# CORRUPTION AND ENVIRONMENTAL CERTIFICATION:

# THE COUNTERVAILING IMPACTS OF POLICY-SPECIFIC AND GENERAL

# **CORRUPTION**

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## ABSTRACT

We distinguish two types of corruption to reconcile opposing theoretical effects of corruption on firms' decisions to obtain voluntary certification. On the one hand, corruption can erode trust in non-governmental certification systems, which reduces the value of voluntary certifications as signals of firms' environmental responsibility. On the other hand, corruption erodes trust in government efforts to regulate firms' conduct, which increases the signaling value of certifications. Results, based on 433 automotive plants in Mexico, show that policy-specific corruption increases the likelihood that firms obtain ISO 14001 certification, while general corruption decreases certification likelihood. Exports to distant customers reduce these effects.

## **INTRODUCTION**

Governmental efforts to combat environmental degradation are threatened by corruption. In emerging economies, corruption undermines the rule of law and creates uncertainty in enforcement, contributing to the failure of environmental regulations to protect the environment. Consequently, voluntary environmental management system (EMS) standards have been advocated as tools for firm self-regulation of their environmental conduct in order to counteract the failure of government regulations to protect the environment (Prakash & Potoski, 2007), especially where government regulations are lax and enforcement is weak (Christmann & Taylor, 2001). These standards are not mandated and enforced by governments, but firms voluntarily adopt these standards and obtain standard certification by independent auditors to signal their environmental responsibility to external stakeholders such as customers. Given the important role that such voluntary standards can play in controlling firms' environmental conduct in jurisdictions with high levels of corruption, we need to know more about the relationship between corruption and firms' decision to obtain standard certification. Unfortunately, the impact of corruption on firms' decision to certify their EMS has not been examined in the literature. Will corruption deter or enhance certification? We propose that different types of corruption influence firms' decisions to obtain certification to voluntary EMS standards in different ways and empirically examine this relationship in the context of ISO 14001 certification of Mexican automotive suppliers. Our findings have important implications for the self-regulation potential of voluntary EMS standards in corrupt environments.

Corruption involves any act or failure to act in relation to the conduct of official duties by a public official, whether or not within the official's authorized competence (OECD, 1998). Corruption may affect firms' decisions to adopt voluntary EMS standards because corruption is

likely to affect the value of certification as a signal of environmental responsibility to external stakeholders. On the one hand, high levels of corruption may reduce the signaling value of independent certification because corruption reduces not only the credibility of government agencies, but also that of other organizations that have the power to grant and withhold resources from firms such as independent standard auditors. On the other hand, high levels of corruption may increase the signaling value of independent certification because compliance with government regulations does not assure responsible environmental conduct.

We suggest that in order to understand these opposing effects of corruption on firms' likelihood of certification, it is critical to differentiate between different types of corruption: corruption related to governments' monitoring and enforcement of specific regulations or policies, which we call "policy-specific corruption" and general corruption, which pervades various transactions of business entities with both government and private entities. We argue that these different types of corruption differ in their effects on firms' decision of certify to voluntary EMS standards. Specifically, we propose that firms decide to certify their EMSs in jurisdictions where policy-specific corruption with respect to the enforcement of environmental regulations is high. In such jurisdictions, firms' compliance with environmental regulations is not sufficient to signal environmental responsibility to firms' external stakeholders so that firms use other means such as certification to signal their environmental responsibility. On the other hand, we argue that general corruption deters firms from adopting voluntary EMS standards. High general corruption is pervasive and distorts the clarity of the signal of environmentallyresponsible behavior created by certification, so that the value of certification is reduced. We develop hypotheses about the effects of each type of corruption on firms' likelihood of obtaining standard certification.

Our study investigates how perceptions of different types of corruption within different jurisdictions located in a single country influence firms' decisions to obtain certification to EMS standards. Our argument initially assumes that the external stakeholders interested in firms' environmental conduct are aware of the general and policy-specific corruption levels in the firm's jurisdiction and therefore accurately assess the signaling value of standard certification. Customers are the main external stakeholder that drive firms' decision to obtain EMS certification (Christmann & Taylor, 2001; Delmas & Montiel, 2009, King, Lenox & Terlaak, 2005). We expect that foreign customers may be less knowledgeable of regional differences of different types of corruption within a single country than domestic customers. Therefore, we will relax our initial assumption and propose that the effects of the different types of corruption on environmental certification are likely to be smaller for firms that export part of their production to foreign countries.

Previous research has mainly investigated the antecedents of firms' EMS certification in developed countries where the effect of corruption has been ignored, possibly because corruption is likely to be low (Husted, 1999). Even studies of the certification of EMS in emerging economies, which are likely characterized by higher levels of corruption (e.g. Christmann & Taylor, 2001), have not explicitly considered corruption as an antecedent of certification. Understanding how firms respond to governmental corruption continues to be among the most important and elusive research areas in international business (Rodríguez, Siegel, Hillman & Eden, 2006).

In this study, we posit that in emerging economies such as Mexico, corruption does have a significant effect on firms' decisions to obtain certification to voluntary EMSs. Moreover, previous corruption studies have not analyzed the effects of variations in corruption levels in

different regions within a single country on firm behavior. We take a more nuanced approach and suggest that, even in countries that are generally regarded as corrupt, regional variations in corruption exist that are substantial enough to lead to differences in firm behavior.

We test our hypotheses in the context of automotive suppliers in Mexico and the adoption of and certification to ISO 14001. By focusing on a single industry sector, we are able to control for potential inter-industry differences in the response to corruption. Next, we present our theory and hypotheses, research setting, method and results sections. We conclude this paper by examining some of the implications of these findings for managers and policy makers.

### **THEORY & HYPOTHESES**

Douglass North (1990) demonstrated how the stability of institutions and the rule of law are vital to establishing the confidence economic agents need in order to invest in economic growth. Law establishes a specific allocation of property rights. Corruption involves a redistribution of those rights. For instance, environmental law motivates firms, through both rewards and sanctions, to internalize their environmental externalities. Widespread corruption among lower- and middle-level government inspectors allows firms to avoid compliance by paying bribes. In Mexico, mid-level officials have often thwarted the aspirations of environmental policy makers by issuing unwarranted permits for the use of natural resources or ignoring environmental violations (Winbourne, 2002). Consequently, the costs of environmental degradation are borne by third parties, rather than by the firms that emit pollutants – a reallocation of property rights.

Corruption contributes to a failure of government regulations to effectively protect the environment. Exploratory research in the context of the forest industry indicates that corruption

and poor governance adversely impact the enforcement of environmental regulations and business investment in sustainable forestry practices (Ebeling & Yasué, 2009). Duffy (2000) suggests a negative relationship between the widespread corruption in the government of Belize and environmental quality.

Voluntary EMS standards may have the potential of reducing the negative effects that result from the failure to enforce governmental regulations in corrupt jurisdictions. Research has shown that firms' adoption of and certification to these standards raises their level of environmental performance (Dasgupta, Hettige & Wheeler, 2000; Potoski and Prakash, 2005). Still, there is no empirical research that we could find that specifically treats the impact of corruption on firms' decision to obtain EMS certification. In this paper, we open up the intriguing question of the impact of both policy-specific and general corruption on the adoption of EMS standards by examining certification as a signal.

#### Certification as a signaling tool

Signaling theory deals with mechanisms for the transfer of information from one party to another in order to overcome information asymmetries. Spence (1973) was one of the pioneers of signaling theory as he tried to understand the value of an educational credential. A university degree signals the ability of the degree-holder given that obtaining such a degree is so much more costly in terms of time and effort for the less capable than for the more capable. Similarly, certifications to voluntary standards may function as a signal in the business world. For example, in the context of the ISO 9000 quality management system standard scholars have shown that obtaining certification to a management system standard allows firms to

communicate desirable organizational attributes, like quality, to parties that cannot observe them directly (Anderson, Daly & Johnson, 1999; Terlaak and King, 2006).

Certifications to voluntary standards may function as a signal because certification is less costly for firms with good environmental performance than for firms with poor environmental performance (Terlaak, 2007). This cost differential between high environmental performers and low environmental performers is key to the ability of the ISO 14001 certification to generate a strong signal of firms' environmental performance (Spence, 1973). Empirical research finds that suppliers do interpret EMS standards as a signal of positive environmental performance (Delmas & Montiel, 2009). In the case of ISO 14001, the third-party auditing mechanism contributes to the credibility of this signal (Darnall & Carmin, 2005).

#### Policy-specific corruption versus general corruption

Perceptions of policy-specific corruption usually arise from the experience of individuals with specific government transactions or procedures in a given jurisdiction, whereas perceptions of general corruption are based on a whole range of experiences across industrial sectors, jurisdictions, and levels of government. Perceptions of general and policy-specific corruption are not necessarily correlated. For example, in Spain, the perception of general transparency has improved considerably over the last twenty years; however, the perception of corruption related to the construction industry remains quite high (Economist, 2005). In other cases, countries may be known for specific problems with customs officials or specific governmental transactions (Hoffman, 2007).

Duffy's (2000) study of ecotourism in Belize finds both perceptions of general corruption as well as perceptions of very specific corruption related to ministries responsible for the

environment such as the Fisheries Department. Using signaling theory, we argue that the perceptions of policy-specific corruption related to environmental issues will impact the firm's decision to obtain EMS certification differently than perceptions of general corruption.

### Policy-specific corruption and independent certification

Governmental transactions related to the environment such as permits for the use of natural resources or the discharge of toxic wastes, and the enforcement of environmental regulations may be subject to specific forms of corruption.

The purpose of signaling is to reduce information asymmetries between parties. High levels of policy-specific corruption can actually exacerbate information asymmetries because bribes allow firms to avoid complying with government regulations resulting in larger inter-firm differences in regulated behaviors. These inter-firm differences are likely to be unobservable by outsiders and thus costly to discern by external stakeholders. For example, in jurisdictions where the enforcement of environmental regulations is subject to corruption, and therefore arbitrary, it becomes extremely difficult for external stakeholders to distinguish between environmentally responsible firms and those that are not. Under such circumstances third-party certification of firms' environmental conduct can become a powerful signal of a firm's environmental performance to different stakeholder groups, including customers (Spence, 1973; Darnall & Carmin, 2005). Thus, policy-specific corruption may increase the value of independent certifications to standards, such as ISO 14001, as a signal of firms' conduct to external stakeholders, because independent certification should disclose otherwise hidden information regarding a firm's performance (Akerlof, 1970; Terlaak and King, 2006).

In summary, we argue that where government agencies responsible for environmental protection are ineffective and enforcement of environmental policy is subject to corruption,

environmentally-friendly firms have a greater need to signal their environmental responsibility via voluntary environmental certification than in those jurisdictions where governmental environmental protection institutions are strong.

Thus, we hypothesize:

*Hypothesis 1: Facilities located in regions characterized by high levels of policyspecific corruption related to environmental protection will be <u>more</u> likely to obtain ISO 14001 certification than facilities located in other regions.* 

### General corruption and certification

General corruption refers to the public's belief that corruption cuts a wide swath across governmental agencies and levels of government and across the private and public sectors. Previous research has found that people's perceptions of governmental corruption affect their assessment of other societal institutions as well. Perceptions of or experience with corruption have been found to be correlated with reduced support for democracy, incumbents, policies, or specific agencies (Bailey, 2006; Canache & Allison, 2003). In Mexico a negative relationship was found to exist between corruption and trust in individuals, institutions, and democracy (Bailey & Paras, 2006).

Perceptions of general corruption have been found to reduce investments of many different kinds, including foreign direct investment (Habib & Zurawicki, 2002; Cuervo-Cazurra, 2006; Brouthers, Gao & McNicol, 2008), innovation, and new venture creation (DeSoto, 1989; Anokhin & Schulze, 2009). As corruption infects so many different sectors of an economy, the uncertainty created by its pervasiveness and arbitrariness favors less asset-specific investments (Uhlenbruck, Rodriguez, Doh, and Eden, 2006). At a country-level of analysis, nations with

poor institutional quality overall (higher general corruption), deplete investments in produced, human, and natural capital, thereby reducing their sustainable development (Dietz, Neumayer, & DeSoysa, 2007). We argue that at the firm level, general perceptions of corruption can also affect the decision to obtain certification to voluntary EMS standards.

Perceptions of high levels of general corruption create such high levels of uncertainty that investments of many sorts are reduced. In terms of signaling theory, high corruption environments create so much "noise" that the signal loses its power to distinguish between high and low performers. Noise refers to disturbances in the receiver's perception of the signal. For a signal to be effective, the high performer has to engage in an activity that is more costly for the low performer. In a highly corrupt environment, buyers and other stakeholders will be uncertain whether the activity (certification) is in fact more costly to the low performer. Noise can be due to random disturbances or to non-random disturbances, such as signal-jamming. Jamming is a strategy by the sender to vary strategically its "output" level in order to influence the conclusions drawn by the receiver. (See Mirman, Samuelson, and Urbano, 1993). Thus, the low performer may try to "jam" the signal by using bribes to cover up its poor performance or prevent information from appearing (Rasmussen, 2001). The certainty of contracts and property rights can be questioned (de Soto, 1989). Greater doubts regarding the reliability of third- party auditors may arise. Consequently, perceptions of general corruption reduce the value of certification as a signal of high performance and thus are likely to reduce firms' propensity to obtain EMS certification.

This phenomenon of signal-jamming has been discussed in the environmental literature as decoupling or symbolic implementation (Boiral, 2007; Christmann and Taylor, 2006). As a result of decoupling, ISO 14001 certification does not translate into effective EMS

implementation, even in industrialized countries like the United States and Canada. In the context of corruption, pervasive corruption facilitates this kind of decoupling. Thus, we hypothesize:

Hypothesis 2: Facilities located in regions characterized by high levels of general corruption will be less likely to obtain ISO 14001 certification than facilities located in other regions

#### **Moderating effect of exports**

Studies in international business have defined the term "liability of foreignness" to denote the difficulty and cost of selecting and monitoring foreign suppliers (Zaheer, 1995; King, Lenox & Terlaak 2005; Kogut & Singh 1988). Information asymmetries between customers and suppliers are larger if the suppliers are located in foreign countries. Likewise, the costs of selecting and monitoring suppliers are larger if suppliers are located in foreign countries. In order to reduce these information asymmetries, companies require that their foreign suppliers adopt certified management standards and use these certifications as a tool to screen and select foreign suppliers. In the context of ISO 14001, companies that export to countries where a high number of firms have adopted a management standard, may need to adopt the same standard to export to those countries or to trade with local firms (Corbett 2006).

So far, we have discussed the impact that different types of corruption have on the value of EMS certification as a signal to external stakeholders such as customers without considering differences between those customers. Now we suggest that corruption levels can be expected to only have an effect the value of EMS certification if firms' customers are aware of corruption levels. Given that EMS certification is costly, ISO 14001 certification costs between

US\$25,000 and \$100,000 per facility, we expect that firms will obtain EMS certification only if their customers are able to appreciate the value of the signal. We suggest that domestic and foreign customers are likely to differ in their awareness of and knowledge about corruption and that customers' awareness of different types of corruption likely moderates the relationships between corruption and EMS certification. Foreign customers are likely less aware of differences in different types of corruption between local jurisdictions simply because they are not exposed to the latest developments in the news media or have fewer personal dealings with local officials. When customers are less aware of corruption levels in a given jurisdiction, the effect of corruption on firms' decisions to adopt EMS certification is likely reduced.

The moderating effect of foreign customers on the relationship between corruption and EMS certification will likely exist for both policy-specific and general corruption. In the case of policy-specific corruption related to environmental regulations, foreign customers' lower awareness of regional policy-specific corruption levels reduces the value of EMS certification as a signal in corrupt environments. Local customers who are more aware of regional policyspecific corruption levels will appreciate the meaning of EMS certification in a jurisdiction where the policy-specific environmental corruption is pervasive as opposed to one which is not. In the case of general corruption, foreign customers' lower awareness of regional corruption levels will also reduce the negative impact of general corruption on EMS certification. Unaware customers will not take into account regional differences in the pervasiveness of general corruption in their decision to make purchasing decisions based on environmental certification. Hence, for both policy-specific and general corruption, we expect that for companies with high levels of exports to foreign countries the impact of corruption on the certification decision will be reduced.

Hypothesis 3: The positive impact of policy-specific (environmental) corruption on firms ´ decisions to obtain ISO 14001 certification is smaller for firms that export their products to foreign countries.

Hypothesis 4: The negative impact of general corruption on firms' decisions to obtain ISO 14001 certification is smaller for firms that export their products to foreign countries.

#### METHOD

We test our hypotheses in the context of ISO 14001 certification of automotive supplier facilities located in Mexico using data collected from multiple sources.

### **Research setting**

The ISO 14001 Environmental Management System standard is the most widely adopted voluntary EMS standard with more than 100,000 certified facilities worldwide (ISO, 2007). ISO 14001 is a process standard issued by the International Organization for Standardization (ISO) in 1996, that specifies generic requirements for an EMS and allows firms' to signal their commitment to improving their environmental performance to external stakeholders by obtaining third-party certification of their ISO 14001 compliant EMS (Delmas & Montiel, 2009; King, Lenox & Terlaak, 2005). Independent auditors accredited by national ISO member organizations perform an on-site visit to verify firms' compliance with ISO 14001 requirements.

Mexico provides a unique setting for our study because it has two characteristics that are pertinent for this research project. First, Mexico faces challenges of regulatory enforcement and corruption, which vary considerably from state to state. In fact, enforcement of government regulations concentrates in Mexico City and along the northern border (Logsdon & Husted, 2000) with other regions having much lower enforcement and higher levels of corruption. Second, data on perceptions of different types of corruption is available at the state level, which allows us to analyze the differential effects of perceptions of different types of corruption on facilities' certification to EMS standards.

We focus our analysis on a single industry sector, the automotive supplier sector. We are able to control for potential inter-industry differences in the response to corruption. We had access to an extensive database about automotive supplier plants located in Mexico from the ELM Guide Automotive Supplier Database.

### Sample

To test our hypotheses we assembled a data set containing information about automotive supplier facilities operating in Mexico from the ELM Guide Automotive Supplier Database. The ELM database we were able to access contained information of supplier facilities for the years 2000 to 2003. Since we are analyzing determinants of certification we realized that panel data analysis was not the best strategy. Instead, we decided to use the first year of ELM data with the assumption that information in the database such as exports or company size would not vary that much during the 4 years. Moreover, our corruption measures were collected during the same time frame. The ELM database includes information of approximately 80% of the automotive suppliers operating in North America on their supply chain characteristics (e.g. the customers they supply to, the parts produced, and the production processes performed) at the parent and facility level. Considering that ISO 14001 certification is awarded at the facility/plant level, we utilized supplier plant level information in our analysis. The database contains information on 473 Mexican facilities however only 433 reported their size (number of employees). Our final sample is then 433 automotive supplier facilities operating in Mexico. Of these 433 facilities 69

(16 percent) were ISO 14001 certified. These facilities were located in13 different Mexican states and ranged in size from 9 to 4,325 employees.

#### Measures

#### Dependent variable

The dependent variable is a binary variable indicating whether the automotive supplier facility had obtained ISO 14001 certification by 2004. We obtained information on ISO 14001 certification for these facilities from the ISO 14001 North American World Preferred Registry database. The latest date for which certification information was available from this database is 2004, since the World Preferred Registry ceased to exist and collect such data after that year. *Independent variables* 

We obtained corruption data from the Governance and Business Development Survey (EDGE). The EDGE study was conducted by the Tecnológico de Monterrey in 2001 to present a broad picture of the perceptions that businesses have about the state of corruption in the public and private sectors in Mexico. They collected extensive survey data from a sample of 3,985 private businesses located throughout the nation.

*Policy-specific corruption.* The EDGE survey collected very specific information about business perceptions of the governmental agency in charge of environmental protection. Concretely, they asked respondents how honest they perceive the federal environmental agency Secretariat of Environmental and Natural Resources (Semarnat) to be, the agency equivalent to the US Environmental Protection Agency (EPA). Semarnat is responsible for the design and enforcement of federal environmental regulations. They degree of honesty is measured in a 7point scale from "1" Completely dishonest to "7" Completely honest. Because a perceived lack of honesty (low score) can be viewed as an indicator of corruption we multiplied the honesty scores by (-1) to convert them into a corruption measure. We averaged the scores for all EDGE respondents in each state to construct state level measures of policy specific corruption.

*General corruption.* We also derive our measure of general corruption within each of the Mexican states from the EDGE survey data. The survey items used to construct this measure gauge firms' perceptions about whether firms that are similar to them pay bribes to inspectors to avoid compliance in three levels of government – the federal, state and local level. These items are measured on a 8 point scale, "0" being 'never' to "7" being 'very frequently'. Perceptions about the level of corruption at these three levels of government vary from state to state. This is even true for corruption by the federal government where enforcement tends to more stringent in the states close to the U.S. border than in other states (Husted & Logsdon, 2000). We first calculated the average corruption score for the three levels of government for each EDGE respondent and then generated an average score for each state based on the location of the respondents.

*Exports.* We measure exports at the firm level rather than at the facility level because we were not able to obtain facility level export data. For each company that owned a facility included in our sample we obtained data on exports from the ELM Guide Automotive supplier database. Given that a large percentage of the firms in our sample (84% percent) had only one or two facilities using corporate data is unlikely to bias our results. The ELM database indicates whether a firm exports to different countries or regions of the world (e.g., United States, Japan, Europe), but does not provide more detailed information about the quantity or relative quantity of exports. Thus, our export measure is a dummy variable that takes the value one if the firm exports any of its output to any foreign country and zero otherwise.

Control variables

In our analysis we control for several variables that can also affect firms' decision to obtain ISO 14001 certification.

*MNC subsidiaries*. In emerging economies subsidiaries of multinational companies (MNCs) may be more likely to obtain ISO 14001 certification than domestic firms because MNCs may have global policies requiring all their subsidiaries worldwide to obtain ISO 14001 certification and because MNC subsidiaries may have access to more resources and capabilities to implement and certify ISO than their domestic counterparts. To control for this effect, we determined the location of headquarters for each facility in our sample by searching online databases such as Hoovers, E-Zource, and Goliath, and by accessing companies' websites and included a dummy variable in our analysis that takes the value one if the facility is part of an MNC and the value zero otherwise.

*Governmental environmental inspection intensity.* The government's propensity to enforce environmental regulations by inspecting firms may affect firms' propensity to obtain ISO 14001 certification. Firms can use ISO 14001 certification to signal responsible conduct to government agencies to potentially reduce inspection frequency. Even though any firm can use ISO 14001 as a signal those located in jurisdictions with more frequent inspections will be more likely to do so. In Mexico enforcement of environmental regulations tends to vary by region. Some government programs such as the Border 2012 Program, which aims to improve firms' environmental performance through compliance, enforcement, pollution prevention and promotion of environmental stewardship, specifically target facilities located in the US-Mexico Border (EPA 2002). Despite NAFTA's intention to improve the implementation of environmental regulations throughout the region, in Mexico enforcement has continued to be concentrated in Mexico City and along the northern border with firms located in these regions

facing a higher frequency of inspections (Logsdon and Husted 2000). To control for uneven governmental inspections, we generate the variable inspections intensity as the logarithm of environmental inspections conducted in each state by the Mexican environmental agency (PROFEPA) in 2000 divided by the number of firms in the state. The data to construct this variable was gathered from Federal Agency for Environmental Protection (Profepa) Annual Reports and from the Mexican Enterprise Information System (SIEM).

*Big Three supplier*. In 1999 the Big Three North American auto-assemblers – Ford, General Motors (GM), and Daimler-Chrysler – mandated that their suppliers obtain ISO 14001 certification by 2003. Therefore, being a Big Three supplier might influence the decision to adopt ISO 14001. We include a binary variable, Big Three Customer, which takes a value of one for those supplier facilities that sell parts to any of the Big Three automakers and zero otherwise. Interestingly, this variable is not highly correlated with Exports which means that these suppliers are mainly supplying Big Three facilities located in Mexico.

*Quality management certifications.* We also control for experience with related management standards, such as the ISO 9000 or QS 9000 quality management systems. Prior certification to quality management standards has been shown to influence a company's decision to obtain ISO 14001 certification (Albuquerque, Bronnenberg & Corbett, 2007; Corbett & Kirsch., 2001; Darnall, 2006; Delmas, 2005). To account for this, we create the variable *QS9000.* QS 9000, which was first published in 1994, is a quality management standard for automotive suppliers developed by Daimler-Chrysler, Ford, and General Motors based on the popular ISO 9000 quality management standard. We collected QS 9000 certification data from both the Global Automotive Industry Database and the QS 9000 Registered Company Directory (QSU, 2005). This variable is coded so that "1" indicates that the facility has obtained QS 9000

quality management standard certification. The QS 9000 standard has been extensively adopted by the automotive industry. About 35% of the facilities in our sample had already obtained certification to the standard in 2004.

*Facility size*. The size of a facility may influence the propensity to certify. We account for the possible effects of facility size by including a control for the number of facility's employees (log transformed) obtained from the Global Automotive Industry Database.

## **Analytical Methodology**

Our empirical analysis is based on estimating discrete choice models. We use a logit regression model, to assess the effects of the independent variables on the likelihood of a supplier facility being ISO 14001 certified (Aldrich & Nelson, 1984). Given that ISO 14001 needs to be recertified every three years and that our independent variables about corruption can be considered time invariant within our period of study, that is, since first facility in our sample adopted ISO 14001 in 1998 until 2004 as perceptions of corruption levels tend to be relatively stable over time (Uhlenbruck, Rodriguez, Doh, and Eden, 2006), we investigate the underlying causes for initial certification using the logit model. We also need to note that none of the certified facilities in our sample lost certification during our period of study. The certification model in the binary logit model is specified as follows:

Prob (ISO14001<sub>i</sub>=1) =
$$F(Z_{i}, \beta)$$

where ISO 14001 is the binary dependent variable indicating certification for facility i,  $Z_i$  is the set of independent variables for facility i, and F is the cumulative logistic distribution.

In order to test our third and fourth hypotheses about the moderating effects of exports on the relationship between corruption and certification, we generated interaction variables between both corruption measures and our export dummy.

## **Descriptive Statistics and Preliminary Data Analysis**

Table 1 includes the descriptive and correlation values for the different variables. Table 2 includes descriptive statistics of the dependent, independent and control variables by state.

Insert Tables 1 and 2 about here

In our sample, Tamaulipas is the state with the lowest policy-specific corruption index (-5.30) while Veracruz shows the highest value (-2). Regarding general corruption, Aguascalientes is the state with the lowest index (0.97) while Hidalgo shows the highest value (2.71).

To check whether multicollinearity, we calculated tolerance and variation inflation indices and none reached the threshold value for concern (Belsley, Kuh and Welsch 1980).

## RESULTS

Tables 3 and 4 present the analysis of the likelihood that automotive supplier facilities located in Mexico will obtain ISO 14001 certification. In Table 3, we include four different regression models, Model 1 with the control variables only, Model 2 to test hypothesis 1 and 2, and Models 3 and 4 to test hypotheses 3 and 4 about the interaction effects of exports using the general exports measure.

Insert Table 3 about here

The first hypothesis predicts a positive relationship between policy-specific corruption perception related to the environmental agency and ISO 14001 certification. This hypothesis is

supported by the data. Models 2 to 4 in Table 3 show that environmental corruption has a significant positive effect on ISO 14001 certification (p<0.05).

In contrast, hypothesis 2 predicts a negative relationship between general corruption and the likelihood of certifying with ISO 14001. This hypothesis is supported by the data. In Models 2, to 4 the general corruption variable is negative and significant (p<0.05), indicating that facilities located in states perceived to have high levels of general corruption are less likely to obtain ISO 14001 certification.

Hypotheses 3 and 4 predict that firms' export characteristics will moderate the relationship between different types of corruptions and firms' likelihood to obtain ISO 14001 certification. Hypothesis 3 suggests that, for firms that export their products to foreign countries, the positive effect of specific environmental corruption on firms' likelihood of ISO 14001 certification is smaller. This hypothesis is not supported by the data. The interaction effect between general corruption and exports in Model 4 has the expected negative effect, but is not significant. Hypothesis 4 suggests that for firms that export their products to foreign countries the negative effect of general corruption on firms' likelihood of ISO 14001 certification is smaller. This hypothesis that for firms that export their products to foreign countries the negative effect of general corruption on firms' likelihood of ISO 14001 certification is smaller. This hypothesis is not supported by the data. The interaction effect between general corruption on firms' likelihood of ISO 14001 certification is smaller. This hypothesis is not supported by the data. The interaction effect between general corruption and exports in Model 3 has the expected positive effect, but is not significant.

#### **Additional Analyses of the Moderating Effect of Exports**

The fact that we did not find the hypothesized moderating effects of exports on the relationship between corruption and ISO 14001 certification prompted us to perform additional analyses. The hypothesized moderating effect of foreign customers was based on a lack of knowledge of foreign customers about inter-state differences in different types of corruption in Mexico. It is feasible that foreign customers differ in their knowledge about corruption in

Mexico based on their geographic distance to Mexico. Closer foreign customers are more likely to have more first-hand experience, more interaction, more press coverage and more Mexican nationals working for them and therefore are more likely to be knowledgeable about regional differences of corruption in Mexico than distant foreign customers. This suggests that exports to distant foreign regions may moderate the relationship between corruption and ISO 14001 certification because distant foreign customers are less knowledgeable about inter state differences in different types of corruption than domestic or geographically close foreign customers. Therefore we explored whether the effects hypothesized in Hypotheses 3 and 4 hold for distant customers located in Japan and Europe by including Exports to Japan and Europe dummy variables along with their interaction effects. Japan and Europe are the two regions with the highest penetration level of ISO 14001 as of 2003. By December of 2003, the total number of ISO 14001 certifications in Japan and Europe was 13,416 and 31,997 respectively. In the United States, the number of certifications was 3,553 (ISO, 2003). We therefore created two binary variables, Exports to Japan and Exports to Europe, which take the value of 1 when the facility is owned by companies exporting to these two regions. It is interesting to note that 45% of the facilities located in Baja California Norte and 40% of the facilities in Sonora - both border states - have Japanese customers, while none of the facilities located in Durango, Tlaxcala, Veracruz and Yucatan export to Japan.

Table 4 presents the results of these additional analyses, in which we examine the moderating effects of exports to specific geographic regions. We indeed find that exports to distant countries moderate the effects of the two types of corruption on ISO 14001 certification.

Our results in Models 6 and 7 show that Exports to Japan and Europe moderate the relationship between general corruption and ISO 14001 certification (p<0.10). Model 8 shows

that Exports to Japan moderates the relationship between policy-specific corruption and ISO 14001 certification (p<0.05). Although not hypothesized, we also find in Models 5 to 8 a positive significant direct effect of exports to Japan on ISO 14001 certification.

Insert Table 4 about here

## **DISCUSSION & CONCLUSIONS**

We examined the relationship between different types of corruption. In conclusion, these results provide significant support for the hypotheses under investigation, supporting the assertion that different types of corruption impact the likelihood of voluntary EMS standards certification differently.

We find that in regions with higher policy-specific corruption levels related to environmental regulations, firms are more likely to adopt ISO 14001. These findings are consistent with the idea that managers implement ISO 14001 as a tool to signal their commitment to improved environmental performance to different stakeholders, especially to those stakeholders capable of discerning distinctions in the levels of corruption in different jurisdictions and agencies such as local customers and high-level policy makers. ISO 14001 serves here as a tool to signal environmental commitment within a corrupt institutional context.

Conversely, our results suggest that automotive supplier facilities operating in Mexico are more likely to obtain ISO 14001 certification in regions with lower general corruption levels. Thus, investments in EMS follow the pattern of investment generally such that uncertainty in the general business environment reduces investments, especially asset-specific investments that cannot be easily redeployed to alternative uses. That is certainly the case of EMS where each EMS is tailor-made to the firm and/or facility in which it is instituted. By creating uncertainty regarding the distribution of basic property rights, the ability of firms to capture the benefits of those investments is reduced.

In addition, our results show the moderating effect that international customers have on corruption perception, which in turn, impacts the likelihood to adopt ISO 14001. When we analyze the effect of international customers, we do not find any effect on the interaction between international customers in general (Exports) or North American customers and corruption on certification decisions. North American customers are closer to Mexico and more likely to receive more information about Mexico in the news media. However, when analyzing interaction effects with more distant customers, Europe and Japan, we do find that the impact that general and environmental corruption has on certification decisions. These more distant customers are less likely to receive media reports on Mexico and thus less likely to perceive these local differences on corruption levels.

Our results highlight the relevance of taking into consideration firms' perceptions of governmental corruption when analyzing the adoption of new management practices, especially in regions where corruption is still a challenge in governmental transactions. In addition, this study also highlights the importance of considering differences in corruption issues across different regions within a single country when analyzing the certification to voluntary EMS standards. While previous studies identified the relevance of stakeholder pressures in influencing certification, they rarely sought to account for the way that the uneven terrain of corruption within a single country affects firm behavior.

Taken together these findings support the distinction we have made between perceptions of general corruption and perceptions of policy-specific corruption. Although prior research

conflated different types of corruption in their examination of the impact of corruption on business decisions, this study begins to take a more fine-grained approach to the types of corruption and their respective impacts on the decision to seek environmental certification. Studies of corruption need to take into account not only general perceptions, but also corruption in the specific policy areas under consideration as general and specific perceptions may not be correlated. Our theory about general and policy-specific corruption has been developed and tested within the context of environmental corruption, but similar distinctions between a general and a more specific level of corruption might be found in other management areas (e.g., quality management) or industry sectors (e.g., construction).

When we control for whether the facility is a Big Three supplier, we find that its impact on the certification of ISO 14001 is insignificant, suggesting that policies requiring suppliers to adopt an EMS standard and thus promoting environmentally friendly practices within the supply chain may not be having their intended effect. Instead, our study demonstrates that one of the reasons explaining variation in the certification rates of ISO 14001 among Mexican automotive supplier facilities by 2004 is the degree of general corruption within the different states' regulatory environments. Facilities located in states with a high perception of corruption prove to be less likely to adopt ISO 14001. As stated in our second prediction, these facilities are less likely to trust the regulatory system and the value of such certification.

Our findings suggest that voluntary EMS standards serve as a tool that contributes to overcoming regulatory failure in specific policy areas. States with high environmental corruption are likely to have weaker enforcement of environmental regulations and thus high levels of regulatory failure. The fact that firms are more likely to obtain voluntary environmental certification is these high environmental corruption states suggest that firms are more likely to

self-regulate their conduct via standard certification in states in which regulatory failure is higher. This positive relationship between policy-specific corruption and firm self-regulation via certifiable standards suggests that certifiable standards can be a powerful tool to overcome the regulatory failure associated with high corruption environments.

Our study is not without limitations. First, it is likely that more firms obtained certification after 2004 (the last year for which we were able to obtain certification data). We cannot be sure that the effect of corruption on ISO 14001 certification is the same for later adopters that might be more motivated to obtain certification by external pressures rather than by using ISO 14001 certification as a signal. Therefore, future research needs to follow up on the adoption processes among automotive suppliers in the next years. Moreover, by restricting our study to one country we cannot be sure that corruption does have the same effects on certification decision in different national environments (Matten & Moon, 2008). Therefore, research on the adoption of these voluntary standards among suppliers located in other regions of the world would be of interest.

Despite these limitations our findings have important implications for different stakeholders such as policy makers, MNEs and other businesses. By analyzing relationships between certification of EMS standards and level of corruption, we provide a better understanding of the role of voluntary programs as a potential tool to green the supply chain and overcome regulatory failure in regions with regulatory enforcement deficiencies.

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TABLE 1.
DESCRIPTIVE STATISTICS AND CORRELATIONS

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	
1	ISO 14001	0.16	0.37	1													
2	General corruption	1.38	0.35	-0.11	1												
3	Policy-specific corruption	-4.09	0.47	0.01	0.23	1											
4	General corruption*Exports	-0.01	0.30	-0.05	0.84	0.18	1										
5	Policy-specific corruption*Exports	0.03	0.36	-0.01	0.20	0.78	0.24	1									
6	General corruption *Exports to Japan	-0.01	0.15	0.01	0.38	0.04	0.45	0.06	1								
7	General corruption *Exports to Europe	-0.01	0.20	0.03	0.57	0.08	0.68	0.11	0.44	1							
8	Policy-sp. Corruption *Exports to Japan	-0.02	0.21	-0.09	0.03	0.45	0.04	0.59	0.10	0.04	1						
9	Policy-sp.*Exports to Europe	-0.01	0.29	0.02	0.07	0.64	0.08	0.83	0.04	0.12	0.56	1					
10	Exports	0.68	0.46	0.04	-0.09	0.12	-0.04	0.05	-0.05	-0.03	-0.05	-0.01	1				
11	Exports to Japan	0.18	0.38	0.15	-0.06	-0.09	-0.05	-0.15	-0.16	0.01	-0.17	-0.14	0.32	1			
12	Exports to Europe	0.37	0.48	0.07	-0.04	-0.03	-0.02	-0.10	0.04	-0.07	-0.11	-0.03	0.51	0.35	1		
13	MNE	0.68	0.46	0.20	-0.14	-0.26	-0.08	-0.21	-0.05	-0.01	-0.06	-0.06	-0.13	0.23	0.29	1	
14	Environmental Inspections Intensity	0.02	0.02	0.08	-0.50	0.30	-0.43	0.25	-0.25	-0.34	0.19	0.24	0.04	0.09	0.06	0.08	
15	Big Three Supplier	0.80	0.40	0.05	-0.04	0.05	-0.05	0.05	0.00	-0.11	0.01	-0.00	0.03	-0.04	0.02	-0.00	0
16	Log of Employees	5.82	1.16	0.15	-0.04	-0.23	0.00	-0.13	0.07	0.09	-0.12	-0.08	-0.03	0.10	0.14	0.27	-0
17	QS 9000 certification	0.50	0.50	0.02	-0.15	-0.03	-0.20	-0.02	-0.04	-0.16	0.05	-0.00	0.03	-0.01	-0.01	0.03	0

N=433. Correlations with an absolute value greater than 0.12 are significant at 5% level.

		AGS	BCN	CHIH	СОАН	DF	DGO	GTO	HGO	MEX	MOR
		N=8	N=7	N=81	N=42	N=34	N=1	N=15	N=4	N=86	N=4
	Variable					N	1ean				
						(	SD)				
1	ISO 14001	0	0.36	0.18	0.28	0.05	0	0.07	0	0.12	0
		(0)	(0.50)	(0.38)	(0.45)	(0.23)		(0.26)	(0)	(0.32)	(0)
2	Policy-specific Corruption	-4.42	-4.42	-3.5	-3.5	-3.63	-3	-3.94	-3.72	-3.95	-4.75
		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
3	General Corruption	0.97	0.98	1.63	1.09	1.76	1.40	1.27	2.71	1.65	1.29
		(0)	(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)
4	Exports	0.70	0.54	0.58	0.76	0.72	0	0.73	0.5	0.73	0.75
		(0.44)	(0.52)	(0.49)	(0.42)	(0.45)		(0.45)	(0.57)	(0.44)	(0.5)
5	Exports to Japan	0.33	0.45	0.29	0.21	0.08	0	0.07	0.25	0.05	0.25
		(0.5)	(0.52)	(0.46)	(0.41)	(0.28)		(0.26)	(0.5)	(0.22)	(0.5)
6	Exports to Europe	0.22	0.36	0.54	0.44	0.19	0	0.13	0	0.27	0.25
		(0.44)	(0.50)	(0.50)	(0.50)	(0.40)		(0.35)	(0)	(0.44)	(0.5)
7	MNE	0.60	1	0.96	0.74	0.30	0	0.40	0.25	0.41	1
		(0.5)	(0)	(0.18)	(0.44)	(0.46)		(0.5)	(0.5)	(0.49)	(0)
8	Environmental Inspections Intensity	-3.55	-2.86	-4.42	-2.47	-4.11	-2.05	-4.51	-4.34	-5.35	-3.18
		(0)	(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)
9	Big Three Supplier	0.44	0.54	0.71	0.93	0.89	1	0.86	0.5	0.77	1
		(0.53)	(0.52)	(0.45)	(0.26)	(0.32)		(0.35)	(0.57)	(0.42)	(0)
10	Log of Employees	5.55	5.64	6.62	5.59	4.87	6.57	5.92	4.48	5.49	5.38
		(0.62)	(1.09)	(0.95)	(1.20)	(1.25)		(0.89)	(4.48)	(1.00)	(1.13)
11	QS 9000 certification	0.33	0.36	0.47	0.65	0.22	1	0.87	0.5	0.40	0.75
		(0.5)	(0.50)	(0.50)	(0.48)	(0.42)		(0.35)	(0.57)	(0.49)	(0.5)

# TABLE 2. DESCRIPTIVE STATISTICS BY STATE

AGS: Aguascalientes, BCN: Baja California Norte, CHIH: Chihuahua, COAH: Coahuila, DF: Distrito Federal, DGO: Durango, GTO: Guanajuato, HGO: Hidalgo, MEX: Estado de Mexico, MOR: Morelos

		NL	PUE	QRO	SLP	SON	TAMPS	TLAX	VER	YUC
		N=30	N=26	N=28	N=12	N=18	N=31	N=4	N=1	N=1
	Variable					Mean				
						(SD)				
1	ISO 14001	0.26	0.08	0.26	0.23	0.09	0.18	0	1	0
		(0.44)	(0.27)	(0.44)	(0.43)	(0.29)	(0.39)	(0)		
2	Policy-specific Corruption	-3.82	-4.31	-4.54	-3.53	-3.83	-5.30	-4.42	-2	-4
		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
3	General Corruption	1.11	1.43	0.51	1.39	1.14	1.18	1.21	1.53	1.39
		(0)	(0)	(0)	(0)	(0)	(0)	(0)		
4	Exports	0.64	0.73	0.86	0.84	0.63	0.42	0.5	1	1
		(0.48)	(0.45)	(0.34)	(0.37)	(0.49)	(0.50)	(0.57)		
5	Exports to Japan	0.16	0.15	0.13	0.07	0.40	0.24	0	0	0
		(0.37)	(0.36)	(0.34)	(0.27)	(0.50)	(0.43)	(0)		
6	Exports to Europe	0.29	0.34	0.40	0.38	0.63	0.39	0.25	1	0
		(0.46)	(0.48)	(0.49)	(0.50)	(0.49)	(0.49)	(0.5)		
7	MNE	0.61	0.77	0.73	0.61	1	1	.25	1	1
		(0.49)	(0.42)	(0.45)	(0.51)	(0)	(0)	(0.5)		
8	Environmental Inspections Intensity	-3.62	-3.62	-3.65	-4.48	-3.11	-4.25	-2.72	-4.31	-4.14
		(0)	(0)	(0)	0	(0)	(0)	(0)		
9	Big Three Supplier	0.90	0.69	0.86	0.92	0.81	0.90	0.5	1	1
		(0.30)	(0.47)	(0.34)	(0.27)	(0.39)	(0.29)	(0.57)		
10	Log of Employees	5.98	5.27	5.73	5.86	5.80	6.50	6.23	5.70	5.75
		(1.05)	(0.93)	(0.86)	(0.80)	(1.53)	(1.08)	(0.12)		
11	QS 9000 certification	0.58	0.5	0.7	0.69	0.40	0.57	0	1	1
		(0.50)	(0.50)	(0.46)	(0.48)	(0.50)	(0.50)	(0)		

# TABLE 2. DESCRIPTIVE STATISTICS BY STATE (Cont.)

NL: Nuevo Leon, PUE: Puebla, QRO: Queretaro, SLP: San Luis Potosi, SON: Sonora, TAMPS: Tamaulipas, TXAL: Txalaca, VER: Veracruz, YUC: Yucatan

	EMS certification with ISO 14001								
	1	2	3	4					
Policy-specific Corruption		0.68*	0.67*	0.79*					
		(0.35)	(0.34)	(0.49)					
General Corruption		-1.11*	-2.31*	-1.09*					
		(0.53)	(0.93)	(0.53)					
Policy-specific Corruption*Exports				-0.17					
				(0.59)					
General Corruption*Exports			1.52						
			(0.99)						
Exports	0.46	0.38	0.49	0.37					
	(0.30)	(0.30)	(0.33)	(0.30)					
MNE	1.40**	1.51**	1.49**	1.50**					
	(0.40)	(0.40)	(0.40)	(0.40)					
Environmental Inspection Intensity	9.11+	-3.80	-4.24	-3.67					
	(5.44)	(7.82)	(7.80)	(7.87)					
Big Three customer	0.38	0.31	0.30	0.31					
	(0.44)	(0.44)	(0.44)	(0.44)					
Log Employees	0.32*	0.36*	0.37*	0.36*					
	(0.13)	(0.14)	(0.15)	(0.14)					
QS 9000 certification	-0.04	-0.12	-0.05	-0.11					
	(0.27)	(0.29)	(0.29)	(0.28)					
Constant	-5.42**	-5.35**	-5.46**	-5.35**					
	(0.90)	(0.93)	(0.94)	(0.93)					
Observations	433	433	433	433					
Wald $\chi^2$	30.64**	40.25**	39.78**	40.40**					
Log likelihood full model	-185.45	-182.35	-181.07	-182.31					

# TABLE 3. LOGIT REGRESSION RESULTS (GENERAL EXPORTS)

Standard errors in parentheses, +significant 10%, \* 5%, \*\* 1%.

		EMS Certification with ISO 14001						
	5	6	7	8	9			
Policy-specific Corruption		0.85*	0.80*	1.31**	0.92*			
		(0.36)	(0.34)	(0.40)	(0.46)			
General Corruption		-1.60**	-1.78**	-1.32*	-1.27*			
-		(0.54)	(0.60)	(0.55)	(0.52)			
Policy-specific Corruption*Exports to Japan				-1.45*				
				(0.63)				
Policy-specific Corruption*Exports to Europe					-0.17			
					(0.57)			
General Corruption*Exports to Japan		1.73+						
		(0.99)						
General Corruption*Exports to Europe			1.56+					
			(0.85)					
Exports to Japan	0.72*	0.96**	0.77*	0.77*	0.81*			
	(0.32)	(0.33)	(0.33)	(0.35)	(0.33)			
Exports to Europe	-0.20	-0.30	-0.10	-0.29	-0.21			
	(0.29)	(0.29)	(0.29)	(0.29)	(0.28)			
MNE	1.23**	1.40**	1.34**	1.45**	1.38**			
	(0.41)	(0.41)	(0.41)	(0.41)	(0.41)			
Environmental Inspection Intensity	8.53	-5.98	-5.37	-7.10	-6.95			
	(5.63)	(7.96)	(8.13)	(7.99)	(8.12)			
Big Three customer	0.50	0.45	0.51	0.39	0.43			
	(0.45)	(0.46)	(0.46)	(0.47)	(0.46)			
Log Employees	0.29*	0.34*	0.32*	0.34*	0.35*			
	(0.13)	(0.14)	(0.14)	(0.14)	(0.14)			
QS 9000 certification	-0.05	-0.12	-0.06	-0.08	-0.12			
	(0.28)	(0.29)	(0.28)	(0.29)	(0.29)			
Constant	-4.96**	-5.04**	-5.04**	-5.04**	-5.05**			
	(0.82)	(0.88)	(0.86)	(0.88)	(0.87)			
Observations	433	433	433	433	433			
Wald $\chi^2$	32.87**	45.41**	44.73**	49.61**	43.77**			
Log likelihood full model	-184.34	-178.44	-178.35	-177.27	-180.13			

# TABLE 4. LOGIT REGRESSION RESULTS (EXPORTS BY REGIONS)

Standard errors in parentheses, +significant 10%, \* 5%, \*\* 1%.