2,3-cd]pyrene, 8-Methoxy-6,7,furanocoumarin, Asbestos, Lead and its compounds, Mercury and its compounds, Nickel and its compounds, Arsenic and its compounds, Beryllium and its compounds, Cadmium and its compounds, and Chromium and its compounds.

toxicity.[26] The criteria used to classify chemical substances into Type 1 and Type 2 are whether a given chemical substance is known as (or presumed to be) human carcinogens or known to induce germ cell mutagenicity. The chemical substances in Type 1 are 'verified' as human carcinogens or known to induce germ cell mutagenicity, while those in Type 2 are just 'suspected' to be human carcinogens or to induce germ cell mutagenicity (Lee et al., 2012).

The Ministry of Environment in Korea also establishes the upper limit on what could be processed without having to report emissions and transfer of chemical substances to TRI of Korea. The upper limits depend on types of chemical substances. The upper limit of chemical substances in Type 1 is 1 ton per year, while the upper limit for the chemical substances in Type 2 is 10 tons per year.[27] For example, a facility using only chemicals of Type 1 reports their emissions and transfer of pollutants only if it manufactures, processes or uses at least 1 ton of any substances in a given year. This is the major reason for missing information in TRI of Korea.

Other countries categorize chemical substances in similar ways. For example, the US Environmental Protection Agency (EPA) also groups all chemical substances into two groups, by their toxicities. The upper limit of chemical substances in the first group (low toxic chemicals) is 25,000 pounds, while the upper limit in the second group (high toxic chemicals) is 10,000 pounds.[28] Japan, Australia, and Canada also use a similar

[26] Categorization criteria and toxicity information of chemicals in type 1 and type 2 in English can be found at TRI of Korea (http://ncis.nier.go.kr/main/Main.jsp).
[27] The underlying logic is that the more toxic the chemical substances, the lower the upper limits.
[28] The chemical substances in this group include the persistent bio-accumulative and toxic (PBT) chemicals and they are usually regarded as 'highly toxic' chemicals (EPA, 2014).

categorization of chemical substances.[29] Since the nature of TRI of Korea is analogous to TRI programs in other countries, the results can be also comparable to the previous studies using TRI programs in other countries (Russo, 2009; Toffel, 2006).

I find a high level of missing information in chemical substances in Type 1. Only 155 facilities report emission information of chemical substances in Type 1 during this period. This means that 56% of the total facilities would be lost in the statistical analysis. This high level of missing information is expected to lead to sample selection bias, and produces misleading conclusions (Heckman, 1979). Since TRI in the US has the same concern about the high level of missing information (Grant et al., 2002; Russo, 2009; Toffel and Marshall, 2004), some scholars have tried to address this problem and accommodate the expected bias of statistical analyses in their analyses (Russo, 2009, Toffel, 2006; Toffel and Marshall, 2004; Klassen and Whybark, 1999). For this study, I limit my scope of analysis to the changes of the level of emissions of chemical substances in the Type 2 category to secure as many as possible observable cases. I find that only 2% of total facilities (7 out of 351 facilities) lack the emission information for chemical substances in Type 2 in this period overall.

To construct an analytical sample, I had to match the emission data from TRI of Korea with the KISVALUE data by using names of firms. The Korean TRI database does not provide the whole list of facilities that have reported the emissions of toxic chemicals. I can only pull the toxic chemical emission information when I know the name of a firm

[29] Currently at least 50 countries have fully established TRI program using U.S. TRI as a model. Detail information about TRI programs across the world can be found at http://www2.epa.gov/toxics-release-inventory-tri-program/tri-around-world.

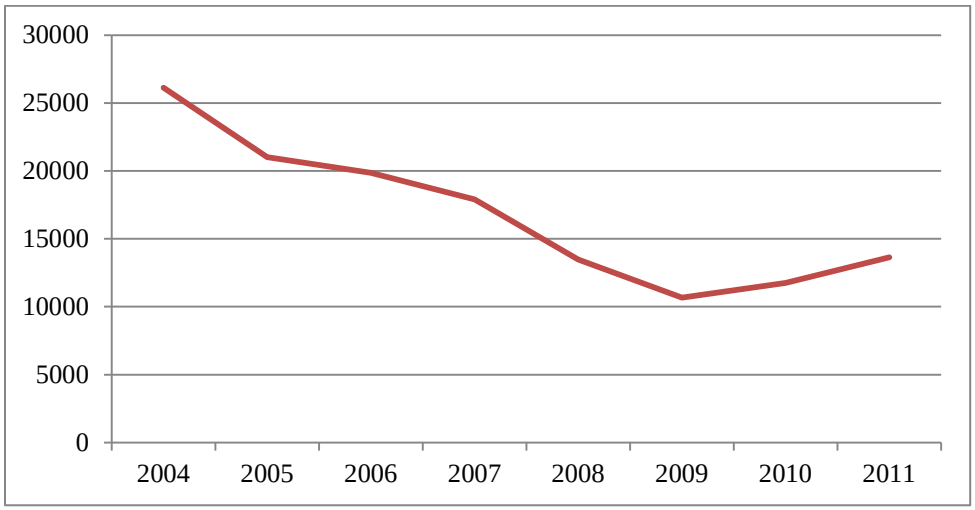
with which a specific facility is associated. Without knowing the names of the firms, I could not pull any emission information. Therefore, I used the firms' name in KISVALUE that I used in the previous chapter to pull the emission information in TRI of Korea. I used the name of firms listed as of 2011 in the five heavy polluting industries.[30] I collected the chemical emission information of 351 facilities between 2004 and 2011 through this process. Among these 351 facilities, I dropped facilities that adopted ISO 14001 before 2004 to only focus on the effects of ISO 14001 on pollutant emissions among later-adopting facilities. The final dataset, therefore, includes 195 facilities and 1365 observations (facility-years).

Dependent Variable

In this chapter, I use the emission data of toxic chemical substances categorized into Type 2 reported to TRI of Korea between 2004 and 2011 as my dependent variable. The data on emissions of toxic chemical substances have been widely employed in previous studies to measure facilities' emission performance (Gerde and Logsdon, 2001; Toffel and Marshall, 2004; Russo, 2009). To accommodate the skewness of the data, the logarithmic transformation is taken. Figure 4.1 shows that on average emissions of chemical substances in Type 2 have decreased over time.

Figure 4.1: The Trend of Changing Level of Pollutant Emissions in the Type 2 Category (kg./ year)

[30] Some firms may have the same name. Not to collect wrong sample, I match a facility's address. Once finding the facility information from TRI of Korea, I can find the facility's address in TRI of Korea. Then, I match the address of the facility with the facility information from the firm's homepage. I do not include the facility if the facility' address does not match the facility address found in the firm's homepage.

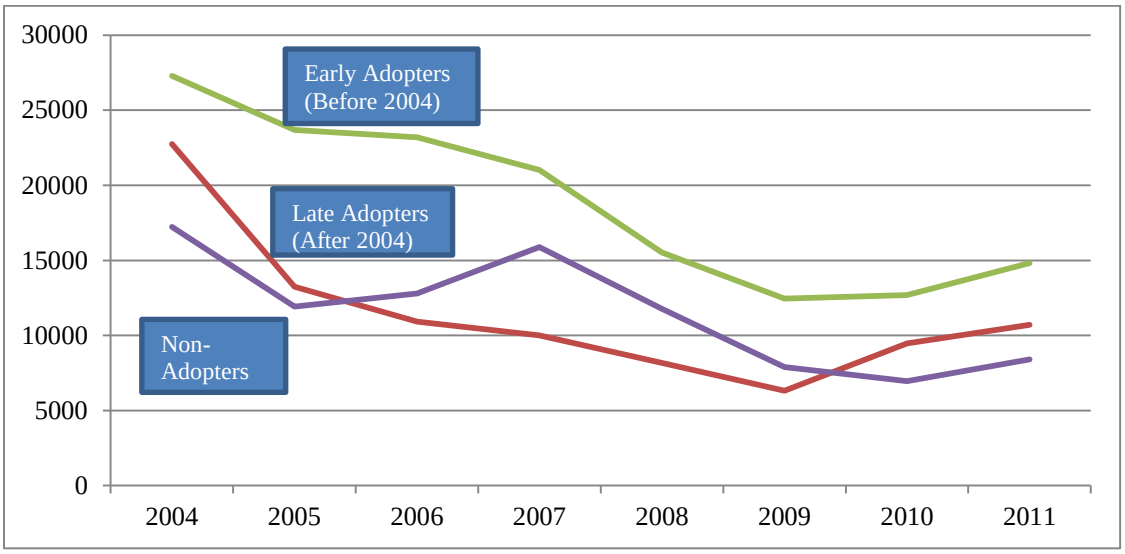


Independent Variable

As my main variable of interest, I use whether a facility is certified to ISO 14001 in a given year. Data on facilities' adoption of ISO 14001 was obtained primarily from the ISO 14001 certification data published by the Ministry of Knowledge and Economy in Korea, the only official government data source for ISO 14001. However, these data only cover certification information from 1996 to 2004. In order to obtain additional information on ISO 14001 certification from 2005 to 2011, I also used four additional credible sources: each firm's homepage, company profiles offered by 'Maeil Business News'[31] newspaper and KISVALUE, and an ISO certification database from the Korean Accreditation Board (KAB) website (www.kab.or.kr).

Figure 4.2: Changing Trend of Pollutant Emissions by ISO 14001 Adoption Status (kg./ year)

[31] This is one of most representative financial newspapers in Korea.



To find each facility's certification information during the period 2005 to 2011, I used the following four steps: 1) I pulled the information about whether a firm has ISO 14001-certified facilities by each firm's name through the KAB website. This website provides the certification information of the associated facilities of a firm, if at least one of associated facilities of a firm adopts ISO 14001; 2) If I did not find any certification information through KAB, I regarded all facilities of a firm as non-adopters. Non-adopters receive the value of 0 across all observation years; [32] 3) If I found information about the certification information of associated facilities, the associated facilities receive the value of 1 at the given year. However, one complication is that KAB only shows the most recent certification, which may be a recertification date rather than the original certification date. To address this issue, I visited the firm's homepage and company profile offered by KISVALUE and 'Maeil Business News' to confirm the original certification dates of each associated facility.

[32] I could not find any evidence through my data sources that a facility had adopted ISO 14001 and canceled it.

Figure 4.2 displays the changing trend of pollutant emissions by ISO 14001 adoption status. This figure shows the changing trend of pollutant emissions by ISO 14001 adopters before 2004, ISO 14001 adopters after 2004, and never adopters. It shows significant differences across groups. Interestingly, early adopters look like heavier polluters than non-adopters and later adopters. I can speculate that heavy polluters are likely to adopt ISO 14001 earlier than others because ISO 14001 can erase their negative image and establish a green reputation for them. This speculation conforms to my prediction, suggested in the previous chapter, and to King and Lenox (2000)'s finding of adverse selection. Later adopters and non-adopters have reduced also their pollutant emissions over time.

Control Variables

I also take into consideration the influence of other factors on the emissions of toxic chemical substances. To isolate the net effect of the adoption of ISO 14001, I control for three types of other factors on the emissions of toxic chemical substances in the statistical model. First, the effect of facility output should be controlled. I know that actual output for facilities is better, but this information is not available from any source at the facility level. Instead, I create a proxy of annual facility output based on three variables: 1) employment at a facility; 2) firms' annual sales; and 3) total employment at firms. Facility employment is obtained from TRI of Korea for a single year for each facility in my sample.[33] Annual sales and total employment at firms are obtained from KISVALUE. To create the proxy variable of an annual facility output, I calculate the

[33] The information about the facility employment is collected only once when a given facility begins to report its emission to TRI. Therefore, facility employment is fixed across the observation periods.

relative sales of a given facility by multiplying the ratio of employment at a facility of total employment at a firm that the facility is associated by the firm's annual sales.

Table 4.1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
ISO 14001	1365	0.36	0.48	0	1
Facility Output	1365	25.16	1.39	19.90	31.10
Enforcement Rate	1365	0.05	0.03	0.01	0.15
Pollution/GRDP	1365	0.08	0.05	0.00	0.24
NGO/GRDP	1365	4.44	5.34	0	20.51
ISO9001	1365	0.71	0.46	0	1
Time	1365	5.02	2.00	2	8

Second, I control for the effect of regulatory social pressures in the administrative districts. [34] To control for regulatory social pressures in each district, I include the ratio of total emissions to the administrative district's GDP and the ratio of total violations to total number of inspected facilities in each district. These two indicators measure direct environmental regulation in each district (Meyer, 1995; Russo, 2009; Short and Toffel, 2010). In addition to direct environmental regulations, I use the ratio of the total number of environmental associations to the administrative district's GDP to measure non-governmental pressures. I obtain annual information about each administrative district from 'Environmental Statistics Yearbook.'

Third, I include a facility's certification information of ISO 9001. This is another management standard. Russo (2009) claims that there is a separate 'quality management'

[34] Korea has 16 local administrative districts as of 2011: Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi-Province, Gangwon-Province, North Chungcheong-Province, South Chungcheong-Province, North Jeolla-Province, South Jeolla-Province, North Gyeongsang-Province, South Gyeongsang-Province, and Jeju.

effect on emission performance, and this effect should be controlled to isolate the net effect of ISO 14001 on pollutant emissions. This standard information is measured using the year of certification. The information sources are the same as those of my dependent variable. Independent variable and control variables are one-year lagged to ensure that the causal effects precede the outcome. Table 4.1 displays the descriptive statistics of independent variable and control variables used in the analysis.

Analytical Strategy

These data are not ideal, though they are best available and comparable to or better than those used in other studies. The data limitations have affected my analytical strategy. The potential problem using TRI (of Korea and U.S.) arises from the lack of data for emission. In other words, the possibility that emission is not reported is tied to the amount of emission per se: unless a facility processes any chemical substance of Type 1 more than 1 ton or otherwise uses at least 10 tons of any chemical substance of Type 2, it does not report to TRI of Korea. Because of this problem, these data have much missing information. This situation can produce sample selection bias (Heckman, 1979). If facilities do not report to TRI of Korea, their emission reduction would not be considered in a statistical model. To address this concern, I use a Tobit approach that accommodates censored data (Tobin, 1958; Long and Freese, 2006; Johnston and DiNardo, 1997). This approach is appropriate if the dependent variable is only observable when it is above or below a certain level.

I also use a fixed effect regression model to estimate the outcome of the ISO 14001 standard. A fixed effect regression method can be employed to isolate the net

effect of the adopted organizational practice and consider unmeasured and time-invariant characteristics that affect the emission performance variable and other independent variables. However, STATA does not include a command for 'Tobit with Fixed Effects.[35]' Instead of using a 'xt' command in STATA 13, I use a string of dummy variables indicating one of each facility in the study. In addition, I add a time trend variable[36] to control for time effects whenever unexpected events and variation might affect the emission performance in facilities. The regression equation follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \delta_1 T_{1,it} + \cdots + \delta_k T_{k,it} + \cdots + Y_2 E_2 + \cdots + Y_n E_n + u_{it}$$

where Y_{it} represents toxic release index of the i^{th} facility in a given year t as a function of independent variable X_{ik} and time trend T_{ik} and a string of dummy variables E_n indicating each facility. Also, β, δ and Y represent the coefficients of variables X, T, and E, respectively.[37] The results using "Tobit with Fixed Effects" appear in Table 4.2.

RESULTS

[35] STATA 13 only includes a command for 'Tobit with Random Effects (xttobit).'
[36] Instead of a string of time dummies, I use a time trend variable to control for the time effects. I choose the time trend variable to save my degree of freedom in my statistical analysis.
[37] "Tobit with Fixed Effects" can address the concern of data censoring issue very well. However, this method does not capture the effects of the nested form of my data structure.

Statistical results appear in Table 4.2. The effect of ISO 14001 adoption is not significant. This result confirms my second hypothesis. The effect of facility output is as expected. This suggests that producing more products is more likely to emit pollutants, as one might expect.

Table 4.2: The Impact of ISO 14001 on Pollutant Emissions (Tobit with Fixed Effects)

	Emission Performance
ISO 14001	0.039
	(0.074)
Facility Output	0.211***
	(0.060)
Enforcement Rate	-2.848**
	(0.867)
Pollution/ GRDP	-0.357
	(0.898)
NGO/ GRDP	0.009
	(0.009)
ISO 9001	-0.083
	(0.108)
Time	-0.076***
	(0.015)
Constant	-6.348***
	(1.469)
Observations	1,154

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05
Fixed Effects are included but not shown

ISO 9001 signals the negative impact on emission performance, but the coefficient on the direct effect of ISO 9001 is not significant. Interestingly, the effect of the enforcement rate in an administrative district on emissions performance is negative and the coefficient is strongly significant ($p<.01$). As an enforcement rate increases, its emission level is likely to decrease. This result indicates that facilities in administrative districts with stronger environmental regulations are less likely to pollute. However, the coefficients of other regional level variables (emission per GRDP and NGO per GRDP) are not significant. For time trend effect, the trend variable signals the negative impact on emission performance, and the coefficient is strongly significant. This indicates that on average pollutant emissions have reduced over time. This result conforms to the time trend of pollutant emissions that appeared in Figure 4.1.

This analysis may have another potential problem. Specifically, a given facility is nested in an administrative district. Therefore, the change of level of pollutant emissions can be attributed to difference across districts, but not to changes of policies in a facility. There is no statistical method addressing both the censoring issue and the nested issue at the same time. One statistical method addresses one limitation at the expense of another limitation. To address the nested issue, I use another statistical method called "Multi-Level Mixed-Effects Linear Regression." The result appears in Appendix 4.1.

CONCLUSION AND DISCUSSION

This study clearly shows whether ISO 14001 influences the emission performance in Korea. While some studies have explored the impact of ISO 14001 on emission

performance, there is a poverty of research that examines facilities in East Asia. Also, there is a need for skillful strategies to cope with the difficulties and limitations of collecting and analyzing the information of TRI. I find that the adoption of ISO 14001 does not affect the changes of emission performance at the later stage of diffusion in Korea. This finding indicates that institutional theory would appear to offer a promising theoretical framework that could be used to understand the non-significant impact of ISO 14001 on emission performance. Moreover, this finding suggests that the institutional context favorable to the diffusion of ISO 14001 − in particular, the Korean government's active involvement in the diffusion of ISO 14001− is not likely to lead to the improvement in environmental quality.

Previous studies about the impact of ISO 14001 on environmental performance have mainly focused on business organizations in Western societies and have given a little less attention to business organizations in East Asia. Although around half of ISO 14001-certified facilities are located in East Asia, there are only few outcome studies of ISO 14001 using a sample of those particular facilities (Kwon et al., 2002; Fryxell et al., 2004). This chapter fills in these gaps in the literature by documenting whether ISO 14001 impacts on emission performance across facilities in the heavy polluting industries in Korea between 2004 and 2011, one of the major countries in East Asia. The results confirm institutionalists' expectations that ISO 14001 has been adopted as a symbol to show off organizational commitment to societal requests for environmental responsibility, but not as an instrument to become more green (Bansal and Roth, 2000; King et al., 2005; Boiral, 2007; Short and Toffel, 2010). Even though this study cannot look at the early

periods where the effects of ISO 14001 may have been real, the statistical results clearly show that ISO 14001 is not effective in reducing the level of pollutant that facilities have emitted in the heavy polluting industries in Korea in the later diffusion stage. In other words, the facilities in Korea have been likely to adopt ISO 14001 as a symbol to respond to institutional pressures, and they might not fully (intentionally or unintentionally) implement the requirement of ISO 14001 in this later period.

Furthermore, this result indicates that the government commitment to promote ISO 14001 diffusion has not been likely to actually improve environmental quality in Korea, at least, at the later stage of diffusion. The previous chapter suggests that the Korean government has promoted ISO 14001 diffusion since 1996. However, the results indirectly suggest that ISO 14001 has been just adopted to show off the facility's commitment to environmental responsibility at the later stage of diffusion.

This chapter has another important implication for regulations and public policies. The results show that facilities in administrative districts with higher enforcement rate are less likely to pollute, while ISO 14001 does not bring about the reduction in pollutant emissions. Although the coercive regulation is not the centerpiece of my analysis, the results suggest the impacts of coercive regulations on emission performance are very significant. Kagan, Gunningham, and Thorton (2003) find that tightening regulatory requirements and intensifying political pressures lead to significant improvements in emission performance by manufacturers. Although my analyses do not show how coercive regulations play a role in reducing pollutant emissions, this study suggests that coercive regulations do account for the changes of environmental performance across

facilities. Future study should delve into the impacts of coercive regulations on environmental performance in Korea.

APPENDIX OF CHAPTER 4

As suggested above, the facility data is nested in the data from administrative districts in Korea. Therefore, the results suggested above might have a potential problem that the change of level of pollutant emissions can be attributed to difference across districts, but not to changes of policies in a facility. To address this potential problem, I use "Multi-Level Mixed-Effects Linear Regression" to check the robustness of my analysis.

This data used in this analysis have two-level data structure. In other words, a given facility is nested in an administrative district. To control for the effects of differences across administrative districts, I use "Multi-Level Mixed-Effects Linear Regression." This regression can include both fixed effects and random effects at the same time. This regression model is a generalization of linear regression allowing for the inclusion of random deviations other than those associated with the overall error term (Rabe-Hesketh and Skrondal, 2008). This model, therefore, makes the specification of random effects of clusters easier. The regression equation follows:

$$Y_j = X_j\beta + Z_j u_j + \epsilon_j$$

where $j = 1, \ldots, M$, with cluster j consisting of n_j observations. The pollutant emissions (Y_j) comprise the rows of y corresponding with the j^{th} cluster, with X_j and ϵ_j defined as

vectors of independent variables and overall error terms, respectively.[38] The results using "Multi-Level Mixed-Effects Linear Regression" appear in Appendix 4.1.

Appendix 4.1: The Impact of ISO 14001 on Pollutant Emissions (Multi-Level Mixed-Effects Linear Regression)

	Emission Performance
ISO 14001	0.103
	(0.154)
Facility Output	0.343***
	(0.098)
Enforcement Rate	-4.054*
	(1.964)
Pollution/GRDP	-0.066
	(1.905)
NGO/GRDP	0.030
	(0.017)
ISO 9001	-0.062
	(0.202)
Time	-0.131***
	(0.031)
Constant	-0.634
	(2.432)
Observations	950
Number of groups	173

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

In this result, three variables – facility output, enforcement rate, and time trend – are strongly significant. The result conforms to the previous finding that appeared in Table

[38] "Multi-Level Mixed Effect Linear Regression" does not address the concern of censoring. To include the missing information of the dependent variable, I simply set the toxic release to 0 if the value is missing, following Russo (2009).

4.2. The significances of variables are consistent with the previous analysis. This indicates that my statistical results are consistent and robust across analytical methods.

CHAPTER 5

CONCLUSION: ISO 14001 IN KOREA

This dissertation has investigated the following two research questions: (1) Why do some firms adopt ISO 14001, one of most well-known voluntary environmental programs (VEPs), to emphasize their environmental responsibility and superior environmental performance in Korea? (2) Do firms in Korea that adopt ISO 14001 actually perform better, in terms of their impact on the environment, than they did in the past? To deal with these questions, this dissertation has depended on two theoretical perspectives: resource-based view, and institutional theory.

In resource-based view (RBV), VEPs have been adopted by firms to sustain their competitive advantages. Furthermore, the VEPs often entail developing new routines and skills, which create rare and inimitable resources inside the organization and achieve improvement in environmental performance.

In institutional theory, it is clear that VEPs have often been adopted in response to institutional pressures. Moreover, this perspective claims that VEPs are sometimes adopted merely as a symbol to respond to institutional pressures, and they are likely to fail to result in improvement in environmental performance. This dissertation relies on these two theoretical perspectives to explore the adoption and outcome of ISO 14001 in Korea.

In the first empirical chapter, I show how business firms have adopted ISO 14001 in Korea. Using longitudinal data, I examine the diffusion of ISO 14001, the most

popular of the VEPs, across Korean manufacturing firms from 1996 to 2011. By using 982 firms in Korean manufacturing sectors, I find that both resource-based and institutional factors influence ISO 14001 diffusion. By exploring time-related effects, I also find that while resource-based factors are important in the early periods of the diffusion, institutional factors become important in the later periods of the diffusion. These findings extend recent Western-oriented research on the diffusion of international management standards to East Asian countries. In particular, this chapter suggests that the Korean institutional context is favorable to the development and diffusion of ISO 14001, as in the countries in the EU.

While the first empirical chapter explores the sources of ISO 14001 diffusion, the second empirical chapter focuses on its consequences. I examine the changes of the levels of emission performance by the adoption of ISO 14001 across facilities in the five heavy polluting industries from 2004 to 2011. By using 195 facilities in the heavy polluting industries, I find that ISO 14001 is not effective in reducing pollutant emissions (for the less toxic pollutants) at the later stage of diffusion. This finding supports an institutional explanation that ISO 14001 was adopted more as a symbolic response to institutional pressures than as an instrumental strategy to fulfill firms' needs. The finding of that chapter also suggests that while the Korean government has promoted the diffusion of ISO 14001 through laws since 1996, the Korean government's encouragement of VEPs is not likely to improve environmental quality.

There are two caveats for these conclusions from the chapter on emissions levels, however. First, data on pollutant emissions levels is not available for 1996 to 2003 so I

cannot assess the impact of early adoption of ISO 14001 on pollutant emissions. The data that is available from 2004 to 2011 suggests, though, that early adopters had quite high levels of pollutant emissions and then saw steep declines in pollutant emissions. Perhaps ISO 14001 encouraged those firms that adopted it early on to make major, helpful changes in their environmental management processes. Second, the Korean government encouraged manufacturing firms to adopt ISO 14001, with the government actively promoting this "self-regulation." But government actors also engaged in direct regulation with positive impacts on pollutant levels. My analysis showed that facilities located in administrative districts with increasing enforcement rates (i.e. a higher ratio of violations relative to the number of inspections conducted) saw decreases in pollutant emissions. This leads me to argue that governments should not only encourage VEPs but also – and perhaps more importantly – increase direct enforcement efforts.

This study also suggests interesting implications for RBV and institutional theory. In the first empirical chapter, variables associated with RBV are only significant in early periods, while variables associated with institutional theory are only significant in later periods. In the second empirical chapter, ISO 14001 does not have a significant impact on the change of pollutant emissions in later periods. These results suggest that resource-based opportunities may shift over time partly because the value of resources may decline over time. As ISO 14001 spreads across an industry, ISO 14001 loses its value to distinguish the firm from its peers and garner a green reputation as it becomes more and more common. Also, these findings indicate that institutional pressures have intensified over time. As the Korean government endorsed ISO 14001 through various laws,

institutional pressures became stronger and penetrated into Korean societies (Edelman, 1990). Therefore, ISO 14001 is increasingly expected for manufacturing firms as the government and other institutional actors push for these changes. This is evident in the finding that firms with greater ties to financial institutions and customers outsides of Korea are more likely to adopt ISO 14001 in the later period. Taken together, these results suggest that the value of rent-earning resources and the strength of institutional pressures can be negatively related over time (Bansal, 2005).

This study also provides an important contribution to the literature on VEPs at two points. First, this study contributes to the literature of the VEPs of organizations in East Asia. Most VEP research has focused on U.S. and European business organizations (Matten and Moon, 2008), and only a few studies have investigated organizations in East Asia (Delmas, 2002). This study has examined Korea, one of major countries in East Asia as its case of interest. The findings find that the Korean institutional context, like the countries in the EU, is favorable to the development and diffusion of VEPs, including ISO 14001. In particular, the Korean government became actively involved in the diffusion of ISO 14001, and this created the social expectation that ISO 14001 was the preferred way to signal a firm's commitment to environmental issues. The result has been a rapid increase of ISO 14001 adopters in Korea. This dissertation proposes a method of analysis that can be adapted to further research into other East Asian societies, such as Japan and China.

Second, this study focuses on the emission performance of ISO 14001 adopters between 2004 and 2011. Most studies of outcomes of ISO 14001 on environmental

performance were not able to observe later adopters because of the lack of data availability of the adoption of the program by a facility. This dissertation collects the data on later adopters of ISO 14001 and observes how ISO 14001 has impacted on pollutant emissions during the later stage of diffusion process. The result clearly shows that ISO 14001 is not effective in reducing pollutant emissions at the later stage of diffusion. This finding validates institutionalists' expectation that ISO 14001 likely adopted as a symbol just to show off organizational commitment to environmental responsibility, but not fulfill their needs for being green at the later stage of diffusion (Delmas and Montes-Sancho, 2011).

Implications for Corporate Social Responsibility in Korea and East Asia

Broadly speaking, this dissertation shows that corporate social responsibility (CSR) in *Korean* organizations is strongly driven by institutional pressures. Organizational scholars have suggested that the corporate motivations to conduct CSR in East Asian countries may not be identical to those in the US because institutional arrangements among business and society are very different (Gond et al., 2011; Matten and Moon, 2008). Such scholars argue that while corporations in the US have regarded CSR as voluntary contributions by businesses to society or marketing strategies, CSR in East Asian countries is under administrative guidance by strong governance systems. Particularly, the governance systems in Korea, China, and Japan can be characterized by concentrated financial systems, regulated education and labor systems, and Confucian culture (Kim, 1997; Whitley, 1991). These governance systems can mobilize corporations through regulations or incentives from the government, or by enhancing

market and civil society pressures on corporations to behave in socially responsible ways. These features have confirmed the notion that the motivations of CSR in East Asian countries are state-oriented and have been derived from their institutional environment. More comparative studies about CSR (particularly in East Asian countries) would be needed to expand our understanding of CSR from a comparative perspective.

Limitations

The limitations of this dissertation mainly originate from the data constraints. In U.S. studies, scholars have used facility information registered in the TRI data from 1996 to 2001 to investigate the diffusion of ISO 14001. However, I have found that facility data are not fully available in Korea. Although Korea also has the TRI data, these data have only covered facility information from 2001 to the present. These data do not cover facility information from 1996 to 2000, which is a key period for understanding the early adoptions of this VEP. Because of these data constraints, I can only observe the emission performance of later adopters. The findings in the second chapter, therefore, are limited to the emission level changes of later adopters. I cannot show how the emission level changes of early adopters are different from those of later adopters.

Future Research

I plan to develop my dissertation into two different ways. First, I am extending the scope of the outcome study in this dissertation—which inquires how the adoption of ISO 14001 affects pollutant emission in Korea—to a project exploring how ISO 14001 affects firms' financial and legal outcomes. For the financial outcomes, I will explore if ISO

14001 certification affects stock prices in a positive way. I expect that the impact of the VEP differs across stages of the diffusion process. For the legal outcomes, I will investigate organizational noncompliance with the Clean Air Act across Korean industries. Much of the previous research about legal compliance has mainly focused on facility managers' rational evaluations of relative costs and benefits of complying with or violating a given law. Building on previous studies, I will consider a variety of predictors suggested by institutional theory to investigate organizational noncompliance with the Clean Air Act. I will use the Toxic Release Inventory of Korea (TRI) as well as government inspection data to test my hypotheses regarding organizational noncompliance with the Clean Air Act.

Second, I plan to examine variations in firm-level adoption of ISO 14001 in Korea, Japan, and China. Much of the previous research about VEPs has focused on firms in a single nation-state. There are only a few studies comparing the adoption of ISO 14001 in multiple countries (Kollman and Prakash, 2002; Delmas and Montes-Sancho, 2011). In particular, there is no study comparing the adoption of ISO 14001 across East Asian countries where 46% of all ISO 14001-certified facilities are located. I will compare Korea, Japan, and China to understand how ISO 14001 has diffused in each country and how institutional contexts differ among the three countries. This dissertation takes a small but hopefully important step toward such future developments.

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