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Perceived stakeholder influences and organizations' use of environmental audits ☆

Nicole Darnall [a,*], Inshik Seol [b,1], Joseph Sarkis [b,2]

[a] Department of Environmental Science and Policy, George Mason University, 4400 University Dr., MSN 5F2, Fairfax, VA 22030, United States
[b] Graduate School of Management, Clark University, 950 Main Street, Worcester, MA 01610-1477, United States

Abstract

While the use of internal, external, and both types of environmental audits are becoming more pervasive in society, little is known about the stakeholder influences associated with their use, in large part because previous research has viewed them as a uniform type of management practice. This study draws on stakeholder theory to explore organizations' use of different types of environmental audits. It uses international manufacturing data to show that significant variations in the use of environmental audits are associated with differences in stakeholder influences, and that a more nuanced treatment is needed when evaluating these audits.

Introduction

Over the last decade, the number of organizations relying on environmental audits has increased exponentially. For instance, in the last 10 years more than 88,000 organizations worldwide have certified their environmental management systems (EMS) to ISO 14001 (Peglau, 2005), the international EMS standard which requires external audits as a condition of certification. Outside of the ISO 14001 framework, many more companies have utilized other types of external environmental audits, implemented internal audits, or adopted both types of auditing schemes.

Recently, Parker (2005) reviewed the research on social and environmental accountability that was published between 1988 and 2003 in six leading interdisciplinary accounting journals. He found that of the 233 published articles assessing social and environmental accountability, 140 (66%) specifically addressed environmental issues.[3] After further

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* Corresponding author. Tel.: +1 703 349 1233/993 3819; fax: +1 703 993 1066.
E-mail addresses: ndarnall@gmu.edu (N. Darnall), iseol@clarku.edu (I. Seol), jsarkis@clarku.edu (J. Sarkis).
[1] Tel.: +1 508 793 7748.
[2] Tel.: +1 508 793 7659.

[3] The six journals were *Accounting, Auditing and Accountability Journal*, *Accounting Forum*, *Critical Perspectives on Accounting*, *Accounting, Organizations and Society*, *Social and Environmental Accounting Journal*, and *Journal of the Asia Pacific Centre for Environmental Accountability*.

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evaluating these papers, Parker (2005) concluded that, while scholarship recognizes environmental accountability as an important research area, the topic of environmental auditing is under-researched by authors publishing in leading interdisciplinary accounting journals. Even less is known about the factors associated with organizations' use of different types of environmental auditing practices.

Understanding these relationships is important for several reasons. First, regulators do not require organizations to utilize environmental audits. As such, companies that rely on them do so voluntarily, and often in the absence of coercive external mandates. By examining organizations' voluntary use of environmental audits we may realize that, despite the lack of coercive mandate, different types of stakeholder influences may be associated with their implementation. Assessing these relationships therefore would offer essential insights about the global adoption of these environmental management tools.

Second, while anecdotal evidence (Hillary, 1998; Tilt, 2001) and empirical research (Khanna & Anton, 2002) on organizations' environmental audits have viewed them as a uniform type of management practice, the landscape of environmental audits is diverse in that organizations can implement internal or external audits, or both. Internal audits generally use existing resources and are conducted by an employee or team of employees who typically have extensive tacit knowledge about the organization and its internal processes. While these audits often reveal specific operations and processes needing improvement, they are criticized for lacking external transparency and credibility.

By contrast, external audits are executed by independent outside assessors who provide assurances to the organization and its external stakeholders about the business's environmental management practices. This approach, however, can be costly and may not provide equivalent operational benefits as those derived from internal audits. In still other instances, researchers have suggested that organizations combine both auditing practices to gain maximum operational benefits and credibility (Stanwick & Stanwick, 2001).

Given the variations in operational benefits and credibility, we anticipate that there are fundamental differences in the organizations that implement one type of environmental auditing scheme over another. An appreciation for these differences may be essential to understanding an organization's subsequent changes in environmental performance and stakeholder relations.

This study draws on stakeholder theory to evaluate the relationship between perceived stakeholder influences and organizations' use of environmental audits. More specifically, the research expands on previous scholarship by considering how perceived stakeholder influences are associated with managers' decisions to implement one of four environmental audit options: no audit, internal audits only, external audits only, and a combination of both internal and external audits.

Further, this study extends prior research that has evaluated environmental auditing studies that have focused on larger firms (Khanna & Anton, 2002), a limited number of industrial sectors (Álvarez, Burgos, & Céspedes, 2001), and single countries (Álvarez et al., 2001; Watson & Emery, 2003). It utilizes data for both large and small organizations in manufacturing sectors operating in seven different countries (Canada, France, Germany, Hungary, Japan, Norway and the United States (US)) to offer a more complete perspective on the extent to which stakeholder influences are associated with the use of different environmental auditing practices.

Variations in environmental auditing

Over the past two decades many organizations have responded to stakeholder influences in an effort to become more environmentally responsible. For example, some organizations have begun to publicly disclose their environmental information through a number of avenues including corporate reporting either as part of their annual report or stand-alone voluntary environmental reports. Financial reporting requirements mandate full disclosures of real and potential environmental liabilities. While predominantly used by publicly traded companies, privately owned firms also rely on environmental reporting. Private companies often use environmental reporting in response to influences from large corporate buyers, which are requiring their suppliers to provide environmental information as a condition to doing business (Darnall, Gallagher, & Andrews, 2001). Environmental reporting therefore is becoming a major feature of all business activity (Gray & Bebbington, 2001).

Some organizations have gone a step further to integrate environmental information into their decision making processes with a variety of programs

including voluntary certifications (such as ISO 14001) and other pervasive environmental management systems. As a component of this operational integration, organizations are utilizing environmental audits.

Defining environmental audits

An audit (of any sort) requires a commitment to the auditing philosophy, its social norms, and a communal investment in this concrete technical practice (Power, 1997). Society is increasingly committed to observing itself through various kinds of auditing practice. The rationale for this commitment is the notion that individuals must be accountable for their actions and this accountability must be verified (Power, 1997). Related to the natural environment, environmental auditing has evolved from a tool for companies to ensure their compliance with environmental regulations to a management based style of self-assessment, emphasizing systems and self-informing (Power, 1997). More formally, an environmental audit has been defined as a management tool that systematically documents and periodically evaluates how well an organization's management practices and equipment are safeguarding the environment (ICC, 1991). By emphasizing objective review, environmental audits are designed to help organizations achieve managerial commitment and control of their environmental practices, compliance with environmental regulations (ICC, 1991; USEPA, 1986) and conformity to company policies (ICC, 1991).

The application of environmental audits to an organization's operations is parallel to how companies have used quality auditing. In requiring a commitment to continually improve process and product quality, organizations that rely on quality auditing ensure that quality is measured constantly and appropriate corrective action is taken whenever defects occur (Corbett, Montes-Sancho, & Kirsch, 2005). They also plan for the long-term and assess their progress toward achieving desired outcomes. Similarly, organizations that rely on environmental audits of their internal operations attempt to ensure that environmental impact is measured continually, that goals are established, and that corrective action is taken when problems occur.

Environmental auditing is a voluntary activity for most organizations. Organizations that conduct environmental audits, therefore, have to manage a tension between the incentives and disincentives for completing these audits. Incentives for environmental auditing relate to the fact that organizations invest significant internal resources to manage their environmental issues. In complying with environmental regulations alone, collectively organizations spend millions of dollars annually installing pollution control technology, applying for operating permits, and monitoring and reporting their environmental discharges (Portney & Stavins, 2000).

Environmental audits may provide organizations better protection of their investment since the auditing process creates routines and systems that can improve environmental management activities (de Moor & de Beelde, 2005; Maltby, 1995; O'Dwyer, 2001; Pfaff & Sanchirico, 2000). Environmental auditing also can lead to the early discovery of environmental issues that organizations can address before they become significant problems (Stanwick & Stanwick, 2001). By preventing significant environmental problems, organizations may reduce their environmental liability, risk (Gilbert, 1999) and remediation costs, while at the same time improving their external image. As such, companies that utilize environmental audits may be in a better position to respond to address stakeholder concerns for stronger environmental management.

However, there are disincentives for completing environmental audits. Problems arise when the audit identifies an environmental non-compliance or violation. In such instances, an organization is required legally to report its discrepancies to environmental regulators, which may lead to sanctions including financial fines or plant closures (Emery & Watson, 2003). In addition, there are costs associated with executing the audit, which relate to preparation for the environmental audit, and dedicating staff towards completing the internal audit or hiring an auditor for external audits.

Environmental audits – differing operational benefits and credibility

Previous auditing research has generally focused on the broader concept of auditing rather than environmental auditing and its various forms. Of the few studies related to environmental audits, all view environmental audits as a uniform type of environmental management practice (e.g., Hillary, 1998; Khanna & Anton, 2002; Tilt, 2001), and to our knowledge no studies have assessed the factors associated with the use of different types of environmental audits.

However, there are at least four different forms of environmental audit, the first form is no environmental audit. An organization may choose the no audit option even though it has adopted numerous proactive environmental measures. Under this scenario, the organization does not systematically document and periodically evaluate how its operations and processes affect the natural environment.

The second form of environmental audit is an internal audit, which is implemented by the organization's internal staff. Internal audits are executed generally by an employee or a team of employees who are knowledgeable about environmental management practices and processes. These audits are used to determine compliance with laws and regulations, but they also can be used to develop recommendations for how an organization can reduce its environmental impacts beyond legal requirements. Further, internal audits may be used to review the organization's provisions for contingent liabilities and validate the propriety of the environmental accounting process (Dittenhofer, 1995). Such actions offer valuable information for making decisions concerning effective business operations. Because internal audits are executed by employees within the organization, the auditor or auditing team develops extensive knowledge about the company's internal operations and controls that can inform the environmental assessment and recommendations (Power, 1997). This expertise makes internal audits especially responsive to internal stakeholder concerns voiced by management and non-management employees.

The third environmental audit is an external audit. In performing an external audit, an organization hires an outside independent assessor to examine its environmental practices. External audits are a more recent occurrence and have arisen to attend to stakeholder concerns regarding independent validation and reporting (Power, 1997). Similar to internal audits, external audits may be used to determine whether the organization is in compliance with environmental regulations (Dittenhofer, 1995), especially when the organization lacks the internal expertise to do the assessment internally. In such instances, the external audit may not provide equivalent operational benefits as those derived from internal audits. External audits also investigate how the organization's environmental actions and non-compliance activities affect its financial statements (Dittenhofer, 1995). The external audit therefore takes a broader view of the organization's operations and processes by considering its overall business performance.

External audits have a greater appearance of objectivity and independence (Karapetrovic & Willborn, 2001) since an outside independent assessor examines the organization's environmental practices. Because of their increased objectivity, coupled with a more expansive view, external audits benefit organizations by enhancing their environmental image and conferring external legitimacy, especially with external stakeholders (Solomon, 2000). Legitimacy refers to organizations' actions that are considered desirable or appropriate within some socially constructed system of norms, values, beliefs and definitions (Suchman, 1995). While often difficult to quantify, enhanced image and legitimacy may lead to such things as increased sales, improved ability to recruit talented employees, and enhanced external relations (Kollman & Prakash, 2001). In other instances, organizations that utilize external audits may be able to more legitimately signal to the marketplace, regulators and investors that they are managing their environmental risks proactively which may improve their reputation and increase their attractiveness to customers and financiers.

The fourth form of environmental audit utilizes both internal and external audits. By employing internal audits, these organizations are able to respond more effectively to internal stakeholder concerns voiced by management and non-management employees and maximize operational benefits. Moreover, they also benefit from outside independent assessors who examine the organization's environmental practices. This process can increase an organization's external credibility. For these reasons, researchers believe that organizations which rely on both internal and external audits may receive the maximum benefit from the auditing process (Stanwick & Stanwick, 2001). Additional benefits of combining both types of audits include a greater opportunity for increasing operational efficiency and effectiveness (Watson & Emery, 2003) because organizations can gain from their internal expertise and also leverage external knowledge to further improve upon their internal operations.

In sum, implementing internal audits benefit internal stakeholders and operations, and may be less costly, but sacrifice external credibility. External audits offer greater credibility with external stakeholders and enhanced organizational benefits than internal audits alone. However, they also require additional costs, reduce internal control over audit

procedures, and increase liability associated with the external disclosure of environmental information. Strategies that rely on both internal and external audits provide the greatest benefits from the auditing process (Stanwick & Stanwick, 2001). This combined approach provides greater credibility with internal and external stakeholders and may offer superior overall organizational benefits as well, although it is likely to be the most expensive auditing option.

Variations in environmental audits, their credibility and their focus on business performance suggest that the typical approach of asking organizations whether they utilize environmental auditing or not fails to appreciate their diversity. A more nuanced treatment therefore is needed when evaluating these environmental management tools. By considering the distinctions among different types of environmental audits we may gain greater insight into how stakeholder influences relate to the use of different kinds of environmental audits. The following sections discuss these influences.

Environmental audits and stakeholder theory

Organizations that utilize one type of environmental audit over another are anticipated to be associated with varying degrees of perceived stakeholder influences. Stakeholders can be defined as "any group or individual who can affect or is affected by the achievement of an organization's objectives" (Freeman, 1984, p. 46). In crafting this definition, Freeman (1984) took the position that companies produce externalities that affect many parties internal and external to the organization. Externalities often cause stakeholders to increase their influence on organizations to reduce negative impacts and increase positive ones. Stakeholder theory asks which of these groups of individuals deserve attention from management and which do not (Mitchell, Agle, & Wood, 1997).

Managers think about stakeholders based on their perceptions (Donaldson & Preston, 1995) and therefore serve as a critical interpreter of stakeholder influence (Fineman & Clarke, 1996). After assessing which stakeholders are salient (Mitchell et al., 1997), managerial perceptions of stakeholders subsequently establish how an organization should respond (Donaldson & Preston, 1995; Fineman & Clarke, 1996). Because of their central role, managerial perceptions are the focus of this paper.

Internal stakeholders

In general, there are two groups of stakeholders that influence organizations: internal and external stakeholders. Internal stakeholders include management and non-management employees (Waddock & Graves, 1997). These internal stakeholders have a direct economic stake in the organization and are typically located within the organization (Freeman, 1984). Internal stakeholders are relevant to environmental auditing because employees often are the initiators of an organization's proactive environmental activities (Daily & Huang, 2001; Hanna, Newman, & Johnson, 2000; Ramus & Steger, 2000). Such initiative is rooted in employees' specialized knowledge and skills related to the organization's activities and how it relates with the natural environment. However, for employee commitments to advance, they must have support from management. Support and leadership from top-level managers is vital to ensuring an organization-wide understanding of and commitment to environmental issues (Tilley, 1999; Zutshi & Sohal, 2004). In particular, managerial attitudes and views about the natural environment (Cordano & Frieze, 2000), in addition to their interpretations influence management decisions regarding the organization's subsequent environmental activities (Ramus & Steger, 2000; Sharma, 2000). Also important is whether managers commit to being environmental leaders within the organization (Egri & Herman, 2000). Such commitment is central to adopting new environmental programs and improving an organization's environmental performance over time. Combined, these arguments suggest the following hypothesis:

Hypothesis 1. The type of environmental audit used by organizations is positively associated with the perceived influence of internal stakeholders.

External stakeholders

Unlike internal stakeholders, external stakeholders have more limited control of critical organizational resources (Mitchell et al., 1997; Sharma & Henriques, 2005). However, in some cases external stakeholders have the ability to regulate the organization (Fineman & Clarke, 1996; Freeman, 1984). For instance, organizations must comply with environmental regulations or face the threat of regulators levying legal action, penalties and fines (Henriques & Sadorsky, 1996). Failure to yield to

regulatory stakeholders leaves organizations vulnerable to individual or class action lawsuits. Such threats, although infrequent, can be devastating to an organization's public image, customer relations and external legitimacy (Power, 1997). As a consequence, organizations may utilize environmental audits as one means to preempt these regulatory threats.

Some regulatory influences are less coercive and more incentive-based. For instance, regulators are offering incentives to encourage organizations to use environmental audits. Regulators' rationale for providing these incentives is the belief that environmental audits can prevent larger environmental mishaps (Stafford, 2005). These incentives may encourage organizations that otherwise would not consider utilizing environmental audits to do so.

In still other instances organizations yield to stakeholder influences from regulators in an effort to maintain or improve their informal relationships (Stafford, 2005) and accrue political capital. For example, by utilizing proactive environmental practices, organizations may be able to form collaborative relationships with government more easily and explore more non-regulatory ways in which government can encourage greater environmental improvements (Darnall, Henriques, & Sadorsky, 2008). These collaborations can promote environmental learning, capacity-building (Darnall & Edwards, 2006), and trust between organizations and regulators (Hoffman, 2000). A good reputation with regulators also may give organizations greater political capital when negotiating with government officials about the terms of forthcoming regulations. Combined, these arguments lead to the following hypothesis:

Hypothesis 2. The type of environmental audit used by organizations is positively associated with the perceived influence of regulatory stakeholders.

Other external stakeholder influences originate from the broader social context (Henriques & Sadorsky, 1999; Power, 1997; Wilmshurst & Frost, 2000). Drawing on previous research (e.g., Darnall et al., 2008), we defined societal stakeholders as interest groups that include environmental and community groups (Etzion, 2007; Hoffman, 2000) and professional organizations such as labor unions (Etzion, 2007). Each of these groups have the capacity to mobilize public opinion in favor of, or in opposition to, the organization (Freeman, 1984). These groups also generally utilize indirect approaches to influence organizational behavior (Sharma & Henriques, 2005). Such actions include public protests, strikes, and calls for engagement. For instance, unions may initiate public campaigns and protests that increase external pressure for an organization to improve its environmental performance. Union interest in these issues relates to general concerns about worker safety and the environmental risks imposed on surrounding communities where workers' families reside (Holder & O'Brien, 2007). Further, societal stakeholders may publicize information that could persuade consumers to favor the products of companies that have demonstrated a stronger regard for the environment (Gould, Schnaiberg, & Weinberg, 1996). In other instances, societal stakeholders may encourage consumers to boycott products of organizations and neutralize attempts that these organizations may take to promote their environmentally proactive management practices. Societal stakeholders of all sorts therefore provide organizations a "social license" to operate (Gunningham, Robert, & Thornton, 2004) and may be critical factors associated with an organization's decision to utilize environmental audits (Altman, 1999).

Hypothesis 3. The type of environmental audit used by organizations is positively associated with the perceived influence of societal stakeholders.

Other relevant external stakeholders include those operating in the organization's supply chain. Supply chain stakeholders consist of all parties who are involved (directly or indirectly) in fulfilling a customer request including the suppliers, transporters, warehouses, retailers, and customers themselves (Cox, 1999). Increasingly, supply chain stakeholders have been exerting influences on organizations to improve their environmental performance and adopt proactive environmental management practices (Zhu & Sarkis, 2004; Zhu, Sarkis, & Geng, 2005). Related to environmental audits, more than ever, corporate customers are requiring that their suppliers provide them with a written certification of their compliance with all environmental regulations (Darnall et al., 2001). In other instances, corporate customers visit their suppliers and require external audits of their operations and procedures (Darnall et al., 2001). Influences such as these arise because corporate customers wish to ensure that their purchases are of sufficient environmental quality since doing so reduces environmental liabilities associated with final

product development (Handfield, Walton, Sroufe, & Melnyk, 2002).

In still other instances, environmental audits can be used to help organizations ensure that they will have a consistent input source. For example, if an upstream supplier has its operating permit revoked because of environmental violations or if a critical supplier shuts down (even temporarily) because of an environmental accident, the entire supply chain can come to a halt (Lamming & Hampson, 1996). Requiring suppliers to utilize environmental audits may be one way for corporate customers to ensure that their suppliers avoid these catastrophic events (Humphreys, Wong, & Chan, 2003; Noci, 1997). Supplier requirements for environmental audits also can help ensure the environmental quality of an organization's input sources by reducing its possibility of utilizing product inputs that are marketed as being environmentally sound when in fact they are not (Green, Morton, & New, 2000). Consequently, we hypothesize

Hypothesis 4. The type of environmental audit used by organizations is positively associated with the perceived influence of supply chain stakeholders.

Research methods

Data

To evaluate our hypotheses, we relied on data collected from an international survey developed and administered by the Organization for Economic Co-Operation and Development (OECD) Environment Directorate and academic researchers from Canada, France, Germany, Hungary, Japan, Norway and the US. The OECD survey was pretested in France, Canada and Japan before it was translated into each country's official language and back-translated to ensure the accuracy of the original translation (Johnstone, 2007). In 2003, surveys were sent to individuals who worked in manufacturing facilities having at least 50 employees and who were responsible for the facility's environmental activities (Johnstone, 2007). The OECD sent two follow-up mailings to prompt additional responses and 4186 facility managers completed the survey (Johnstone, 2007). The response rate was 24.7% (Johnstone, 2007), which is similar to previous studies of organizations' environmental practices (e.g., Christmann, 2000; Delmas & Keller, 2005; Melnyk, Sroufe, & Calantone, 2003), where response rates were 20.1%, 11.2% and 10.4%, respectively. About half of the sample consisted of small- and medium-sized enterprises (<250 employees), in addition to publicly traded and privately owned facilities (Johnstone, 2007). Included in this study are 2249 facilities that responded to each of the questions of interest. Of these facilities, approximately 60% were either small- or medium-sized enterprises. Our sample represented 53.7% of the facilities included in the OECD dataset. Because the survey data were cross-sectional in nature, this study evaluated whether associations existed among the variables of interest rather than causal relationships.

To check for common method variance, we performed a *post hoc* Harman's single-factor test (Podsakoff & Organ, 1986). The basic assumption of this test is that if a substantial amount of common method variance is present, a factor analysis of the entire sample will result in a single factor accounting for the majority of the covariance in the independent and dependent variables. The results of Harman's single-factor test revealed that no single factor accounted for the majority of the variance in the variables, offering evidence that this type bias was not a concern.

The OECD controlled for social desirability bias in the construction of its survey by ensuring anonymity for all respondents (Johnstone, 2007). Anonymity assurances reduce bias even when responses relate to sensitive topics (Konrad & Linnehan, 1995). To further address potential problems related to social desirability bias, survey questions related to stakeholder influences were separated from questions pertaining to environmental auditing. In instances where a social desirability bias exists, researchers are less likely to identify statistically significant relationships because there is less variability in respondents' survey answers. However, by finding statistical significance, additional evidence would be offered about the strength of the relationship between the variables of interest (Hardin & Hilbe, 2001).

The OECD examined non-response bias by evaluating the general distribution of its survey respondents. It assessed the industry representation and facility size of the survey sample relative to the distribution of facilities in the broader population, and found no statistically significant differences (Johnstone, Serravalle, Scapecchi, & Labonne, 2007). Issues related to generalizability were less of a concern because the OECD survey had broad

applicability in that it targeted multiple industry sectors in multiple countries.

Measures

Dependent variable

Facilities' environmental audit practices were assessed by asking facility managers (in separate questions) whether internal or external environmental audits were established in their facility in order to implement environmental management. Facility managers indicated either "Yes" or "No" to each question. Respondents with "No" responses to both items were classified as having no environmental auditing procedures. Respondents that reported "Yes" to internal audits but "No" to external audits were classified as having only internal environmental auditing procedures. Respondents that reported "Yes" to external but "No" to internal audits were classified as having only external environmental auditing procedures. Facilities that reported "Yes" to both items were classified as having both internal and external environmental auditing procedures. Our final categorical variable (environmental audits) consisted of four audit types: no audit ($n = 670$), internal audit only ($n = 406$), external audit only ($n = 150$), both internal/external audits ($n = 1023$).

Explanatory variables

Influences from regulatory stakeholders were measured by relying on OECD data asking facility managers "How many times has your facility been inspected by public environmental authorities (central, state/province and municipal governments) in the last three years?" We supplemented these responses with OECD data that asked environmental managers about the influence of public authorities on their environmental practices. Respondents indicated whether the perceived influence from public authorities was "not important", "moderately important", or "very important" to their environmental practices. We defined these influences from regulatory stakeholders as two independent variables representing *inspection frequency* and *public authority influence*, respectively. While inspection frequency as a measure of regulatory stakeholder influence may not be as subjective as the OECD survey data asking for managers' perceptions of the influence of public authorities, it is not completely objective. Inspection frequency is subject to managers' perceptions of the experience during which the inspections took place and this perception is likely to affect facility managers differently depending upon their view of regulators as salient stakeholders. For instance, some facilities may feel threatened by inspections while others may be less intimidated. Like other stakeholder influences, managerial perceptions of inspection frequency establish how and to what extent they are relevant to the organization's environmental strategy. As noted in other stakeholder research relying on managerial surveys (Berman, Wicks, Kotha, & Jones, 1999; Henriques & Sadorsky, 1999; Sharma & Henriques, 2005), there are rarely completely objective measures of stakeholder influences.

Perceived influences from internal, societal and supply chain stakeholders were assessed by responses to the following question: "How important do you consider the influence of the following groups of organizations on the environmental practices of your facility?" Respondents reported the importance of non-management employees, management employees, environmental groups, neighborhood/community groups, labor unions, commercial buyers, and suppliers, by indicating whether these stakeholders were "not important", "moderately important", or "very important". To ensure that respondents focused on decisions regarding practices rather than the performance of those practices, the OECD prefaced this question by stating that "In this section, you are asked to provide information on the relative importance of different stakeholder groups and motivations on *decisions* regarding your facility's environmental practices". The seven stakeholder influences were entered into a common factor analysis using orthogonal varimax rotation. As anticipated, the results produced three factors representing facilities' influences from *internal*, *societal*, and *supply chain stakeholder* groups. Cronbach's α statistics for each of our scales were above Nunnally's (1978, p. 226) recommended value of 0.60 for exploratory research, indicating sufficient internal reliability of our factor scores (0.751, 0.651 and 0.846 for internal, societal, and supply chain stakeholder groups, respectively). Table 1 summarizes the results of this factor analysis.

Control variables

Since size is related to the organization's visibility in the community and its associated external influences (Bowen, 2002), we included a variable

to account for the number of employees (logged) within the facility. Because influences from shareholders can shape an organization's environmental activities (Henriques & Sadorsky, 1996, 1999), we also included a variable indicating whether or not the facility's parent company (or the facility itself) was listed on a stock exchange. Similarly, organizations with an export orientation have capabilities necessary to meet the needs of diverse customers (Darnall, Henriques, & Sadorsky, 2005; Darnall et al., 2008). They also are more skilled at educating multiple types of customers about their operations, and gaining trust from a variety of buyers (Tallman & Li, 1996). This proficiency may complement an organization's decision to utilize environmental auditing since the export oriented company is better able to educate their customers about the societal benefits of their strategic approach (Bansal & Hunter, 2003). Therefore, we included a variable indicating whether the facility had a foreign head office.

To control for industry differences, five dummy variables were created for international standard industrialization codes (ISIC) at the two-digit level: 15–19 (food, beverage, textiles), 20–22 (pulp, paper, publishing, print), 27–33 (non-metallic minerals, metals), 29–35 (machinery, transport equip.), and 36–37 (furniture, recycling). Finally, dummy variables were used to account for facilities' country of operation: Canada, France, Germany, Hungary, Japan, and Norway. Our excluded dummy variables for empirical modelling were ISIC 23–26 (petroleum, chemicals, plastics) and the US.

Empirical models

Table 2 shows the correlations and descriptive statistics for each of our variables. While Spearman correlations among the explanatory variables were within the range of acceptability, empirical models that rely on numerous categorical variables (as is the case in our model) tend to suffer from multicollinearity problems. For this reason, we evaluated the variance inflation factors (VIF) for each of our explanatory variables. The results revealed the highest VIF was 3.48, which is well below Kennedy's (1997) maximum acceptable threshold of 10.0 indicating that multicollinearity was not a concern.

Our hypotheses were evaluated using logistic (Model 1) and multinomial logistic regression (Model 2). A basic logistic regression classifies environmental auditing as a binary variable equal to one if the facility engaged in any type of audit and zero otherwise. This baseline model was included for comparison purposes only. Multinomial logistic regression was used to evaluate facilities' use of the various forms of environmental audits. Also known as polytomous logistic regression, multinomial logistic regression simultaneously estimates binary logits for all comparisons among dependent categories (Long & Freese, 2001). Multinomial logistic regression was our preferred empirical model since it allows for comparisons of more than one contrast and since a series of binary logits (that draw similar empirical comparisons) would inappropriately use different samples (Long & Freese, 2001). While ordered logit might also be considered

Table 1
Factor analysis results[a]

Constructs	Factor loadings		
	Factor 1	Factor 2	Factor 3
Internal influences			
Influence of management employees on your facility's environmental practices	**0.769**	0.186	0.104
Influence of non-management employees on your facility's environmental practices	**0.775**	0.200	0.160
Societal influences			
Influence of environmental groups on your facility's environmental practices	0.233	**0.665**	0.159
Influence of neighborhood groups on your facility's environmental practices	0.251	**0.539**	0.190
Influence of labor unions on your facility's environmental practices	0.317	**0.568**	0.178
Supply chain influence			
Influence of commercial buyers on your facility's environmental practices	0.188	0.181	**0.521**
Influence of suppliers of goods/services on your facility's environmental practices	0.281	0.282	**0.526**
Cronbach's α	**0.751**	**0.651**	**0.846**

[a] Loadings greater than ±0.50 are bolded.

Table 2
Correlations and descriptive statistics[a]

Variable name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Internal stakeholders	1.00																		
2. Inspection frequency	.17	1.00																	
3. Public authority influences	.27	.23	1.00																
4. Societal stakeholders	.17	.26	.04	1.00															
5. Supply chain stakeholders	.02	.13	.04	.26	1.00														
6. Facility size (log)	.15	.13	.14	.30	.26	1.00													
7. Firm listed on stock exchange	.13	.04	.14	.14	.19	.30	1.00												
8. Foreign head office	.04	−.03	.15	.08	.09	.13	.25	1.00											
9. Food, beverage, textiles	.07	−.02	−.07	.05	−.01	−.02	−.08	−.10	1.00										
10. Pulp, paper, publishing, print	.03	.01	−.02	−.02	−.04	−.04	−.06	.01	−.13	1.00									
11. Non-metallic minerals, metals	−.03	−.05	.02	.05	.00	−.06	−.05	−.02	−.23	−.19	1.00								
12. Machinery, transport equipment	−.10	.08	−.03	−.17	−.04	.10	.06	.04	−.27	−.21	−.37	1.00							
13. Furniture, recycling	.01	−.02	−.01	.00	−.01	−.01	−.03	−.03	−.07	−.06	−.10	−.12	1.00						
14. Canada	.10	−.04	.15	−.05	.10	.04	.11	.17	−.03	.06	−.02	−.01	.01	1.00					
15. France	.02	−.15	.05	−.11	.09	.03	.02	.00	.02	−.02	.02	−.03	.00	−.07	1.00				
16. Germany	−.16	.00	.06	.20	−.12	−.01	−.10	.06	−.04	.02	.05	−.03	.01	−.15	−.14	1.00			
17. Hungary	.10	.11	−.01	.10	.15	.14	−.06	.09	.10	−.04	−.03	−.02	.00	−.09	−.08	−.17	1.00		
18. Japan	−.09	.12	−.26	−.31	−.19	−.10	−.09	−.24	.01	−.05	−.06	.14	−.06	−.18	−.17	−.35	−.21	1.00	
19. Norway	−.03	−.12	.02	−.14	−.13	−.18	−.06	.07	.00	.09	−.01	−.01	.06	−.09	−.08	−.17	−.10	−.21	1.00
Mean	.03	4.17	2.69	.01	.02	5.27	.22	.15	.14	.10	.24	.30	.03	.07	.06	.22	.09	.31	.09
Standard deviation	.82	7.50	.50	.75	.62	110	.41	.35	.35	.30	.43	.46	.17	.26	.24	.41	.29	.46	.29
Min	−1.51	0	1	−1.28	−1.15	.69	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Max	1.41	104	3	1.97	1.55	10.26	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

[a] All correlations with absolute values >.04 are statistically significant at $p < 0.05$.

a viable estimation technique, variables that can be ordered should not necessarily be analyzed as ordinal since they can be ordered for one purpose but not ordered or ordered differently for another (Miller & Volker, 1985). In applying the multinomial logistic model, organizations that implemented no form of environmental audit were compared to those that utilized internal audits only, external audits only, and both types of audits. Prior to estimating our empirical models, we assessed whether or not the four audit categories were independent using Wald's Test for Independence of Categories (Long & Freese, 2001). The test showed that there were significant differences in the relationship between the independent variables and the different types of environmental audits ($p < 0.0001$), offering further confidence in our empirical approach.

Heteroskedasticity-robust standard errors were computed for each coefficient estimate. In interpreting the relative risk ratios associated with each independent variable, values greater than 1 indicate an increased risk of relying on a particular environmental audit compared to no audit, and values less than 1 indicate a decreased risk. Relative risk ratios equal to 1 indicate neither increased nor decreased risk of utilizing a type of environmental audit compared to no environmental audit. All empirical estimations were performed using Stata 9 statistical software.

Results

Table 3 describes the results of our empirical estimations. Model 1 is our baseline model and shows the results of a logistic regression comparing facilities that had any type of environmental audit to those with no audits. The likelihood ratio test statistic indicates that the null effect of the independent variables can be rejected at $p < 0.001$. The pseudo-R^2 statistic is an approximation of the squared contingency coefficient, and ranges between 0 and 1, approaching 1 as the quality of the fit improves (Aldrich & Nelson, 1984). The value of this statistic is generally less than would be expected in a linear model (Greene, 1997). Model 1 has a McFadden pseudo-R^2 of 22.37%. The estimated coefficient on each of the stakeholder variables (except for societal stakeholders) is positive and statistically significant (two of the estimated coefficients are statistically significant at $p < 0.01$ and two estimated stakeholder coefficients are statistically significant at $p < 0.05$). In all instances, coefficients related to our stakeholder variables are greater than 1, indicating that the "risk" of implementing any environmental audit increases as stakeholder influences increase. For instance, the coefficient associated with internal stakeholders is 1.64 ($p < 0.01$) suggesting that as perceived internal stakeholder influences increase, facilities are associated with a 64% greater probability of implementing any type of environmental audit. These findings suggest that greater perceived stakeholder influences from internal, regulatory, societal and supply chain stakeholders are associated with the use of environmental audits.

Comparisons across environmental audits

Our main estimation model (Model 2) compares facilities that utilized internal, external, and both types of environmental audits to those that did not use any type of environmental audits. The log likelihood statistic (−2150.97; $p < 0.0001$) indicates sufficient model fit. Model 2 has a McFadden pseudo-R^2 of 20.87%.

The overall patterns of Model 2 illuminate how managerial perceptions of greater stakeholder influence are associated with different types of environmental audits. Only one of our independent variables of interest (internal stakeholders) was statistically significant in the no audit-internal audit comparison. Compared to facilities that had no environmental audits, those that utilized internal audits were 31.0% more likely ($p < 0.01$) to be associated with greater perceived influences from internal stakeholders. Facilities that relied on external audits had a similar relationship with internal stakeholders in that they were 33.9% more likely to be associated with having greater influences from these stakeholders. However, facilities relying on external audits also had a 63.7% increased probability ($p < 0.05$) of having stronger perceived influences from public authorities.

Facilities that utilized both types of environmental audits were associated with a wider array of stakeholder pressures in that they were more likely to have greater perceived stakeholder influences from internal, regulatory and supply chain stakeholders. More specifically, managers in these organizations were 92% more likely ($p < 0.001$) to be associated with having greater perceived influences from internal stakeholders and had a 36.4% increased probability ($p < 0.05$) of having more perceived influences from public authorities than facilities that implemented no environmental audits.

Table 3
Multinomial logit results – perceived influences of stakeholders and the use of environmental audits[a]

Variable	Model 1[b]		Model 2[c]					
	Any audit		Internal audit only		External audit only		Both audits	
	Odds ratio	SE	Relative risk ratio	SE	Relative risk ratio	SE	Relative risk ratio	SE
Hypothesized variables								
Internal stakeholders	1.640***	0.120	1.310**	0.127	1.339*	0.164	1.920***	0.157
Inspection frequency	1.033*	0.016	1.021	0.017	1.010	0.028	1.039*	0.017
Public authority influences	1.343**	0.147	1.142	0.176	1.637**	0.325	1.364*	0.176
Societal stakeholders	1.066	0.088	1.180	0.126	1.126	0.162	1.002	0.091
Supply chain stakeholders	1.213*	0.116	1.075	0.131	1.037	0.183	1.328**	0.141
Firm characteristics								
Facility size (log)	1.794***	0.111	1.416***	0.110	1.197	0.141	2.207***	0.150
Firm listed on stock exchange	1.684**	0.297	1.297	0.283	1.958*	0.560	1.748**	0.321
Foreign head office	1.680**	0.307	1.194	0.269	1.518	0.602	2.114***	0.404
Industry characteristics								
Food, beverage, textiles ISIC 15-19	0.517***	0.099	0.545*	0.135	0.798	0.259	0.445***	0.096
Pulp, paper, publishing, print ISIC 20-22	0.639*	0.142	0.708	0.199	0.879	0.336	0.555*	0.134
Nonmetallic minerals, metals ISIC 27-33	0.783	0.133	0.906	0.198	0.749	0.235	0.738	0.135
Machinery, transport equip. ISIC 29-35	1.069	0.178	1.119	0.250	1.048	0.310	1.025	0.184
Furniture, recycling ISIC 36-37	1.172	0.434	1.284	0.549	1.395	0.921	1.019	0.420
Country								
Canada	0.152***	0.049	0.184***	0.064	0.510	0.344	0.120***	0.041
France	0.292***	0.104	0.180***	0.071	3.137	1.944	0.262***	0.098
Germany	0.126***	0.035	0.127***	0.037	0.278*	0.172	0.114***	0.033
Hungary	0.074***	0.023	0.064***	0.022	0.294	0.197	0.074***	0.024
Japan	0.168***	0.045	0.012***	0.005	2.580	1.392	0.221***	0.062
Norway	0.890	0.299	0.799	0.284	0.917	0.696	0.888	0.313
N	2249		2249					
Likelihood ratio χ^2	395.49		729.86					
Prob > χ^2	0.000		0.000					
Log likelihood	−1063.40		−2150.97					
Pseudo-R^2	0.2237		0.2087					

[a] The excluded sector dummy is the petroleum, chemical, and plastics industries (ISIC 23-26); excluded country dummy is the US.
[b] Model 1 is a logistic regression where environmental auditing is a binary variable equal to one if the facility engaged in any type of audit and zero otherwise.
[c] Model 2 is a multinomial logistic regression evaluating the three types of environmental audits against the baseline of "no audit". Sample size and model fit statistics for Model 2 pertain to all three comparison categories.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Facilities that utilized both types of environmental audits also had a marginally greater probability (3.9%, $p < 0.05$) of being associated with larger numbers of inspections and a 32.8% greater likelihood ($p < 0.01$) of being associated with stronger perceived supply chain influences than facilities that implemented no environmental audits. Like facilities that used internal audits only and external audits only, facilities that relied on both types of environmental audits were not associated with perceived societal stakeholder pressures any more than facilities that did not use environmental audits.

Similar patterns were found when considering the results of our control variables. Our empirical analysis shows that, while all the estimated coefficients related to facility size, stock exchange listing, and foreign head office in Models 1 were greater than 1 and significant, they were not significant across all types of environmental audits. For example, facility size was positive and statistically significant for internal audit use (1.416, $p < 0.001$) and the implementation of both audits (2.207, $p < 0.001$) but not external audit use. On the other hand, stock exchange listing was positively associated with external audit use (1.958, $p < 0.05$) and the reliance of both audits (1.748, $p < 0.01$) but not with internal audit use. Finally, foreign head office was positively associated with the implementation of both audits (2.114, $p < 0.001$) but not associated with either internal or external audit use only.

Similarly, while most of the estimated coefficients for the food, beverage and textile sectors (ISIC 15–19) as well as the pulp, paper, publishing and print sectors (ISIC 20–22) in Models 1 were less than 1 and significant, they were not significant across all types of environmental audits described in Model 2. The results presented in Model 2 indicate the petroleum, chemicals, and plastics industries tend to use both audits rather than using external audits only (compared to the food, beverage, and textile industries (ISIC 15–19) and the pulp, paper, publishing and print industries (ISIC 20–22)). The more widespread use of environmental audits in the petroleum, chemicals, and plastics industries is most likely due to normative influences from industry associations. For instance, the Canadian and the US chemical industry associations mandate their member companies to participate in voluntary programs that require internal environmental audits. More recently, these programs have required external audits as well. Companies operating within the chemical sector therefore would be anticipated to use internal auditing and both auditing procedures to a greater degree.

In considering the remaining controls, again we see greater variation in Model 2. That is, while estimated coefficients on the country dummies in Models 1 were less than 1 and significant, they were not significant across all types of audits described in Model 2. The estimated coefficients for country dummies in Model 2 were less than one and statistically significant for internal audits only and both audits indicating that facilities located in Canada, France, Germany, Hungary and Japan, *ceteris paribus*, were less likely ($p < 0.001$) to be associated with using internal audits only and both types of environmental audits than those located in the US. However, with the exception of Germany ($p < 0.05$), which was less likely to employ external environmental audits than US facilities, facilities operating in other countries were no more likely to be associated with using external audits than the US.

In sum, by comparing the results of Model 2 to the results in Model 1, our findings indicate that aggregating the three types of environmental audits into a single binary category of "any audit" loses significant information about how perceived stakeholder influences and other factors are associated with each type of environmental audit scheme, and it would be easy to believe that stakeholder influences affect each type of environmental audits similarly. These findings offer evidence for a more nuanced approach when examining organizations' environmental audit usage.

Comparisons across stakeholder influences

In considering how our results inform our research hypotheses, Model 2 offers evidence for the notion that the type of environmental audit used by organizations is related to perceived influence from internal stakeholders (Hypothesis 1). More specifically, perceived internal stakeholder influences were associated with a 31% increased likelihood ($p < 0.01$) that facilities used internal audits only, a 33.9% greater probability ($p < 0.05$) that facilities relied on external audits only, and a 92% increased likelihood ($p < 0.01$) that facilities used both audits.

In evaluating the relationship between audit type and influences from regulatory stakeholders (Hypothesis 2), facilities with more inspections were no more likely to be associated with internal audits

only or external audits only as compared to facilities utilizing no environmental audits. While they had a 3.9% greater probability ($p < 0.05$) of being associated with using both types of audits, this elevated probability has less practical relevance because of its small size. However, perceived facility influences by public authorities had a stronger (and more varied) relationship with environmental audit use. These influences were associated with no increased likelihood that facilities would utilize internal audits, a 63.7% greater probability ($p < 0.05$) that they would utilize external audits only, and a 36.4% increased likelihood ($p < 0.05$) that they would utilize both audits. These findings offer some support Hypothesis 2. Perceived societal stakeholder influences, however, had no statistically significant relationship with facilities that utilized environmental audits of any kind, and fail to support Hypothesis 3, which states that the type of environmental audit used by organizations is positively associated with the perceived influence of societal stakeholders.

Finally, while there was no statistically significant relationship between supply chain stakeholders and facilities' use of either internal audits only and external audits only, they were associated with facilities utilizing both types of environmental audits. These facilities were 32.8% more likely ($p < 0.01$) to utilize both types of audits over no audit, offering some support for Hypothesis 4, which states that the type of environmental audit used by organizations is positively associated with the perceived influence of supply chain stakeholders.

In sum, we found support for Hypotheses 1, 2, and 4 – that the type of environmental audit used by organizations was positively associated with perceived influence from internal, regulatory and supply chain stakeholders. However, facilities' environmental audit use was not related to the perceived influence from societal stakeholders (Hypothesis 3). Further, aggregation of environmental audits into a single construct loses important distinctions regarding the association between stakeholder influences and environmental audit use.

Discussion

This research builds on prior studies evaluating organizations' environmental accountability. It offers three contributions to theory and practice. First, while previous scholarship recognizes environmental accountability as an important research area, studies about environmental auditing have been lacking (Parker, 2005). This study offers evidence that perceived influences from internal, regulatory, and supply chain stakeholders are positively related to the use of environmental audits. These findings are particularly interesting because most organizations utilize environmental audits voluntarily and often in the absence of coercive external influences. Regardless, perceived influences from internal, regulatory and supply chain stakeholders are related to their utilization and offer essential insights about the use of these practices.

However, our results also show that perceived influence from societal stakeholders have no association with an organization's use of environmental audits. These findings most likely are due to the fact that influences from societal stakeholders can be addressed in a variety of ways that may or may not include environmental audits. For instance, an organization can adopt a well-publicized pollution prevention program or report its environmental performance publicly using corporate environmental reports instead of having some form of environmental audit. By contrast, influences from regulatory stakeholders are more specific to environmental audit usage due to possible incentives to organizations that rely on these environmental management tools (Stafford, 2005). Similarly, perceived influences from supply chain stakeholders to use environmental audits may be more acute, especially as more corporate customers require their suppliers to certify their environmental procedures and compliance with environmental regulations (Darnall et al., 2001). By using environmental audits organizations may be responding to perceived concerns expressed by regulatory and supply chain stakeholders. However, societal stakeholders who often live near a company may have less interest in environmental audits since they generally have access to direct information to indicating whether or not there is an environmental problem. In instances where societal stakeholders express their concern, organizations may respond by relying on other types of environmental management practices.

The second contribution of this study is that it illustrates the importance of using a more systematic approach when examining organizations' environmental audits. The landscape of environmental audits is diverse in that organizations can implement internal, external or both- environmental audit types. The stakeholder influences associated with the use of these audits differs. For example,

organizations that adopt internal audits are associated more with perceived influences from internal stakeholders, but not regulatory or supply chain stakeholders. However, since the results of these audits cannot be verified by external parties they may lack legitimacy with some external constituencies. By contrast, organizations that utilize external audits are more likely to be associated with greater perceived influences from internal and regulatory stakeholders. These types of audits offer external credibility that facility managers may believe is valued by regulators. Finally, organizations that use both types of audits are associated with greater perceived influences from internal, regulatory, and supply chain stakeholders. The relevance of supply chain stakeholders is particularly interesting since these stakeholders are increasingly exerting influences on organizations to improve their environmental performance, adopt proactive environmental management practices (Zhu et al., 2005; Zhu & Sarkis, 2004), provide certification of their compliance with environmental regulations, and agree to onsite visits (Darnall et al., 2001). Under these circumstances, organizations may benefit more by utilizing both types of environmental audits to ensure maximum credibility and organizational benefit. Combined, our results suggest that variations in environmental audits are related to different degrees of stakeholder influence.

At the same time, our findings emphasize the importance of perceived influences from internal stakeholders and their relationship with organizations' use of all forms of environmental audits. In the absence of these influences, organizations appear less likely to utilize environmental audits of any sort. While additional analysis is required to determine a causal link, these results suggest that enterprises wishing to initiate evaluations of their organization's environmental management practices may first need to direct their attention towards gaining the support from internal stakeholders. By contrast, organizations' use of external environmental audits or both environmental audits is associated with greater degrees of influence from external stakeholders. These findings offer support for the idea that organizations that implement internal audits may be seeking more internal legitimacy, whereas organizations that utilize external audits and/or both types of environmental audits may be seeking more external credibility. Because of their more expansive view, external audits may offer greater credibility with external stakeholders. Similarly, relying on both types of environmental audits may enhance organizational benefits and improve external credibility to a greater degree than any other type of environmental audit.

Differences also existed among the use of environmental audits as they related to our control variables. In particular, organizations' use of one type of environmental audit over another were associated with firm characteristics including organizational size, whether the head office was listed on the stock exchange, and whether the head office was located in a foreign country, in addition to the organization's country of operation. Moreover, industrial sector is particularly salient because we selected the petroleum, chemical and plastics industry as our omitted sector and the US and Canadian chemical industry associations mandate their member companies to participate in voluntary programs that require internal and external environmental audits.

Collectively, these patterns illustrate important distinctions among different types of audits and how considering them similarly may lead to inappropriate conclusions. By appreciating the nuances among different types of environmental audits, we may gain a better understanding about an organization's subsequent changes in environmental performance and stakeholder relations. Future research might consider whether finer distinctions can be made within each of these environmental audit categories. Additional research also should consider whether the increased focus on accountability and emphasis on management systems that are supported by environmental audits might actually lead to a so-called "dead end" in accountability. Such a proposition is raised by Power (1997), and if valid, suggests that environmental audits may lead to little improvement to the natural environment because of their focus on documentation rather than on enhanced outcomes. The countervailing viewpoint suggests that companies manage what they measure, and that the increased emphasis on measurement brought forward by environmental audits may lead to improved environmental performance. Additional research is needed to explore these important issues further.

The third contribution of this research is that it takes an important step in advancing our understanding of environmental auditing in the global setting. By examining these relationships for facilities in seven OECD countries, results of this study can be generalized to a much broader international

setting thereby contributing to existing scholarship. This research also points to the importance of additional scholarship related to whether the use of environmental audits is influenced by national cultures. For example, our empirical analysis indicates that facilities located in Canada, France, Germany, Hungary, and Japan, *ceteris paribus*, were less likely to use internal environmental audits and both audits than those located in the US. However, with the exception of Germany, facilities in other countries were no more or no less likely to utilize external audits than facilities operating in the US. While we controlled for these country differences in our analysis, we did not model the sources of these differences *per se*. Because the nature of the OECD data limits us from assessing temporal, sub-national and culture-based issues; however, these issues are important and should be explored in future research.

Finally, since the OECD data were for a panel of companies at a single point in time, it is difficult to assess the predictive link between stakeholder influences and the use of environmental audits. Instead, our findings show strong associations among our variables of interest. Future research would benefit from using data that were collected longitudinally. Time series panel data would allow for comparisons among facility responses over multiple periods and therefore account for the temporal ordering of specific events. Such information may offer more rigorous evidence for the relationships identified in this study.

Conclusion

This study evaluates whether perceived stakeholder influences are associated with organizations' use of environmental audits across multiple international and organizational settings. It shows that the use of environmental audits is related to both internal and external stakeholder influences and such relationships are more complex than previously recognized.

These findings have important empirical implications for subsequent studies evaluating how environmental audits are related to organizations' environmental and business performance. Our results suggest that facilities may be self-selecting into one type of environmental audit over another, which needs to be accounted for when considering how environmental audits relate to environmental and business performance. After controlling for these issues, we may find that different types of environmental audits create greater opportunities for improved operational efficiency and effectiveness which could lead to superior business performance. Understanding these relationships would contribute significantly to our knowledge of environmental audits. Such understanding also would offer greater insight into how distinctions among environmental audits contribute to environmental and social accountability scholarship and management practice.

References

Aldrich, J., & Nelson, F. (1984). *Linear probability, logit and probit models*. Beverly Hills, CA: Sage.

Altman, B. W. (1999). Transformed corporate community relations: A management tool for achieving corporate citizenship. *Business and Society Review, 102*, 43–51.

Álvarez, G. M. J., Burgos, J. J., & Céspedes, L. J. J. (2001). An analysis of environmental management, organizational context and performance of Spanish hotels. *Omega, 29*, 457–471.

Bansal, P., & Hunter, T. (2003). Strategic explanations for the early adoption of ISO 14001. *Journal of Business Ethics*, 289–299.

Berman, S. L., Wicks, A. C., Kotha, S., & Jones, T. M. (1999). Does stakeholder orientation matter? The relationship between stakeholder management models and firm financial performance. *The Academy of Management Journal, 42*, 488–506.

Bowen, F. E. (2002). Does size matter? Organisational slack and visibility as alternative explanations for environmental responsiveness. *Business and Society, 41*, 118–124.

Christmann, P. (2000). Effects of 'best practices' of environmental management on cost competitiveness: The role of complementary assets. *Academy of Management Journal, 43*, 663–880.

Corbett, C., Montes-Sancho, M., & Kirsch, D. (2005). The financial impact of ISO 9000 certification in the United States: An empirical analysis. *Management Science, 51*, 1046–1059.

Cordano, M., & Frieze, I. H. (2000). Pollution reduction preferences of US environmental managers: Applying Ajzen's theory of planned behavior. *Academy of Management Journal, 43*, 627–641.

Cox, A. (1999). Power, value and supply chain management. *Supply Chain Management: An International Journal, 4*, 167–175.

Daily, B. F., & Huang, S-C. (2001). Achieving sustainability through attention to human resource factors in environmental management. *International Journal of Operations and Production Management, 21*, 1539–1552.

Darnall, N., & Edwards, D. Jr., (2006). Predicting the cost of environmental management system adoption: The role of capabilities, resources and ownership structure. *Strategic Management Journal, 27*, 301–320.

Darnall, N., Gallagher, D. R., & Andrews, R. N. L. (2001). ISO 14001: Greening management systems. In J. Sarkis, *Greener manufacturing and operations: From design to delivery and back* (pp. 178–190). Sheffield, UK: Greenleaf Publishing.

Darnall, N., Henriques, I., & Sadorsky, P. (2005). An international comparison of the factors affecting environmental strategy and performance. In M. Rowan (Ed.), *Best Paper Proceedings: Sixty-Third Meeting of the Academy of Management* (pp. B1–B6). Washington, DC: Academy of Management.

Darnall, N., Henriques, I., & Sadorsky, P. (2008). Do environmental management systems improve business performance in an international setting? *Journal of International Management, 14*.

Delmas, M., & Keller, A. (2005). Free riding in voluntary environmental programs: The case of the US EPA WasteWise program. *Policy Sciences, 38*, 91–106.

de Moor, P., & de Beelde, I. (2005). Environmental auditing and the role of the accountancy profession: A literature review. *Environmental Management, 36*, 205–218.

Dittenhofer, M. (1995). Environmental accounting and auditing. *Managerial Auditing Journal, 10*, 40–51.

Donaldson, T., & Preston, L. (1995). The stakeholder theory of the corporation: Concepts, evidence, and implications. *Academy of Management Review, 21*, 65–91.

Egri, C. P., & Herman, S. (2000). Leadership in the North American environmental sector: Values, leadership styles, and contexts of environmental leaders and their organizations. *Academy of Management Journal, 43*, 571–604.

Emery, A. R. T., & Watson, M. (2003). Eco-auditing and environmental liability: An international perspective. *Managerial Auditing Journal, 18*(8), 631–636.

Etzion, D. (2007). Research on organizations and the natural environment, 1992–present: A review. *Journal of Management, 33*, 637–664.

Fineman, S., & Clarke, K. (1996). Green stakeholders: Industry interpretations and response. *Journal of Management Studies, 33*, 715–730.

Freeman, R. E. (1984). *Management: A stakeholder approach*. Boston, MA: Pitman.

Gilbert, D. (1999). Effective auditing is key to selecting an environmental services partner. *Pollution Engineering, 31*, 60–62.

Gould, K., Schnaiberg, A., & Weinberg, A. (1996). *Local environmental struggle: Citizen activism in the treadmill of production*. Cambridge, MA: Cambridge University Press.

Gray, R., & Bebbington, J. (2001). *Accounting for the environment*. Thousand Oaks, CA: Sage Publications.

Greene, W. H. (1997). *Econometric analysis* (3rd ed.). New York: Prentice Hall.

Green, K., Morton, B., & New, S. (2000). Greening organizations: Purchasing, consumption, and innovation. *Organization and Environment, 13*, 206–225.

Gunningham, N. A., Robert, A. K., & Thornton, D. (2004). Social license and environment protection: Why businesses go beyond compliance. *Law and Social Inquiry, 29*, 307–341.

Handfield, R., Walton, S., Sroufe, R., & Melnyk, S. (2002). Applying environmental criteria to supplier assessment: A study in the application of the analytical hierarchy process. *European Journal of Operational Research, 141*, 70–87.

Hanna, M. D., Newman, W. R., & Johnson, P. (2000). Linking operational and environmental improvement through employee involvement. *International Journal of Operations and Production Management, 20*, 148–165.

Hardin, J., & Hilbe, J. (2001). *Generalized linear models and extensions*. College Station, TX: Stata Press.

Henriques, I., & Sadorsky, P. (1996). The determinants of an environmentally responsive firm: An empirical approach. *Journal of Environmental Economics and Management, 30*, 381–395.

Henriques, I., & Sadorsky, P. (1999). The relationship between environmental commitment and managerial perceptions of stakeholder importance. *The Academy of Management Journal, 42*, 89–99.

Hillary, R. (1998). Environmental auditing: Concepts, methods and developments. *International Journal of Auditing, 2*, 71–85.

Hoffman, A. (2000). *Competitive environmental strategy: A guide to the changing business landscape*. Washington, DC: Island Press.

Holder, M., & O'Brien, T. (2007). Protest and survive, the UK construction safety campaign: A case study of workers' and victims' family action and legal and regulatory inaction on construction health and safety. *International Journal of Occupational and Environmental Health, 13*, 27–31.

Humphreys, P. K., Wong, Y. K., & Chan, F. T. S. (2003). Integrating environmental criteria into the supplier selection process. *Journal of Materials Processing Technology, 138*, 349–356.

International Chamber of Commerce (ICC) (1991). *An ICC guide to effective environmental auditing*. Paris: ICC Publishing.

Johnstone, N. (Ed.). (2007). *Environmental policy and corporate behaviour*. Northampton, MA: Edward Elgar Publishing (In association with Organisation for Economic Co-Operation and Development (OECD)).

Johnstone, N., Serravalle, C., Scapecchi, P., & Labonne, J. (2007). Project background, overview of the data and summary results. In N. Johnstone (Ed.), *Environmental policy and corporate behaviour* (pp. 1–33). Northampton, MA: Edward Elgar Publishing, In association with Organisation for Economic Co-Operation and Development (OECD).

Karapetrovic, S., & Willborn, W. (2001). Audit system: Concepts and practices. *Total Quality Management, 12*, 13–28.

Kennedy, P. (1997). *A guide to econometrics* (3rd ed.). Cambridge, MA: The MIT Press.

Khanna, M., & Anton, W. R. Q. (2002). Corporate environmental management: Regulatory and market-based incentives. *Land Economics, 78*, 539–558.

Kollman, K., & Prakash, A. (2001). Green by choice? Cross-national variations in firms' responses to EMS-based environmental regimes. *World Politics, 53*, 399–430.

Konrad, A. M., & Linnehan, F. (1995). Formalized HRM structures: Coordinating equal employment opportunity or concealing organizational practices?. *Academy of Management Journal 38*, 787–820.

Lamming, R. C., & Hampson, J. P. (1996). The environment as a supply chain issue. *British Journal of Management, 7*, S45–S62.

Long, J. S., & Freese, J. (2001). *Regression models for categorical dependent variables using stata*. College Station, TX: Stata Press.

Maltby, J. (1995). Environmental audit: Theory and practices. *Managerial Auditing Journal, 10*, 15–26.

Melnyk, S. A., Sroufe, R. P., & Calantone, R. L. (2003). Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management, 21*, 329–351.

Miller, P. W., & Volker, P. A. (1985). On the determination of occupational attainment and mobility. *The Journal of Human Resources, 20*, 197–213.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of Management Review, 22*, 853–886.

Noci, G. (1997). Designing 'green' vendor rating systems for the assessment of a supplier's environmental performance. *European Journal of Purchasing and Supply Management, 3*, 103–114.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

O'Dwyer, B. (2001). The legitimacy of accountants' participation in social and ethical accounting, auditing and reporting. *Business Ethics, A European Review, 10*, 27–39.

Parker, L. (2005). Social and environmental accountability research: A view from the commentary box. *Accounting, Auditing and Accountability Journal, 18*, 842–860.

Peglau, R. (2005). *ISO 14001 certification of the world*. Berlin: Federal Environmental Agency.

Pfaff, A. S. P., & Sanchirico, C. W. (2000). Environmental self-auditing: Setting the proper incentives for discovery and correction of environmental harm. *Journal of Law, Economics and Organization, 16*, 189–208.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research. *Journal of Management, 12*, 531–544.

Portney, P. R., & Stavins, R. N. (Eds.). (2000). *Public policies for environmental protection*. In *Resources for the Future*. Washington, DC: Resources for the Future.

Power, M. (1997). *The audit society: Rituals of verification*. Oxford: Oxford University Press.

Ramus, C. A., & Steger, U. (2000). The roles of supervisory support behaviors and environmental policy in employee 'ecoinitiatives' at leading-edge European companies. *Academy of Management Journal, 43*, 605–626.

Sharma, S. (2000). Managerial interpretations and organizational context as predictors of corporate choice of environmental strategy. *Academy of Management Journal, 43*, 681–697.

Sharma, S., & Henriques, I. (2005). Stakeholder influences on sustainability practices in the Canadian forest products industry. *Strategic Management Journal, 26*, 159–180.

Solomon, A. (2000). Could corporate environmental reporting shadow financial reporting?. *Accounting Forum 24*, 30–55.

Stafford, S. L. (2005). Does self-policing help the environment? EPA's audit policy and hazardous waste compliance. *Vermont Journal of Environmental Law*, *6*. <http://www.vjel.org/articles/articles/Stafford11FIN.htm>.

Stanwick, P., & Stanwick, D. (2001). Cut your risks with environmental auditing. *The Journal of Corporate Accounting and Finance, 12*, 11–14.

Suchman, M. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review, 20*, 571–610.

Tallman, S., & Li, J. (1996). Effect of international diversity and product diversity in the performance of multinational firms. *Academy of Management Journal, 39*, 179–196.

Tilley, F. (1999). Small-firm environmental strategy: The UK experience. *Greener Management International, 25*, 1–14.

Tilt, C. A. (2001). The content and disclosure of Australian corporate environmental policies. *Accounting, Auditing and Accountability Journal, 14*, 190–212.

US Environmental Protection Agency (USEPA). (1986). *Environmental auditing policy statement*. 51 Federal Register 25003, 25006. Washington, DC: USEPA.

Waddock, S. A., & Graves, S. B. (1997). Finding the link between stakeholder relations and quality of management. *Journal of Investing, 6*, 20–24.

Watson, M., & Emery, A. R. T. (2003). The emerging UK law on the environment and the environmental auditing response. *Managerial Auditing Journal, 18*, 666–672.

Wilmshurst, T. D., & Frost, G. R. (2000). Corporate environmental reporting: A test of legitimacy theory. *Accounting, Auditing and Accountability Journal, 13*, 10–26.

Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management, 22*, 265–289.

Zhu, Q., Sarkis, J., & Geng, Y. (2005). Green supply chain management in China: Drivers, practices and performance. *International Journal of Operations and Production Management, 25*, 449–468.

Zutshi, A., & Sohal, A. S. (2004). Adoption and maintenance of environmental management systems: Critical success factors. *Management of Environmental Quality: An International Journal, 15*, 399–419.