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**AN INSTITUTIONAL PERSPECTIVE ON THE DIFFUSION OF INTERNATIONAL MANAGEMENT  
STANDARDS: THE CASE OF THE ENVIRONMENTAL MANAGEMENT STANDARD ISO 14001**

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**ABSTRACT**

This paper investigates the determinants of the early adoption of the international environmental management standard ISO 14001 using a panel of 84 countries from 1996 to 2002. It analyzes the relationship between firms' decisions to adopt international management standards and institutional factors. The analysis emphasizes that, in the case of an emerging standard, the potential lack of consensus within the regulatory/institutional environment concerning the value of a new standard could send mixed signals to firms about the standard. The results show that in the early phase of adoption, regulative and normative forces within the institutional environment can work against each other. This study contributes to the institutional theory perspective by offering a more complex specification of the neo-institutional model where institutional forces can compete with each other.

Keywords: Institutional theory, Management standard, International Management, Environmental Management Standard, International Standard, ISO 14001, Diffusion of management practices.

One of the central topics of organizational theory has to do with the diffusion of management standards, but to date, most research has provided a limited view of the role of the legal institutional environment. Previous research shows national governments as being important actors, facilitating or hampering the adoption of organizational practices (Delmas & Terlaak 2002; DiMaggio & Powell 1983; Guler, Guillen, & MacPherson 2002; Kelley & Arora 1996; Russo 2001; Tolbert & Zucker 1983), but most of this literature treats government pressure as coercive and monolithic, when in reality, the legal environment is likely to be more complex. Indeed, the legal institutional environment includes not just the coercive pressure that can be exercised through formal regulations but also informal practices, norms and interpretation of the law (Edelman, Uggan, & Erlanger 1999; Sutton & Dobbin 1996).

Furthermore, most attention has focused on the diffusion of established practices. In particular, existing literature on the diffusion of international management practices highlights the coercive role of states and multinationals and the role of imitation in the network of trade relations (Guler et al. 2002). As a result, little is known about the early adoption of an emerging standard. This paper argues that the dynamics between coercive and normative forces within the legal environment may be particularly important to the understanding of an emerging standard, when views about its actual value are still the most malleable.

In this paper, I develop the analysis of the diffusion of standards in new directions contributing both to existing work on international standard diffusion and to neo-institutionalist research. I extend the literature on international standard diffusion by showing how the national institutional context can favor or hamper the early diffusion of an emerging international standard. I enrich the institutional framework by proposing that institutional forces can work against each other. I highlight the potential tension between the regulative and the normative aspects of the legal environment in the early phases of the institutionalization of a management standard.

I will illustrate these points by examining the early adoption of the international environmental management standard ISO 14001—a very recent standard (established in 1996), but one for which there is documented information on the number of its certifications per country. I will begin with a survey of the institutional literature on the diffusion of management practices, and then review the case of the ISO 14001 standard. Based on these reviews, I will next develop and test hypotheses on the role of the institutional environment in the early diffusion of international management practices and then offer a concluding discussion.

### **INSTITUTIONAL ENVIRONMENT AND ADOPTION OF ISO 14001**

Institutionalization involves “the processes by which social processes, obligations or actualities come to take on a rule-like status in social thought and action” (Meyer & Rowan 1977). To date, however, institutional theory has paid relatively little attention to the early processes of institutionalization (Ritti & Silver 1986; Tolbert & Zucker 1983). In a rare exception, Tolbert and Zucker (1996) have suggested three basic stages of institutionalization of a management practice: pre-institutionalization, semi-institutionalization, and full institutionalization. In this typology, the first stage of pre-institutionalization is characterized by few adopters and by limited knowledge about the practice. Next, in the semi-institutionalization stage, the practice is fairly diffused but not yet permanent and stable, and may instead have a “fashionable” or “fad” quality (Abrahamson & Fairchild 1999). In the third or final stage of full institutionalization, the practice is said to have “become taken for granted by members of a social group as efficacious and necessary” (Tolbert & Zucker 1996).

In terms of this typology, most research to date has focused on the third or final stage, or on what happens during the transition between the second and third stages. Some researchers, for example, have noted the effects of national institutions and forces on the process of diffusion of certain organizational practices within countries (Abrahamson & Fairchild. 1999; Lazerson 1995). Others have more specifically considered the institutional factors that shape the cross-national diffusion of practices, focusing on state structures, professionalization, and culture as explanations (Guillen 1997; Meyer, Boli,

Thomas, & Ramirez 1997; Westney 1987). Some have also argued that countries should not be studied in isolation, but that the diffusion of practices is strongly influenced by how countries relate to each other in the global trading system (Guler et al. 2002). This paper, by contrast, will focus on the pre-institutionalization and semi-institutionalization stages, when there is still a lack of consensus on the value of the organizational innovation.

In their own work, Tolbert and Zucker argue that the movement toward a more permanent and widespread status rests heavily on what they call the “objectification” that accompanies the diffusion of a management practice (Tolbert & Zucker 1996). According to these authors, objectification involves the development of some degree of social consensus among organizational decision-makers concerning the value of a practice, and the increasing adoption by organizations on the basis of that consensus (Tolbert and Zucker 1996). In the emerging phase of an international management standard, the lack of social consensus on the practice may manifest itself at the national level, or there may be differences in the interpretation of the standard across countries. It is important to understand what constitutes the basis of the interpretation of the value of a management standard when there is no evidence of its technical efficiency. I argue that the regulative and normative context in which the standard is implemented matters. The risks of the standard may be accentuated in some contexts, whereas the potential benefits may be emphasized in other national contexts. Even within the same national context, the value of a management standard may be contested by some constituents of the institutional environment while others promote it. The emerging phase of a standard provides a unique opportunity to analyze the web of institutional forces that shape and guide the diffusion of a standard.

Recognizing the importance of studying pre-institutionalization, however, is not the same as doing it. The main empirical challenge is that by the time diffusion has clearly reached Tolbert and Zucker’s “second stage,” some of the key details of the early days may have faded from memory or otherwise be difficult to reconstruct. A particularly promising possibility in this connection is provided by the relatively recent introduction and spread of a standard for the improvement of environmental

management practices by the International Organization for Standardization (ISO), namely ISO 14001. An existing body of work has focused on the spread of another international standard from the same organization, ISO 9000, generally known as the “Quality Management” Standard. Because of the lack of data from the early stage of its adoption, however, research on the ISO 9000 standard focused mainly on the later stages of diffusion, by which time the standard had been adopted by a large number of companies in a large number of countries (Casper & Hancke 1999; Guler et al. 2002; Mendel 2001). By contrast, it is possible to obtain data even on the first years of the adoption of ISO 14001, although the adoption process for this more recent standard has now progressed far enough to provide us with an excellent opportunity to analyze the institutional dynamics of the take-off period of the diffusion process. Before turning to the details of the case study and its findings, it may be useful to consider the basic background for the new ISO 14001 standard.

### **ISO 14001**

Formally adopted in 1996 by the International Organization for Standardization (ISO), ISO 14001 represents a new approach to the improvement of environmental management practices. As of 2002, 49,462 firms in 121 countries had adopted ISO 14001, but the level of adoption still differed greatly across countries, with 47 percent of the worldwide ISO 14001-certified facilities located in Western Europe and 36 percent in the Far East. U.S. certified facilities accounted for only 5 percent of ISO 14001-certified facilities (ISO 2002).

The ISO 14001 standard shares many common traits with its predecessor, ISO 9000, the international standard for quality management. Like ISO 9000, ISO 14001 does not focus on outcomes, such as pollution, but focuses on processes. Also like its predecessor, ISO 14001 involves the possibility of an audit by a third party, meaning that studies of ISO standards can benefit from the luxury of third-party auditing and verification.

In essence, the ISO 14001 standard describes the basic elements of an effective Environmental Management System, or EMS. The underlying logic is that if organizations set out to manage environmental matters systematically, 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 (Coglianese & Nash 2001). These elements include creating an environmental policy, setting objectives and targets, implementing a program to achieve those objectives, monitoring and measuring the program's effectiveness, correcting problems, and reviewing the system to improve both the program and the firm's overall environmental performance (Andrews et al. 2003).

Although there are many similarities between ISO 9000 and ISO 14001, there are two main differences, both of which reflect the fact that ISO 14001 focuses on environmental performance in particular. First, given that environmental performance is highly regulated in most industrialized countries, ISO 14001 allows the examination of the role of the regulatory environment in the diffusion of a management standard. Second, given the widespread (albeit not universal) belief among business managers that improved environmental performance is likely to come at the cost of reduced economic performance, the actual impact of ISO 14001 on environmental performance is by no means guaranteed. ISO 14001 does not establish absolute requirements for environmental performance—other than a commitment to compliance with applicable regulations—and it does not explicitly identify environmental performance as a factor in the actual certification process (Christmann & Taylor 2001).

This last point is all the more important in light of the fact that, although the costs of ISO 14001 certification are very real—ranging from \$50,000 for small firms to more than \$200,000 for larger firms (Watkins & Gutzwiller 1999)—the benefits of adopting ISO 14001 are still unclear, and they remain subject to interpretation even seven years after the creation of the standard (Andrews et al. 2003). The potential benefits, moreover, are expected to accrue not only from potential improved environmental performance, but also from avoiding damaging impacts—a process that is difficult to evaluate (Bansal & Bogner 2002). For example, companies may experience a decrease in the cost of their regulatory fines, as



well as a decrease in their environmental liabilities, but it is more difficult for a firm to quantify the dollar value of a lawsuit that is avoided than that of a payment that actually needs to be made. As another example, although it is possible that ISO 14001 procedures will ultimately lead to operational efficiencies through involving employees in the design and implementation of the standard, no study has yet documented the efficiency gains resulting from the adoption of ISO 14001 (Delmas 2001).

This very uncertainty, however, also contributes to the value of ISO 14001 as a case study, particularly as examined through an institutional lens. According to institutional theory, decision-makers will be especially sensitive to institutional pressures when they are faced with uncertainty regarding the tangible benefits of an organizational practice. Still, this is a benefit that is perhaps best obtained through comparative research, while most research on ISO 14001 to date has highlighted the importance of institutional factors within a specific country or a specific industry (Bansal & Bogner 2002; Christmann & Taylor 2001; Delmas 2002; Kollman & Prakash 2002; Russo 2000). To be sure, this research has had value, noting in particular that the adoption of ISO 14001 can signal to external stakeholders that the company is willing to improve its environmental performance—although the signal may be more or less effective, depending on the context. The value of the signal is limited, for example, when stakeholders see the standard as a procedural smokescreen, rather than believing that firms are actually improving their environmental performance (Delmas 2000).

By 2002, ISO 14001 could be seen as moving toward the conditions defining the semi-institutionalized period of diffusion of a practice proposed by Tolbert and Zucker (1996). On the one hand, there was no clear agreement on the value of ISO 14001, but on the other hand, the standard had become fairly widely diffused, with nearly 50,000 certifications in place worldwide by 2002 (see Figure 1). Of course, studying ISO 14001 has several limitations. First, because ISO 14001 is a recent standard, we are able to study only seven years since its adoption. Second, there is no longitudinal information available yet on the adoption of ISO 14001 per sector.

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[Insert Figure 1. about here]

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## **HYPOTHESES: IN SEARCH OF ISO**

Several research traditions within institutional theory have highlighted how various aspects of the legal environment impact firm strategies (Ingram & Silverman 2002). We argue that it can be useful to combine these traditions to understand the early adoption of a management standard. First, the institutional economics literature demonstrates that a government's probability of fulfilling its promises will vary with the structure of a nation's political institutions (Levy & Spiller 1994; Henisz 2000). Second, some scholars in the literature on law and society depict the law as an endogenous phenomenon that is interpreted and sometimes shaped by compliance professionals (Edelman et al. 1999; Sutton & Dobbin, 1996). As I will argue below, both of these perspectives can provide useful insights into the institutional dynamics of the early adoption of an international management standard, although the influences they identify may well work against one other. I subsequently develop hypotheses on the role of previous experience with other types of management standards, as well as on the role of trade relations in explaining the early adoption of a management standard.

### **Credible government commitment**

Scholars in the institutional economics tradition have analyzed how the interplay between government action and the structure of a nation's political institutions can shape the ability of a company to make private investments (Levy & Spiller 1994). In particular, researchers note that policy uncertainty results in lower levels of investment, and that even favorable government policies need to be credible if they are to facilitate investments (Henisz 2000). The credibility and effectiveness of a government's commitment to a specific policy varies with its political and social institutions, with two examples being the effectiveness of a nation's regulatory framework and the credibility of institutions that hold

governments accountable for their actions (Henisz 2000; Levy & Spiller 1994; Lupia & McCubbins 1998).

Given that firms are especially dependent on the legal environment regarding environmental protection, governmental commitment to environmental protection is particularly important in explaining the diffusion of environmental management standards. Because ISO 14001 is a management system that goes beyond existing command-and-control regulations, firms may see ISO 14001 as a tool to help their organization to respond to stringent regulations. A government's commitment to the environment will therefore increase the perceived benefits of adopting ISO 14001. In the presence of uncertainty over the credibility of government commitment to environmental protection, by contrast, there will be fewer incentives for firms to invest in ISO 14001 efforts. Contexts of uncertainty regarding governmental commitment may lead to more questioning of the actual value added of an unclear emerging standard than of a more mature standard that provides clearly identified benefits. I therefore hypothesize that:

Hypothesis 1. The greater the credibility of government commitment to environmental protection, the greater the number of ISO 14001 certificates within a country.

### **Interpretation of the law by compliance professionals**

In the institutional sociology perspective, the normative pillar of the institutional environment refers to sets of expectations, within particular organizational contexts, of what constitutes appropriate and legitimate behavior. In the case of the legal environment, what constitutes "appropriate and legitimate" may be subject to interpretation. Edelman (1992), Edelman et al. (1999), and Sutton and Dobbin (1996) have argued that law is shaped by the social realms it seeks to regulate, and that legal ambiguity in regulations can leave organizations with substantial latitude for constructing the meaning of compliance. These authors explain that compliance professionals (such as lawyers) act as social filters through whom legal ideas pass on their way to organizations, and through whom organizational constructions of law are likely to pass on their way back to the legal realm (Edelman et al. 1999). Indeed,

when lawyers present the legal environment to the business world, they also provide their interpretation of the law and what they consider is appropriate for regulation compliance.

An international standard will be implemented in various national legal environments. Given that levels of litigation can vary significantly from one nation to another, it needs to be recognized that the potential for the discovery of previously unidentified or unresolved regulatory violations may discourage some firms from considering the adoption of ISO 14001. As Rodgers (1996) has noted, in other words, the potential for violations to be identified during the implementation phase or during self- or third-party audits can lead to potential liabilities—raising as well the possibility that regulatory agencies could use the ISO 14001 process to take legal actions against even ISO-certified firms (Orts & Murray 1997). In a recent survey, sent to 200 U.S. firms that were certified before 1999, 62 percent of surveyed firms identified uncertainty about the regulatory agencies' potential "utilization of EMS audit information" as a constraint to the adoption of ISO 14001, and 60 percent indicated "potential legal penalties from voluntary disclosure" to be a constraint to the adoption of ISO 14001 (Delmas 2000). In the case of ISO 14001, the ambiguity in the law regarding the benefits of the standard leaves room for environmental lawyers to provide their own interpretation of the standard's potential value. Because it is part of the mission of lawyers to be conservative to protect their clients, it is likely that they will highlight the negatives of the standard. For example, the U.S. environmental law literature is replete with articles on the risks of adopting ISO 14001 for corporations (Mostek 1998; Orts & Murray 1997; Rodgers 1996).

Such problems would appear to be greater in countries marked by a high level of litigation and adversarial relations between stakeholders, such as the United States, where methods of policy implementation and dispute resolution are more adversarial and legalistic than in European countries (Kagan 2001). With time, of course, the uncertainty concerning potential litigation may well diminish: if there are no cases of litigation linked to the adoption of ISO 14001, managers will realize that firms that adopted the standard did not suffer from liabilities. The importance of compliance professionals in a

litigious society should therefore be more important for an emerging standard than for an established standard. Therefore, I formalize my second proposition as:

Hypothesis 2. The higher the level of litigation within a country, the smaller the number of ISO 14001 certifications within that country.

### **Previous experience with management standards**

The set of expectations of an emerging management standard may also be influenced by past experience with existing management standards. This is especially true if professionals related to the adoption of the earlier standards may benefit from the adoption of the new standard. As described above, ISO 9000, the international quality management standard, was a precursor of ISO 14001, having been adopted in 1987. Because of the similarities between these standards and their implementation, positive experience with ISO 9000 should have a positive impact on how ISO 14001 is perceived by companies.

The institutional literature has described how objectification and diffusion of management standards can be influenced by what has been referred to as “champions”—i.e., a set of individuals with a material stake in the promotion of such a standard (DiMaggio 1988; Kagan 2001; Tolbert & Zucker 1983). In particular, management consultants are often active in providing advice to companies on the decision to adopt management standards (see, e.g., the literature on the adoption of total quality management standards including Reeves and Bednar (1994) and Sitkin, Sutcliffe, and Schroeder (1994)). These consultants benefit directly from the diffusion of ISO standards, which increases their potential market for services.

Because ISO 14001 and ISO 9000 bear communalities, consultants and certifiers of ISO 9000 often become consultants and certifiers of ISO 14001 (Mazurek 2001), often having the opportunity to provide information about ISO 14001 certification during the process of advising their clients about ISO 9000. Evidence shows that firms that have adopted ISO 9000 are more likely to adopt ISO 14001 (Darnall, 2003). Therefore, in a country where a significant number of firms have adopted the ISO 9000

standard, it is likely that consultants and firms will have more knowledge about how to implement ISO 14001 than in a country where there are few ISO 9000 standards. Again, the role of professionals is key at this emerging phase, when firms need more help in understanding how to implement the standard. I formalize the role of previous adoption of a management standard on the likelihood of the adoption of ISO 14001 as follows:

Hypothesis 3. The greater the number of existing ISO 9000 certificates within a country, the greater the number of ISO 14001 certificates within that country.

### **The role of trade relations**

Institutional research has argued that organizations are more likely to imitate the behavior of other organizations that are tied to them through networks (Guler et al. 2002; Westphal, Gulati, & Shortell 1997). Multinationals are widely recognized as key agents in the diffusion of practices across national borders, through the transmission of organizational techniques to subsidiaries and to other organizations in the host country (Arias & Guillen 1998; Christmann & Taylor 2001). Firms that are exporting to countries where an important number of local firms have adopted a management standard may need to adopt the same standard to export to these countries or to trade with local firms there. Guler et al. (2002) have shown such behavior, which they call “cohesion in trade,” in the case of ISO 9000. In the case of an emerging standard, this effect may not be widespread at first, because of the initially low number of adopters in each country. In addition, countries that compete with one another in efforts to trade to third countries may well imitate the behavior of the countries they are competing with (Guler et al. 2002). Firms may adopt the same practices because not doing so would disadvantage them relative to the competition and erode their edge in the market place. According to this argument, firms competing in countries that have a higher adoption rate of ISO 14001 should mimic their competitors’ behavior and adopt ISO 14001. Likewise, Guler et al found this behavior, which they called “role equivalence in trade,” to be a significant driver of the adoption of ISO 9000. In light of the above, I formalize the role of cohesion in trade and role equivalence of trade as follows:

Hypothesis 4a. The greater the number of ISO 14001 certifications in countries with which the focal country is *trading*—representing *cohesion* in trade—the greater the number of certificates in the focal country.

Hypothesis 4b. The greater the number of ISO 14001 certifications in countries with which the focal country is *competing*—representing what the literature calls “role equivalence in trade”—the greater the number of certificates in the focal country.

In summary, the regulatory and normative elements of the institutional environment, as well as trade relations, may shape the adoption of a standard. Each of these factors, however, may play a more or less important role, depending on the stage of the diffusion of the standard. I make the case that, although factors related to trade have been identified as particularly significant in past work, which has focused largely on the later stages of diffusion, the regulatory and normative elements of national environments may also play an important role at earlier stages of diffusion and may well oppose each other.

## **DATA AND METHOD**

I have compiled a panel data set of the total number of ISO 14001-certified facilities in 84 countries between 1996 and 2002. In my sample, 77 countries had at least one certificate in the year 2002, and the remaining seven countries had none. These 84 countries represent 96.9 percent of the total number of certifications worldwide in 2002 (see appendix).

The dependent variable is the number of facilities certified in each country for the period 1996-2002, as recorded by the International Organization for Standardization in Geneva. The reference month for the number of certificates was December of each year. I obtained measures for the independent variables from other secondary data sources. I measured all independent variables with a one-year lag.

### **Credibility of governmental commitment to environmental protection.**

I use two variables to represent the *credibility of governmental commitment to environmental protection*. The first variable represents the *involvement of a country in international environmental treaties*. Several authors have used such variables to measure governmental commitments to

environmental protection (Corbett & Kirsch 2001; Frank 1997). The EarthTrends Data Tables on Environmental Institutions and Governance from the World Resources Institute identify seven main international environmental treaties and provide information on ratification dates (EarthTrends 2003).<sup>1</sup> This variable was calculated by taking the number of years that passed since a given nation ratified a given treaty, focusing on the four treaties that had been signed by the beginning of the study period in 1996. Countries that did not ratify a treaty were assigned zero. Countries with a higher score can thus be considered as first movers on the international environmental scene.

The second variable represents the *credibility of a government's commitment to its policies*. The measure of credible commitment was taken from Henisz's political hazards index (POLCON) (Henisz, 2000). This index quantifies the extent of "state strength," or to be more specific, the extent to which institutional actors within a country (for example, the executive or a chamber of the legislature) are constrained in their ability to implement their policies. To construct this index, Henisz used existing political science databases, identifying the number of independent branches of government (executive, lower and upper legislative chambers, judiciary, and states or provinces) having veto power over a potential policy change. Possible scores for the final measure of political hazards for a given country in a given year ranged from 0 (minimal constraint) to 1 (maximum constraint) (for a detailed discussion of this measure, see Henisz, 2000).

To calculate an overall estimate for *credible governmental commitment to environmental protection*, I created an interaction term between the variable representing the *involvement of a country in international environmental treaties* and the variable representing *credibility of a government's*

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<sup>1</sup> The seven treaties are the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), The United Nations Framework Convention on Climate Change (UNFCCC), The Kyoto Protocol, the United Nations Convention on Biological Diversity (CBD), the Biosafety Protocol, the United Nations Convention to Combat Desertification, and the Stockholm Convention on Persistent Organic Pollutants (POPs).



*commitment to its policies*. To minimize the distortion due to high correlations between the interaction term and its component variables, I first de-mean the variables representing the *involvement of a country in international environmental treaties* and the variable representing *credibility of a government's commitment to its policies*, and then compute the interaction term as the product of both.

### **Litigation**

To my knowledge, there is no one measure that is commonly accepted as providing a comparative measure of the level of litigation in a given nation, but as a proxy for the level of litigation, I have created a variable measuring the number of *environmental law firms*, per capita, in each country. The data for this variable were taken from the Martindale-Hubbell International Law Directory (1995-2001). For analytical purposes, however, it needs to be recognized that this variable may not be linear in its effects: a very low number of law firms may well represent a low level of environmental regulation in a given country, while a very high number of law firms might represent the high level of litigation that might deter firms from adopting ISO 14001. I therefore included this variable as a quadratic term, reflecting the expectation that fears over litigation might negatively affect the decision to seek ISO 14001 certification only after a certain threshold level is reached. It needs to be recognized that there may be some bias in this measure toward U.S.-based companies because this Law Directory is published by a U.S company, but the regression results reported below are not sensitive to the exclusion of the U.S. (More detailed results are available from the author upon request.)

### **Cohesion in trade and role equivalence of trade**

To approximate *cohesion in trade*, I adapted the measure developed by Guler et al. (2002), which captures how strongly a country is tied to other countries through trade and through the extent to which ISO certificates have already diffused in these countries. Unlike Guler et al., however, I used exports instead of total trade, as I expected the imitation effect to flow through export ties. Indeed, focal countries are more likely to be affected by the practices of their customers than by the rest of the world, as their

customers are the ones with which the focal country must establish legitimacy in order to export.

Formally, the cohesion in trade measure for country  $i$  at time  $t$  is:

$$\text{Cohesion in Trade}_{it} = \sum_j \text{ISO}_{jt-1} \times \left( \text{Exports}_{ij} / \text{Exports}_i \right)^2$$

where  $\text{ISO}_{jt-1}$  is the number of certificates for country  $j$  at time  $t-1$ ,  $\text{Exports}_{ij}$  is the exports from country  $i$  to country  $j$  averaged over 1995-1997, and  $\text{Exports}_i$  is country  $i$ 's total exports during the same period. The data on export ties between each pair of countries come from Feenstra (2000).

To capture the effect of *role equivalence in trade*, I also adapted the measure developed by Guler et al. (2002) and calculated how much a country's pattern of exports and imports by product category overlaps with those of the other countries, weighted by the extent to which ISO 14000 certification has already diffused in each of the other countries:

$$\text{Role Equivalence in Trade Effect}_{it} = \sum_j \text{ISO14000}_{jt-1} \times r(\text{ISV}_{it-1}, \text{ISV}_{jt-1})$$

where  $\text{ISO14000}_{jt-1}$  is the number of certificates held by country  $j$  in year  $t-1$  and  $r$  is the Pearson correlation coefficient between the industry share vectors for countries  $i$  and  $j$  during year  $t-1$ . The ISV vector is the combination of import and export industry share vectors for each country  $i$  in the period  $t-1$  (for more details see Guler et al., 2002). The trade matrices used to calculate cohesion and role equivalence were obtained from Feenstra (2000).

### **Experience with process standards**

To represent existing experience with international management standards, I included a variable representing the number of ISO 9000 certifications in the focal country, as obtained from the International Organization for Standardization in Geneva, measured at a one-year lag, and divided by the GDP of the focal country.

I also controlled for the experience with the European Eco-Management and Audit Scheme (EMAS), which is the European standard for a certified EMS, by creating a dummy variable to represent the existence of any EMAS certifications in a specific country.

### **Control variables**

To assess the extent of adoption in a country at any given time, it would be ideal to compare the number of certifications to the maximum number of potential certifications (i.e., the number of establishments), but the latter data do not exist for many of the countries in this study. There are two alternate possibilities. The first is to deflate certification counts using GDP and population. GDP has been used as a deflator in Guler et al. (2000) and Corbett and Kirsch (2001), but it does not represent the actual number of firms that could potentially be certified. The second possibility—and the one used here—is to use a measure that represents the number of domestically incorporated companies listed on the country's stock exchanges at the end of the year. Bekaert and Harvey (2000) employ this variable as a measure of market development. This measure was obtained from the World Bank's World Development Indicators Database for the years 1995-2001. In practice, measures of GDP and of the number of listed companies are highly correlated (0.78), and the measure used here does not include private companies, but it still provides a better proxy of the actual number of companies within a country than does the GDP.

I also controlled for the impact of the presence of foreign multinationals with a variable that represents the value of inward foreign direct investment (FDI) as a percentage of Gross Domestic Product (GDP). This measure was obtained from the World Bank's World Development Indicators Database for the years 1995-2001. Table 1 presents the descriptive statistics and the correlation coefficients of the variables used in this study.

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[Insert Table 1. about here]

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Note that because ISO 14001 is a recent standard, I do not seek evidence of changes in the effects of the independent variables in the first seven years of the diffusion of ISO 14001. Instead, I compare the results from ISO 14001 to past findings on the adoption of another standard—ISO 9000—for which most work focuses on later stages.

## Estimation

The dependent variable, which represents the number of ISO 14001 certificates per country, has two important characteristics: it is a count variable, and it includes both many observations clustered at zero and several observations far in the right tail of the distribution, resulting in a variance higher than the mean and therefore overdispersion. Poisson regression is specifically designed for count dependent variables. It assumes, however, that the mean and variance of the events counts are equal (Greene 1993). When individual counts are more dispersed than the Poisson model, the negative binomial model can be used, because a random term reflecting unexplained between-subject differences is included in the regression model (Gardner, Mulvey, & Shaw 1995). I therefore ran a negative binomial model using a panel data set for country data pooled over the 1996-2002 period. The panel negative binomial model that I use is represented by the following equation:

$$\log \lambda_{i,t} = X_{it}\beta + \sigma\varepsilon_i + \mu_i \text{ where } \Pr(y = r) = \frac{\lambda^r \varepsilon^r}{r!},$$

where  $y$  is the observed count and  $r$  is an integer.  $X$  is a vector of characteristics of the country  $i$  at time  $t$ , and  $\sigma$  is a correction for overdispersion. The model also includes  $\mu_i$ , a time-invariant country  $i$  effect. I ran the model using the *xtnbreg* command in the Stata 7 statistical software (see Stata 2001).

To account for unobserved heterogeneity, the possibility that observationally equivalent countries may differ on unmeasured characteristics, I used the fixed-effects overdispersion model approach. Fixed-effects estimators for count data handle unobserved heterogeneity by computing within-country estimates

of the coefficients. In the fixed-effects approach, when an individual country has zeros or values that do not vary over time, that country's contribution to the log-likelihood is equal to zero, meaning that individual countries with values that do not vary over time are not included in the total number of observations. In my sample, as noted earlier, there are 21 countries that did not adopt any ISO 14001 certificates in the period 1996-2002. They are therefore not included in the fixed-effects model. The resulting number of countries included is 77.<sup>2</sup>

## RESULTS

Table 2 presents the test of the direct effects of the independent variables on the adoption of ISO 14001, doing so through the consideration of 10 possible models. Model 1 includes the control variables only. Because Table 1 showed some significant correlations between the variables measuring the credible government commitment toward the environment, the number of environmental law firms, the number of ISO 9000 certificates, and the number of listed companies, I entered independent variables individually (Models 2-8) as well as entering all of them in the full model (Model 9). I also calculated Variance Inflation Factors (VIF). The results yield VIF values below 2.20, much lower than the usually accepted threshold of 4, indicating that there is no problem of multicollinearity. Model 10 is the best model, omitting insignificant variables. A log likelihood test of Model 9 against Model 10 shows that the two models are not significantly different from one another. In addition, I graphed the negative binomial probability of the full model and the observed proportion (see Figure 2). The negative binomial probability fits well the observed proportion.

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<sup>2</sup> To check whether the inclusion of additional countries with no ISO 14001 certificates would change the results, I also ran a random-effects overdispersion model. In random-effects overdispersion models, the dispersion varies randomly from group to group, such that the inverse of the dispersion has a Beta(r,s) distribution. The results are not significantly different from the fixed effects model (the results are available from the author on request).

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[Insert Table 2. and Figure 2. about here]

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In Model 1, the year dummies exert significant effects on the number of certificates. The number of listed companies also is significant. The influence of foreign direct investment, however, is not significant, indicating that at the early stage of the adoption of ISO 14001, the presence of multinationals is not a driver of adoption.

Hypothesis 1 states that the credibility of governmental commitment to the environment will contribute positively to the number of ISO 14001 certifications. In Model 2, the direct effects of the variables representing the involvement of a country in international environmental treaties and the credibility of governmental commitment are both positive and significant ( $p < 0.01$ ). In Model 3 and the full model, the coefficient of the interaction is positive and significant as well ( $p < .01$ ), indicating that the effect of international treaties on ISO 14001 appears to be dependent on the credibility of governmental commitments.

Hypothesis 2 predicts that firms would be less likely to adopt ISO 14001 in a national context where the number of environmental law firms is either very low or very high—the former because a very low number of law firms might indicate that a given nation’s level of environmental enforcement creates little need for legal representation, and the latter because high numbers of lawyers could discourage firms from exposing themselves to the potential for litigation. This hypothesis is also supported by the results; the sign of the quadratic term has a negative value and is significant ( $p < 0.05$ ), both in Model 3 and in the full model.

Hypothesis 3 predicts that the more the experience with process standards such as ISO 9000 within a country, the more likely ISO 14001 would be adopted. The variable representing the number of ISO 9000 certifications is positive and significant ( $p < 0.01$ ), both in Model 4 and in the full model, supporting Hypothesis 3 as well. The variable representing EMAS adoption is also significant in model 5 ( $p < 0.10$ ), although it loses its significance in the full model.

Hypothesis 4a predicts that the number of certificates in the focal country should be positively related to the number of certificates in those countries to which the focal country is directly tied in the trade network. The results support this hypothesis as well, with coefficients that are positive and significant, both in Model 7 and in the full model ( $p < 0.01$ ). Hypothesis 4b predicts that the number of certificates in the focal country should be positively related to the number of certificates in those countries with which the focal country is competing. By contrast, the coefficient for representing the role equivalence of trade, however, is not significant, and this hypothesis is not confirmed.

These results provide good support for the hypotheses under investigation, sustaining the assertion that the more credible the governmental commitment to the environment and the greater the experience with process standards such as ISO 9000 within a country, the more likely the firms are to adopt certifications. Likewise, above a threshold, the presence of more lawyers in a given country reduces the number of firms seeking ISO 14001 certifications. The role of cohesion in trade is also important, while the role of equivalence of trade is not.

## **DISCUSSION AND CONCLUSION**

There has been a lot of speculation concerning the drivers of firms' first adoption of management standards, but there is still limited empirical evidence. In this paper, I show the relationship between firms' decisions to adopt environmental management standards and institutional factors. The analysis emphasizes that, in the case of an emerging standard, the potential lack of consensus within the regulatory/institutional environment concerning the value of a new standard could send mixed signals to firms about the standard. For example, although the government may send positive signals favoring the adoption of environmental management practices, compliance professionals may send negative signals. In an international context, the dynamics that will lead to a degree of social consensus will vary from one country to another. The data suggest that ISO 14001 is more likely to be adopted in a country where there is (1) a high level of credible governmental commitment to environmental protection and (2) a low to moderate number of law firms, per capita, suggesting relatively low levels of litigation. To the extent to

which these early-stage findings suggest tension between the “regulative” and “normative” aspects of the legal environment, this tension may well become resolved over time, as the actual transaction costs and benefits of the standard become better known.

More broadly, this study contributes to the institutional theory perspective by enriching the neo-institutional model. Most prior studies have treated the effects of the regulative and normative aspects of the institutional environment as being independent of one another, with normative aspects of the legal environment, in particular, rarely being considered. I have found support instead for the expectation that the legal environment is constituted through the interaction between government policies and professional influence, and that the legal environment will incorporate both regulative and normative forces, which can work against each other in the case of the adoption of a management standard. In particular, this study extends the findings of Edelman et al (1999) and Sutton and Dobbin (1996), who highlighted the role of compliance professionals, in two directions. First, while they showed that compliance professionals encouraged the legalization of employment practices, I described how compliance professionals could exaggerate the threat of misuse of information and actually discourage managers to adopt ISO 14001. In this study, compliance professionals could be an impediment to the adoption of a standard. They contest the value of a standard that in principle aims at helping companies to comply to existing regulations. I did not argue that these compliance professionals would personally lose from the diffusion of ISO 14001, but rather that they were playing their expected role, which is to highlight the risks of a standard in a specific legal context. Second, I compare internationally the importance of norms within the legal environment. I show that there is a nonlinear relationship between litigation and the adoption of ISO 14001. It is only above a certain threshold that litigation will hamper the adoption of ISO 14001. Therefore, it is important to recognize this threshold effect to analyze the dynamics of the relationship between the regulative and normative elements of the legal environment.

My research also shows that previous experience in adopting process standards such as ISO 9000 appears to facilitate the early adoption of ISO 14001. Previous studies analyzing the adoption of ISO



9000 would not have been able to consider such a possibility, because there was no previous process standard before the adoption of ISO 9000. My research therefore provides new insights on this issue by showing the link between two standards that differ in terms of their objectives (quality management versus environmental management) but have similar prerequisites and organizational requirements.

Trade relations, through the role of exports, also explain the adoption of ISO 14001 certificates, as was found in previous studies of ISO 9000. However, competition through trade, or role equivalence of trade, does not explain the adoption of ISO 14001. One could argue that, because previous research showed the importance of the role equivalence of trade relations on the adoption of ISO 9000, it is possible that it plays a role on the adoption of ISO 14001 through its indirect impact on ISO 9000.

Future research may well be able to examine the ways in which the dynamics of initial adoption and later diffusion may interact with the characteristics of a given innovation, just as previous research on product standards has shown that the specifics of the products have an important bearing on their diffusion curves (see, e.g., the summary by Rogers 1962). Just as Teece, for example, has argued that there are some similarities in the diffusion processes of product and administrative innovations (Teece 1980), future studies should investigate the role of the specific characteristics of a management standard on its likely diffusion. In this paper, I have postulated that institutional factors may be especially important in explaining the diffusion of ISO 14001 because of the incompleteness of the standard in dealing with the measurement of environmental performance. But why was such an “incomplete” standard enacted in the first place? Further research could investigate whether the institutional forces that are at play for the creation of a standard could be related to those that hamper or facilitate its diffusion.

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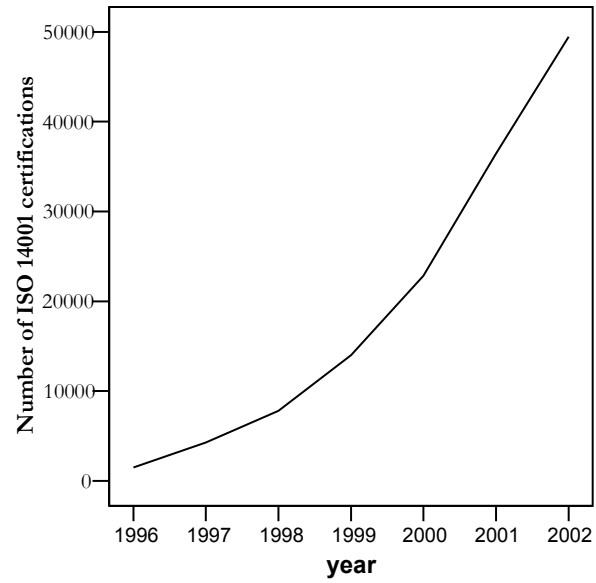
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**Figure 1. Number of ISO 14001 certifications worldwide<sup>3</sup>**



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<sup>3</sup> Source: International Organization for Standardization. Note that the reference month for the number of certificates is December of each year.

**TABLE 1****Descriptive statistics and correlations**

Variable	Obs	Mean	Std. Dev.	Min	Max	1	2	3	4	5	6	7	8	9
1 ISO 14000	550	238.85	775.77	0.00	10620									
2 International treaties	550	0.00	10.44	-43.51	15.01	.19*								
3 Credible govt commitment	550	0.00	0.19	-0.38	0.36	.16*	.21*							
4 Log (Number of law firms)	550	1.39	3.85	0.00	29.83	.27*	.25*	.18*						
5 Log (ISO 9000/GDP)	550	7.54	2.31	0.00	10.90	.24*	.16*	.37*	.24*					
6 Role equivalence trade	550	9.30	8.96	0.15	37.73	.38*	.06	.15*	.21*	.43*				
7 Cohesion in trade	550	4.07	1.44	-1.72	7.51	.09	-.15*	.07	.03	.16*	.54**			
8 Log (FDI)	550	0.63	1.29	-7.20	4.54	.00	.04	.10	.07	.11	.15*	.19		
9 Log (Number of companies)	550	5.06	1.52	1.10	9.09	.35*	.44**	.20*	.43**	.38*	.19*	-.01	-.05	
10 EMAS certifications	550	0.16	0.37	0.00	1.00	.28	.23*	.28*	.25*	.35*	.26*	.00	.14*	.21*

\* p&lt;0.05, \* p&lt;0.01



**TABLE 2**

**Negative binomial of the number of ISO 14001 certificates (1996 to 2002) fixed-effects model**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
International treaties		0.02* (0.01)	0.02* (0.01)						0.03** (0.01)	0.03** (0.01)
Credible govt commitment		0.54* (0.27)	0.39 (0.28)						0.64* (0.27)	0.59* (0.27)
Treaties x Cred govt com			0.06+ (0.03)						0.05+ (0.03)	0.05+ (0.03)
Law firms				0.04** (0.02)					0.04+ (0.02)	0.04+ (0.02)
Law firms2				-0.14* (0.06)					-0.13* (0.06)	-0.12* (0.06)
ISO 9000					0.45** (0.05)				0.43** (0.05)	0.42** (0.05)
EMAS						0.28+ (0.15)			0.11 (0.13)	0.12 (0.13)
Role equiv Trade Cohesion in Trade							-0.00 (0.01)		-0.01 (0.01)	
								0.33** (0.11)	0.31** (0.12)	0.32** (0.12)
FDI	-0.01 (0.03)	0.00 (0.03)	0.00 (0.03)	-0.01 (0.03)	0.01 (0.03)	-0.02 (0.03)	-0.01 (0.03)	-0.02 (0.03)	0.04 (0.03)	
# of companies	0.12* (0.06)	0.08 (0.06)	0.08 (0.06)	0.06 (0.07)	0.11+ (0.06)	0.13* (0.06)	0.12+ (0.06)	0.12* (0.06)	0.06 (0.06)	0.05 (0.06)
y1996	-3.63** (0.14)	-3.63** (0.14)	-3.62** (0.14)	-3.72** (0.15)	-2.80** (0.15)	-3.56** (0.15)	-3.66** (0.26)	-2.51** (0.40)	-2.02** (0.46)	-1.87** (0.40)
y1997	-2.54**	-2.55**	-2.54**	-2.62**	-1.88**	-2.49**	-2.57**	-1.69**	-1.35**	-1.21**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	(0.10)	(0.10)	(0.09)	(0.10)	(0.10)	(0.10)	(0.23)	(0.30)	(0.36)	(0.30)
y1998	-1.89** (0.07)	-1.89** (0.07)	-1.88** (0.07)	-1.93** (0.07)	-1.46** (0.07)	-1.85** (0.07)	-1.91** (0.21)	-1.27** (0.22)	-1.10** (0.29)	-0.96** (0.22)
y1999	-1.29** (0.06)	-1.28** (0.06)	-1.28** (0.06)	-1.32** (0.06)	-1.02** (0.06)	-1.27** (0.06)	-1.31** (0.18)	-0.87** (0.15)	-0.78** (0.22)	-0.66** (0.16)
y2000	-0.81** (0.05)	-0.80** (0.05)	-0.81** (0.05)	-0.84** (0.05)	-0.65** (0.05)	-0.80** (0.05)	-0.83** (0.13)	-0.54** (0.10)	-0.52** (0.15)	-0.43** (0.10)
y2001	-0.34** (0.04)	-0.36** (0.04)	-0.35** (0.04)	-0.36** (0.04)	-0.28** (0.04)	-0.34** (0.04)	-0.35** (0.08)	-0.25** (0.05)	-0.28** (0.07)	-0.22** (0.05)
Constant	2.70** (0.38)	2.89** (0.38)	2.95** (0.39)	3.19** (0.41)	-1.25* (0.58)	2.53** (0.39)	2.72** (0.41)	0.87 (0.71)	-2.25** (0.87)	-2.32** (0.84)
Observations	516	516	516	516	516	516	516	516	516	516
Number of id	77	77	77	77	77	77	77	77	77	77
Log likelihood	-1504.35	-1500.14	-1498.52	-1500.18	-1465.07	-1502.54	-1504.35	-1499.77	-1449.77	-1500.87
Log likelihood test against model 1		8.43**	11.66**	8.35**	78.56**	3.33*	0.01	9.16**		
Log likelihood test against model 9										2.19

Standard errors in parentheses \*\* p<0.01, \* p<0.05, † p<0.10

## APPENDIX

### Number of ISO 14001 certificates in 2002 by country included in the analysis

Argentina	249	El Salvador	0	Lebanon	5	Saudi Arabia	5
Australia	1485	Finland	750	Luxembourg	17	Singapore	441
Austria	429	France	1467	Malawi	3	Slovak Rep	70
Bahrain	2	Germany	3700	Malaysia	367	Slovenia	149
Bangladesh	3	Ghana	0	Malta	3	South Africa	264
Barbados	3	Greece	89	Mauritania	0	Spain	3228
Belgium	264	Guatemala	1	Mauritius	5	Sri Lanka	5
Bolivia	4	Hong Kong	208	Mexico	369	Sweden	2730
Brazil	900	Hungary	640	Morocco	11	Switzerland	1052
Bulgaria	10	Iceland	3	Netherlands	1073	Tanzania	0
Canada	1064	India	605	New Zealand	78	Thailand	671
Chile	55	Indonesia	229	Nigeria	4	Trin & Tob	7
China	2803	Iran, Isl Rep.	54	Norway	278	Tunisia	13
Colombia	69	Ireland	289	Pakistan	21	Turkey	135
Cote d'Ivoire	0	Israel	112	Panama	1	Uganda	0
Croatia	35	Italy	2153	Peru	25	UK	2917
Cyprus	21	Jamaica	1	Philippines	124	United States	2620
Czech Republic	318	Japan	10620	Poland	434	Uruguay	32
Denmark	711	Jordan	14	Portugal	137	Venezuela	17
Ecuador	1	Kenya	1	Romania	45	Zambia	2
Egypt, Arab Rep.	101	Korea, Rep.	1065	Russian Fed	23	Zimbabwe	5

Figure 2. Observed and predicted probabilities

