

RESEARCH NOTES AND COMMENTARIES

USING PRIVATE MANAGEMENT STANDARD CERTIFICATION TO REDUCE INFORMATION ASYMMETRIES IN CORRUPT ENVIRONMENTS

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This paper investigates how corruption in the institutional environment influences firms' decisions to obtain third-party certification to private management standards as signals of desirable conduct. We argue that policy-specific corruption erodes trust in government efforts to regulate firms' conduct, thus increasing the signaling value of private certifications and the likelihood of certification. However, widespread corruption in the general environment can extend distrust to private certification systems, which reduces the credibility and signaling value of private certifications, thus decreasing the likelihood that firms obtain certification. Our empirical results based on ISO 14001 environmental management system certification among 433 automotive plants in Mexico confirm these relationships. We discuss the implications of our findings for transaction cost economics, institutional theory, research, and practice. Copyright © 2012 John Wiley & Sons, Ltd.

INTRODUCTION

Information asymmetries between suppliers and customers increase the transaction costs of market exchanges (Williamson, 1985). Suppliers usually know more about their characteristics than their customers, so that customers incur search and monitoring costs to identify suppliers that have characteristics that are desirable but costly to observe. These transaction costs are reduced if suppliers signal that they possess these characteristics. Signaling refers to actions that are meant

to demonstrate that the supplier possesses certain characteristics that are otherwise hidden to external parties (Spence, 1973). Given the crucial role that signaling can play in reducing the transaction costs of market exchanges and the interest in the strategy literature in identifying mechanisms that reduce transaction costs in other governance modes such as hierarchies and hybrid forms (Dyer, 1997; Ring and van de Ven, 1992), it is surprising that strategy scholars have not paid more attention to signaling.¹

Keywords: corruption; information asymmetry; private certification; environmental management systems; Mexico

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¹ Only 26 of the more than 3,700 articles published in the top management and strategy journals (*Academy of Management Journal*, *Academy of Management Review*, *Organization Science*, *Administrative Science Quarterly* and *Strategic Management Journal*) between 2000–2010 deal primarily with signals and signaling.

Moreover, the current literature does not take into account the institutional context in which signals are transmitted. By institutional context we refer to the ‘informal constraints (sanctions, taboos, customs, traditions...)’ and ‘formal rules (and the effectiveness of enforcement),’ which define the opportunity set for firms (North, 1991: 97, 108–109). The organizational economics literature largely examines signals as a cost-economizing answer to issues of information asymmetry in institutional contexts where regulatory institutions are assumed to work effectively (Williamson, 1985). In this paper, we explore how corruption weakens the institutional context in which signals are transmitted and thus alters the transaction cost logic behind certification to private management standards as a signal to overcome information asymmetries about supplier characteristics.

Firms can signal unobservable characteristics to external stakeholders by obtaining certification to private management standards (King, Lenox, and Terlaak, 2005), which exist in various areas such as quality management, environmental management, and corporate social responsibility. These standards specify requirements that firms adopting the standard need to implement. Obtaining certification² requires firms to pass a third-party audit performed by a private auditing firm that verifies the firms’ adherence to the requirements specified by the standard.

A firm’s decision to obtain standard certification to signal desirable firm characteristics is made more complex by the presence of corruption. This is especially the case for standards that address issues that are also subject to government regulations, such as environmental management standards. Corruption, which has been defined more narrowly as ‘the abuse of public [i.e., government] power for private benefit’ (Rodríguez, Uhlenbruck, and Eden, 2005: 383), is also defined more broadly as the ‘use or abuse of public or collective responsibility for private ends’ (Macrae, 1982: 678), to include corruption in the private sector. Government corruption undermines the rule of law and creates uncertainty in the enforcement of regulations (Cuervo-Cazurra, 2006), while private sector corruption reduces trust in private institutions and parties (Coase, 1979). We theorize that corruption

has two opposing effects on certification decisions. On the one hand, the value of certifications as signals of unobservable firm characteristics may be higher in corrupt jurisdictions because external stakeholders will likely not perceive formal compliance with government regulations as accurate signals of firm conduct. Therefore, firms in corrupt jurisdictions will use other means to signal their desirable characteristics and, hence, will be more likely to certify. On the other hand, the credibility of the private third-party certification audits may be lower in jurisdictions with high corruption, which reduces the signaling value of certifications and the likelihood that firms certify.

To disentangle these opposing effects, we distinguish two types of corruption that are likely to influence firms’ certification decisions in different ways—policy-specific corruption and general corruption. Policy-specific corruption refers to corruption related to the enforcement of specific government regulations such as environmental regulations, and general corruption tends to be widespread and erodes trust not only in public but also in private institutions. We empirically examine the relationships between different corruption types and firms’ decisions to use certification to signal unobservable characteristics in the context of certification to the International Organization for Standardization (ISO) 14001 environmental management system (EMS) standard among automotive suppliers located in Mexico. We discuss our study’s implications for transaction cost theory, the corruption literature, the literature on private certification as well as for the relationship between institutional economics and institutional theory. We also address practical implications for the use of certification as a signal in corrupt environments.

THEORY & HYPOTHESES

Studies in the transaction cost literature have identified governance mechanisms that reduce the transaction costs of different governance modes such as markets, hierarchies, and hybrids. For example, trust has been found to reduce transaction costs in strategic alliances (Gulati, 1998; Ring and van de Ven, 1992). With respect to market transactions, the literature focused on mechanisms such as credible commitments and hostages (Williamson 1985), while signaling through certifications, professional licensing, guarantees, and

² We use the term certification to refer to certification to (private) management standards.

brands (Akerlof, 1970) has received less attention. The rapid growth of certifiable standards in the past decade gives rise to a need for more research on their merits and limits as mechanisms to signal desirable firm or product characteristics.

The institutional context affects the opportunity set of firms and, thus, their production and transaction costs and ultimately their profitability and survival (North, 1991: 97). The existing work on signaling largely ignores how the institutional context affects the use and effectiveness of signals in overcoming information asymmetries. In this paper, we consider one specific aspect of the institutional context, corruption, and suggest that it affects firms' need to use signals to reveal desirable characteristics as well as the credibility of one specific signaling mechanism that is gaining increasing importance, that is, private certification.

Reducing information asymmetries in market transactions

Firms frequently have more information about their characteristics and conduct than customers and other external stakeholders who may be interested in these firm properties. Such information asymmetries increase transaction costs associated with market transactions, which include customers' costs of searching for and identifying suppliers that possess desirable but unobservable characteristics, costs associated with drafting agreements to assure that suppliers possess the unobservable characteristics that they claim to have, and costs of verifying whether the contractual terms have been met (Milgrom and Roberts, 1992). In such situations, suppliers may decide to reveal information about their characteristics with a signal. To be an informative signal, that is, to disclose a high degree of accurate information, the action intended to signal the possession of unobservable characteristics has to be less costly for firms that possess the characteristic in question than for firms that do not (Spence, 1973).

For example, external stakeholders such as customers and investors are increasingly interested in firms' efforts to protect the environment and consider firms' environmental conduct in their business transactions. Because firms have private information about their environmental conduct and management efforts, they may decide to signal these characteristics to their external stakeholders. Third-party certification can function as a signal

of desirable corporate conduct because such certifications are less costly to obtain for firms with good conduct than for firms with poor conduct (Terlaak, 2007). The costs associated with certification comprise implementation costs such as the costs of creating and updating required procedures and documents, and the costs of restructuring organizational processes and training, as well as certification costs such as fees for the third-party certification audits, which are conducted by private auditing firms. Empirical research confirms that certification schemes like the ISO 9000 standard for quality management and the ISO 14001 EMS standard act as signals (Anderson, Daly, and Johnson, 1999; Delmas and Montiel, 2009). Implementing a management standard without obtaining third-party certification cannot be considered an informative signal because it is costly to observe for external stakeholders and lacks the credibility associated with external verification (Darnall and Carmin, 2005).

Policy-specific corruption versus general corruption

Corruption research frequently conflates different dimensions of corruption and uses fairly broad, aggregate measures such as the Corruption Perception Index. However, the literature is beginning to acknowledge that corruption is a more complex phenomenon that requires more fine-grained research on different facets and dimensions (Rodríguez *et al.*, 2005). Distinguishing between different dimensions of corruption can contribute to our understanding of its effects on firm behavior.

We distinguish between two dimensions of corruption that are conceptually distinct and that we expect to differ in their effects on firms' certification decisions: policy-specific corruption and general corruption. Perceptions of policy-specific corruption usually arise from a firm's experiences with the enforcement of regulations and policies by specific government agencies, whereas perceptions of general corruption are based on experiences with a range of transactions with different government agencies, levels of government, as well as with private sector entities. General corruption is conceptually similar to the aggregate measures of corruption frequently used in the extant literature, while policy-specific corruption is a narrower theoretical construct that captures one specific content dimension of corruption.

Anecdotal evidence supports our notion that perceptions of general and policy-specific corruption are distinct constructs. For example, 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. Drawing on signaling theory and institutional theory, we argue that perceptions of policy-specific corruption will impact firms' decisions to obtain certification differently than will general corruption.

Policy-specific corruption and private certification

In jurisdictions with high levels of policy-specific corruption, firms' apparent compliance with regulations does not reveal credible information about their conduct regarding the regulated issue. For example, firms can fail to comply with environmental regulations, but give the appearance of compliance by bribing government officials to obtain environmental permits such as hazardous waste or waste water discharge permits, or to avoid penalties for regulatory violations. Conversely, in jurisdictions with low policy-specific corruption, external stakeholders can presume that most firms, which are not fined for violations and possess appropriate permits, generally do comply with regulations (Ivanova, 2007). Thus, information asymmetries about policy-specific conduct between firms and their external stakeholders are larger in jurisdictions with high policy-specific corruption.

Firms with good conduct will use certification as a signal to reveal this information only if the value derived from certification exceeds the cost (Delmas and Montiel, 2009; King *et al.*, 2005). While the costs of obtaining certification do not differ across jurisdictions with different levels of policy-specific corruption, its signaling value can be expected to be larger in jurisdictions with high levels of policy-specific corruption where apparent regulatory compliance conveys little information regarding true policy-specific conduct. In such jurisdictions, a policy-relevant certification, that is, a certification that addresses the regulated issue, reveals additional information by separating firms with good conduct from those with poor conduct. Thus, high

levels of policy-specific corruption increase the value of private certification and, thus, the likelihood that firms obtain certification.

Hypothesis 1: Firms located in jurisdictions characterized by high levels of policy-specific corruption will be more likely to obtain policy-relevant private certification than firms located in other jurisdictions.

General corruption and private certification

General corruption refers to the public's belief that corruption cuts a wide swath across both the public and private sectors. Previous research has found that people's perceptions of widespread governmental corruption, which involves many agencies and a wide range of transactions with the government, affect their assessments of other societal institutions as well. Perceptions of or experience with widespread corruption have been found to be correlated with reduced trust in individuals and institutions (Bailey and Paras, 2006; Canache and Allison, 2005). In addition, perceptions of widespread public corruption have been found to be highly correlated with perceptions of private sector corruption (Melgan, Piani, and Rossi, 2009). While private corruption often goes hand in hand with public corruption, the press, politicians, and civil society tend to focus their attention on the government, so that only limited information is available on corruption in the private sector in many places such as Central America, Mexico, and the Caribbean (Transparency International, 2003).

Because general corruption is closely linked to private sector corruption, the private auditors that grant certification will likely be perceived to be more corrupt in jurisdictions with high levels of general corruption. While one may think that policy-specific corruption could also give rise to perceptions of private auditor corruption, this is less likely to be the case because most auditors are not specialized in auditing standards addressing a specific issue like environmental management (ISO 14001), but are experts in auditing management system standards, which address a range of different issues including quality management (ISO 9000), occupational health and

safety (OHSAS 18001), and information security management (ISO 27001).³

In environments with high levels of general corruption, it may be possible for firms to obtain certification by bribing the private auditors that assess firms' conformance with standard requirements, rather than by substantively implementing the standard and using the standard in their daily operations. The possibility that undeserving firms may obtain certification via bribing private auditors affects the costs of obtaining certification for these firms as well as the signaling benefits that firms derive from the certification. In jurisdictions with high levels of general corruption, firms can avoid the high costs of substantive standard implementation and obtain certification by paying a bribe to the private auditor while implementing the standard symbolically and not using it in their daily operations (Boiral, 2007; Christmann and Taylor, 2006). Firms will only bribe auditors if the total cost of obtaining certification (i.e., implementation and certification costs plus the cost of the bribe) is less than the cost of obtaining certification via substantive standard implementation. Given that firms with poor performance incur higher implementation costs than other firms, they will be more likely to bribe the auditors in order to lower their total costs of obtaining certification. Thus, general corruption lowers the costs of certification for poor performers, which suggests that a separating equilibrium, that is, a situation in which high performing firms incur lower signaling costs than low performing firms, does not exist for certification in jurisdictions with high levels of general corruption. As a result, the signaling value of certification is compromised in these jurisdictions and neither type of firm (high and low performers) will want to incur the costs of a certification that has no value. It is important to point out that public perceptions of high levels of general corruption (rather than actual high levels of general corruption) are sufficient for this effect to occur. If external stakeholders perceive general corruption to be high, they will infer that a separating equilibrium does not exist. Hence, the signaling value of certification is reduced, which reduces firms' likelihood of certification.

Hypothesis 2: Firms located in jurisdictions characterized by high levels of general corruption will be less likely to obtain private certification than firms located in other jurisdictions.

METHOD

We test our hypotheses in the context of ISO 14001 certification among automotive suppliers located in Mexico. ISO 14001 is the world's most widely adopted environmental management system standard with more than 220,000 certified facilities in 159 different countries (ISO, 2009). It was issued by ISO in 1996. We selected the ISO 14001 standard because it addresses an issue—firms' environmental conduct—that is also regulated by specific government policies, so that policy-specific corruption exists. Furthermore, customers are increasingly considering suppliers' environmental conduct in their purchasing decisions, but cannot directly observe their environmental conduct. Obtaining ISO 14001 certification allows suppliers to signal their commitment to improving their environmental performance to external stakeholders (Delmas and Montiel, 2009; King *et al.*, 2005). Certification is generally granted at the facility level by private third-party auditors who perform on-site visits to verify facilities' compliance with ISO 14001 requirements. In Mexico, certification is usually granted by auditors that are accredited by the Mexican Accreditation Entity, known in Mexico as EMA. The first Mexican ISO 14001 certifications were granted in 1998. Given that ISO 14001 certification is obtained by facilities, we perform our analysis at the facility level. We focus our analysis on a single industry sector in order to control for potential interindustry differences in firm responses to corruption.

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 among its 31 states and Mexico City. In fact, enforcement of government regulations concentrates in Mexico City and along the northern border (Logsdon and Husted, 2000) with other regions having much lower enforcement. Second, we were able to obtain data on perceptions of different types of corruption at the state level, while for most countries data are only

³ Normex, the leading Mexican auditing firm, confirmed that all their auditors are qualified to audit different systems.

available for general corruption and at the country level.

Endogeneity could exist if firms considered their ability to use ISO 14001 as a signal of responsible environmental conduct in their facility location decisions, so that environmentally responsible firms were more likely to locate in jurisdictions with low general corruption. If this was the case, a negative relationship between general corruption and certification would not only be due to reduced signaling credibility of ISO 14001 but also due to facility location decisions resulting in inflated estimates of the effects of general corruption on certification. However, most Mexican automotive supplier facilities were established in the 1980s and 1990s before adoption of ISO 14001 in Mexico began (Ramírez, 1999) and their location is primarily determined by their customers' supply chain requirements, such as participation in just-in-time inventory systems, as well as by labor costs and access to a nonunionized workforce (Ernst, 2005; Ramírez, 1999). Thus, it seems remote that the possibility that facilities' ability to use ISO 14001 as a signal affected their location decisions. Consequently, endogeneity is unlikely an issue in our study, although not entirely ruled out.

Sample and measures

Our sample consists of 433 automotive supplier facilities located in Mexico that were included in the ELM Guide Automotive Supplier Database (ELM, 2004), which contains facility and parent company information for about 80 percent of automotive suppliers. Because data on ISO 14001 certification of these facilities is only available until 2004—our source for this data, the *World Preferred Registry* (World Preferred, 2004) ceased publication after that year and no other comprehensive resource collecting ISO 14001 data for Mexican facilities exists—we used data on facility characteristics from the ELM database for the years directly preceding 2004. The 433 facilities are located in 19 different Mexican states. Sixty-nine of them (16%) were ISO 14001 certified by 2004. The certified facilities were located in 13 different states and ranged in size from 9 to 4,325 employees.

ISO certification: Our dependent variable is a binary variable that takes the value of 1 if the facility was ISO 14001 certified by 2004.

Corruption measures: We obtained state-level corruption data from the Governance and Business Development Survey (EDGE) that was conducted in 2001 by Tecnológico de Monterrey, one of the top universities in Mexico. The survey gathered data on business perceptions of corruption in Mexico from a sample of 3,985 private businesses located throughout the nation (EDGE, 2001).

Our measure of policy-specific corruption is based on two survey items—the percentage of times that respondents had paid tips, gifts, or bribes for two administrative transactions with the government that are related to environmental regulations: (i) obtaining permits to use and exploit natural resources, and (ii) government inspections to monitor toxic waste discharges and spills. Our measure of general corruption is based on three survey items that gauge firms' perceptions about whether firms that are similar to them pay bribes to governmental officials to avoid compliance with any type of regulations at three levels of government—federal, state, and local. These items are measured on an eight-point scale, 0 being 'never' to 7 being 'very frequently.' Perceptions about corruption intensity at these three levels of government vary across states.^{4, 5}

The Appendix summarizes our control variables and the rationale for including them.

Analytical methodology

We use a logit regression model to assess the effects of the independent variables on a facility's likelihood of being ISO 14001 certified (Aldrich and Nelson, 1984). The 69 ISO 14001 certified

⁴ To assess the convergent and discriminant validity of our two multi-items corruption measures we conducted a confirmatory factor analysis of the raw EDGE survey data from 3,985 firms. Fit indices show that the two-factor model fit the data very well. Each of the five items loads significantly on its intended factor—policy specific or general corruption—indicating convergent validity. Individual item reliability scores, average variance extracted, and composite reliabilities all exceed the recommended thresholds. Discriminant validity is evidenced by the modest correlation between the two corruption factors (0.14) and by a statistically significant chi-square difference between the two-factor model and a single-factor model. Furthermore, Cronbach Alpha's of 0.77 and 0.95 for our measures of policy-specific and general corruption respectively indicate a high degree of internal consistency of the items included in each measure. Detailed results are available from the authors upon request.

⁵ Direct measures of private sector corruption do not exist for Mexico, but there is a clear relationship between private sector corruption and public sector corruption (Transparency International, 2003; *El Economista*, 2011).

Table 1. Descriptive statistics and correlations

Variable	Mean	SD	Min	Max	1	2	3	4	
1 ISO 14001	0.16	0.37	0	1	1				
2 Policy-specific corruption	0.73	0.79	0	3.19	0.01	1			
3 General corruption	1.38	0.35	0.51	2.71	-0.11	0.07	1		
4 Exports	0.68	0.46	0	1	0.04	0.08	-0.09	1	
5 MNE subsidiary	0.68	0.46	0	1	0.20	-0.24	-0.14	-0.13	
6 Tier I plant	0.80	0.39	0	1	0.03	-0.09	-0.06	-0.07	
7 Facility size	5.82	1.16	2.19	8.73	0.15	-0.28	-0.04	-0.03	
8 QS 9000 certification	0.50	0.50	0	1	0.02	-0.06	-0.15	0.03	
9 State inspection intensity	0.59	0.06	0.51	0.72	0.06	0.56	-0.50	0.02	
10 State gross domestic product (GDP) per capita	8.69	0.57	6.95	9.65	0.04	0.46	0.00	-0.04	
Variable					5	6	7	8	9
1 ISO 14001									
2 Policy-specific corruption									
3 General corruption									
4 Exports									
5 MNE subsidiary		1							
6 Tier I plant		0.17		1					
7 Facility size		0.27		0.08		1			
8 QS 9000 certification		0.03		0.02		0.13		1	
9 State inspection intensity		0.10		0.07		-0.06		0.01	
10 State GDP per capita		-0.03		-0.06		0.03		-0.03	0.34

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

Detailed descriptive statistics by state are available from the authors upon request.

facilities in our sample obtained initial certification between 1998 and 2004 and no facility lost certification in our study period. Our independent variables can be considered time invariant within our study period as facility characteristics did not vary much from 2000 to 2003 and perceptions of corruption tend to be fairly stable over time (Uhlenbruck *et al.*, 2006).

RESULTS

Table 1 shows descriptive statistics and correlations. To check for multicollinearity, we calculated tolerance and variation inflation indices. All values were far below 10, the general threshold value of concern (Belsley, Kuh, and Welsch, 1980). Table 2 presents our analysis of the likelihood that automotive supplier facilities located in Mexico will obtain certification. Model 1 includes control variables only and Model 2 tests our two hypotheses.

The first hypothesis predicts a positive relationship between policy-specific corruption and the likelihood that firms obtain standard certification. This hypothesis is supported by the data. Model

2 in Table 2 shows that policy-specific corruption has a significant positive effect on ISO 14001 certification ($p < 0.05$).⁶ Hypothesis 2 predicts a negative relationship between general corruption and the likelihood that firms obtain standard certification. This hypothesis is supported by the data. Model 2 shows that general corruption has a significant negative effect on certification ($p < 0.05$).⁷

DISCUSSION AND CONCLUSIONS

We proposed that different types of corruption in the institutional environment affect the signaling value of private standard certifications differently and, thus, have divergent effects on firms' likelihood of certification. Empirical results confirm

⁶ The predicted probability of ISO 14001 certification for firms operating in the state with the lowest policy-specific corruption is 9.7%, while it is 39.5% for those in the state with the highest policy-specific corruption.

⁷ The predicted probability of ISO 14001 certification among firms in the state with the lowest general corruption is 35.5%, while it is only 2.4% among those in the state with the highest general corruption.

Table 2. Logit regression results

	ISO certification	
	Model 1	Model 2
Policy-specific corruption		0.57* ⁸ (0.27)
General corruption		-1.41* ⁹ (0.58)
Exports	0.48 (0.30)	0.44 (0.30)
MNE subsidiary	1.40** (0.41)	1.58** (0.41)
Tier I plant	-0.01 (0.37)	0.08 (0.36)
Facility size	0.30* (0.14)	0.39* (0.15)
QS 9000 certification	0.02 (0.26)	-0.11 (0.29)
State inspection intensity	2.48 (2.36)	-6.03 (3.99)
State GDP per capita	0.18 (0.22)	0.12 (0.27)
Constant	-7.86** (2.40)	-1.43 (3.62)
Observations	433	433
Wald χ^2	28.50	38.14
Log likelihood full model	-186.06	-182.27

Robust standard errors in parentheses. +significant at 10%, * at 5% and ** at 1%.

these divergent effects: policy-specific corruption increases firms' certification likelihood, while general corruption lowers certification likelihood.

Our findings contribute to the literatures on transaction costs, corruption, and private certification and have implications for the relationship between institutional economics and institutional theory. First, our study analyzes how the institutional context affects firms' use of signals as mechanisms to reduce the costs resulting from information asymmetries in market transactions. In particular our study finds that one aspect of the institutional context—corruption—affects firms' use of private standard certification as a signal. This finding contributes to the literature on the role of the institutional context in creating the conditions under which market transactions can take place (North, 1991). In settings with high policy-specific corruption, in which customers cannot discern firms' policy-related conduct from compliance with government regulations, firms use

certification to signal desirable conduct, which reduces customers' search and monitoring costs. However, in settings where general corruption decreases the credibility of private certification as a signal, potential markets may never come into existence as firms internalize transactions where information asymmetry is sufficiently severe (Akerlof, 1970; Williamson, 1985). Further research should explore whether other type of signals such as professional licensing, guarantees, and brands are also affected by corruption and which other aspects of the institutional context affect signaling.

Second, while much prior research has conflated different types of corruption by conceptualizing corruption as an aggregate construct, we take a more fine-grained approach to the types of corruption and their respective impacts on business decisions. We show differential effects of general and policy-specific corruption on firm behavior in the context of environmental protection. Similar differences in corruption are likely to exist for other types of regulation. Thus, studies examining the effect of corruption on firm behavior need to consider the differential impacts of different types of corruption. In addition, our study highlights the importance of considering differences in corruption across regions within a single country. Future research should consider whether the corruption level can be generalized at the country level or whether differences between jurisdictions within a country need to be taken into account.

Third, our findings contribute to the literature on the determinants of private standard certification (Christmann and Taylor, 2001). We show that firms' certification decisions are not only affected by external pressures and internal firm characteristics but also by characteristics of the institutional context, such as corruption. Given diverse institutional contexts across nations and the effects of national institutional contexts on the credibility of certifications, one wonders to what extent they can contribute to the creation of more sustainable international supply chains.

Finally, our study suggests that opportunism, which is a fundamental behavioral assumption of transaction costs economics (Williamson, 1985), actually varies across institutional contexts. Corruption in the institutional environment affects firms' opportunities to act opportunistically by obtaining private standard certification to give the

⁸ Odds ratio = 1.760

⁹ Odds ratio = 0.245

appearance that they possess certain characteristics, while they, in fact, do not adhere to standard requirements. Such symbolic implementation of practices, which has been studied by institutional sociologists, is closely related to the concept of opportunism in organizational economics (Christmann and Taylor, 2006), since both involve distortion of information. Despite the different assumptions about rationality in organizational economics and institutional sociology, this study suggests that they might fruitfully cross-fertilize each other in their understanding of issues related to opportunism, symbolic implementation, transparency, and verification.

Our findings also have implications for practice. Firms using private certifications to signal desirable characteristics need to find ways to increase certification credibility in jurisdictions with high general corruption where external stakeholders likely distrust private auditors. Firms may be able to increase certification credibility by selecting reputable auditing firms from foreign countries with low general corruption because these auditors may be perceived as less susceptible to domestic corruption and more capable of detecting inaccurate information. Further research could evaluate whether and how general corruption affects firms' choice of domestic versus foreign auditors.

While we were able to obtain fine-grained corruption and certification data from an emerging country, our data has limitations. Facility level data on ISO 14001 certification in Mexico does not exist after 2004, so we were not able to examine whether the effects of corruption on certification differ for later adopters that may be more motivated by external pressures for certification. Our single industry and single country analysis allows us to control for interindustry and intercountry differences in the antecedents of certification decisions, but also prevents us from testing whether our predictions will hold in other industries and in other countries with different institutional environments. These data limitations give rise to future research opportunities. Studies could examine whether our findings hold across time, industries, certification programs, and countries.

Our study is the first to highlight the complex influence of corruption on the value of signals. Understanding these relationships has important implications for the design and use of signals by firms and organizations creating certifiable standards. We hope that our study sparks more research

in this area possibly considering additional dimensions of corruption.

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APPENDIX: DESCRIPTION OF MEASURES FOR CONTROL VARIABLES

Variable	Description of measure	Rationale for inclusion	Data source
Exports*	Binary variable: value 1 if firm exports any of its output, value 0 otherwise	Exporting firms may be more likely to obtain ISO 14001 certification because of foreign customers' requirements (Christmann and Taylor, 2001) and possibly also because information asymmetries between firms and customers tend to be larger when dealing with distant foreign customers	ELM Guide Automotive Supplier database (2000)
MNE subsidiary	Binary variable: value 1 if facility is owned by a multinational enterprise (MNE), value 0 otherwise	In emerging economies, subsidiaries of MNEs may be more likely to obtain ISO 14001 certification than domestic firms because they have greater access to resources to implement and certify an ISO EMS	Company websites and online databases such as Hoover's and Goliath
Tier I plant	Binary variable: value 1 for first tier plants in the automotive supply chain that sell directly to automakers, value 0 otherwise	First tier plants in the automotive supply chain that sell directly to automakers and are more subject to automakers' pressures to obtain certification	ELM Guide Automotive Supplier database (2000)
Facility size	Number of facility employees (log transformed)	The size of a facility may influence its propensity to certify	
QS 9000 certification	Binary variable: quality management standard based on ISO 9000 developed by the 'Big Three Automakers' (Ford, General Motors, and Chrysler)	Firms that have experience with related quality management standards, such as the ISO 9000 or QS 9000, may be more likely to obtain ISO 14001 certification (King <i>et al.</i> , 2005)	<i>QS 9000 Registered Company Directory</i> . QSU Publishing: Fairfax, VA.
State inspection intensity	Environmental inspections conducted in each state by the Mexican Environmental Agency in 2000 divided by the number of firms located in the state (log transformed)	The likelihood of environmental inspection by government authorities in a given state may affect ISO 14001 certification decisions because firms may obtain certification to reduce the likelihood of governmental environmental inspections in states with higher inspection intensity	Profepa and the Mexican Enterprise Information System (SIEM)
State GDP per capita	GDP per capita (log transformed) in each of the different states in 2000	Environmental investments such as ISO 14001 certification are more likely to occur in richer regions due to the greater availability of resources. Also, the residents of richer states generally have higher levels of education and are more likely to understand the value and importance of environmental issues and ISO 14001 certification	<i>Regional GDP per capita year 2000</i> . National Institute of Statistics and Geography: Mexico.

* Export data was not available at the facility level. However, given that a large percentage of the firms in our sample (84%) had only one or two facilities using corporate data is unlikely to bias our results.