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Motivations for Proactive Environmental Management and Innovative Pollution Control

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The corporate approach to environmental protection has been evolving from a regulation-driven reactive mode to a more proactive approach involving an internally motivated organizational change in corporate culture and management practices towards environmental self-regulation. A growing number of firms are taking a strategic view towards environmental management and adopting environmental management practices (EMPs) that establish formal procedures and organizational routines that can help to achieve environmental goals. These practices represent internal efforts at establishing environmental policies and goals, setting environmental standards for suppliers, training employees, undertaking environmental auditing and environmental cost accounting and publishing environmental information in reports made available to the public. Many firms are also taking a holistic view of pollution control and treating it as synonymous with minimizing waste streams associated with the design, manufacture, use and disposal of products and materials. Such firms are modifying processes and products, substituting raw materials and recycling waste products to reduce end-of-pipe disposal. We refer to such activities as pollution prevention or P2 activities.

Both the adoption of EMPs and P2 activities are forms of environmental management and both represent effort rather than actual environmental performance outcomes. However, P2 activities may require a greater degree of integration of environmental concerns in the operational decisions of the firm and efforts that may mitigate a firm's impact on the environment more directly.

Adoption of EMPs and P2 activities is voluntary since there are no regulations mandating their adoption. Firms have considerable flexibility in the EMPs and/or P2 activities they adopt and the degree to which each is implemented within the organization. The motivations for firms

to adopt EMPs might be quite different from their motivations to undertake P2 activities. Many firms face external demands for adopting EMPs from trade associations, customers and agencies. They face two separate decisions: whether to adopt EMPs and how intensively to invest in improving environmental performance. Depending on their motivations for adopting EMPs, the decision to adopt them may or may not be linked to a decision to invest in environmental performance improvement. Some firms may see environmental practices as being marginal to their strategic and competitive objectives and adopt EMPs simply to provide an appearance of conformity, to demonstrate commitment to the environment and attain legitimacy with stakeholders treat EMPs. Such firms may adopt EMPs as a symbolic tool to manipulate their external image but not as being important for internal change in strategies to improve environmental performance (Nash and Ehrenfield, 2001; Delmas and Toffel, 2005). Other firms may have stronger commitments to the environment and may be more likely to make investments in pollution prevention activities.

What motivates firms to voluntarily adopt EMPs and P2 activities? Are the same types of firms likely to adopt both to a greater extent than others? What is the role of external stakeholders vs. internal factors and managerial attitudes in determining the extent to which firms adopt EMPs and P2 activities? This paper seeks to understand the extent to which there are differential incentives that motivate the adoption of EMPs and P2 practices. In particular, we seek to analyze the role of internal drivers such as managerial attitudes towards the environment and external factors in shaping incentives to adopt EMPs and P2 practices. Our analysis is based on survey-based information on a variety of EMPs and P2 activities adopted by 689 facilities located in Oregon in 2005 and operating in six different sectors. We also examine the relative importance of perceived (subjective) incentives for environmental management and those of objective incentives captured by observable facility characteristics such as ownership, size, and

type of product produced. We use information on reported intensity of adoption of EMPs and P2 activities to construct an index for each that measures the extent to which EMPs and P2 is being implemented within the facility. We implement this research using a combination of confirmatory factor analysis (CFA) and a structural equation model (SEM) We focus this analysis on facilities located in Oregon where public and private initiatives to foster improved business environmental management have proliferated since the 1990s.¹ Of the facilities responding more than half had implemented at least one environmental management practice. The respondents include small facilities and those under private ownership. The empirical analysis uses a two-stage process in which the measurement models are first developed and confirmed using confirmatory factor analysis to obtain latent constructs of EMPs and P2 activities and of perceived pressures from various stakeholders. In the second stage the measurement model and the SEM are estimated jointly to examine the determinants of EMPs and P2 activities using path analysis. Our reliance on a SEM instead of standard regression analysis recognizes that perceived pressures are not a predetermined exogenous variable and that the measure of pressure does not have a cardinal interpretation that is comparable across firms.

Several studies have empirically examined the factors that motivate some firms to voluntarily adopt one or more environmental management practices or to seek ISO 14001 certification using observable characteristics of firms to serve as objective measures of external

¹ The Oregon Legislature created a Green Permits Program (<http://www.deq.state.or.us/programs/greenpermits>) in 1999 to achieve environmental results that are significantly better than those required by law. In January 2007, business and government leaders endorsed sustainable business as a core element of the state's economic development strategy (<http://www.oregonbusinessplan.org/>). The City of Portland, Oregon has a 'green buildings' program to promote cost-effective solutions that lessen environmental impacts of commercial buildings (<http://www.green-rated.org/>). Private sector (for-profit and non-profit) examples include the emergence of business sustainability consulting firms (e.g., <http://www.brightworks.net/>), the Forest Stewardship Council's certification program (<http://fscus.org/>), the Food Alliance certification system (<http://www.thefoodalliance.org>), and the Oregon Natural Step chapter (<http://www.ortns.org/>).

regulatory and market pressures². These studies show the importance of regulatory pressures (Anton et al., 2004; Potoski and Prakash, 2005; Arimura et al., 2007) in motivating the adoption of EMPs or the ISO 14001 standard. Firms that were larger in size (Dasgupta et al., 2000) and those producing final goods, particularly if they were small polluters, were also more likely to adopt more EMPs (Anton et al., 2004). A few studies, such as, Henriques and Sadosky (1996), Delmas and Toffel (2004) and Nakamura et al (2001) include both observable proxies and constructed measures of perceived pressures to explain adoption of EMPs and ISO 14001 standard, respectively. Henriques and Sadosky (1996) find that customer pressure, shareholder pressure, regulatory pressure and community pressures and lower sales-to-asset ratio motivates firms to adopt an environmental plan.³ Delmas and Toffel (2004) construct three broad groups of pressures (commercial, non-market and internal)⁴ faced by firms. They find that perceived pressures, particularly commercial pressures and internal pressures, have a stronger role in explaining adoption of EMPs than objective pressures. Similarly Nakamura et al (2001) find that environmental values, beliefs and attitudes of managers are important in addition to observable proxies for costs and benefits of ISO certification. Banerjee et al. (2003) find that regulatory pressures and public concern were strong determinants of top management commitment to the environment which together with environmental orientation of the firm are significant determinants of its environmental corporate strategy.

² This includes studies examining motivations for adopting a practice, such as total quality environmental management (Harrington et al., forthcoming), an environmental plan (Henriques and Sadosky, 1996), a firm-structured system of environmental management practices (Khanna and Anton, 2002; Anton et al., 2004; Dasgupta et al., 2000; Delmas and Toffel, 2004). Studies examining the motivations for seeking ISO 14001 certification include Potoski and Prakash (2005), Nakamura and Takahashi (2001) and Arimura et al. (2007).

³ However, this study includes an indicator variable, provided by survey respondents, directly as a latent variable instead of determining the latter using factor analysis based on several indicators of the same latent pressure. This implies that they are assuming the indicator variables do not include any measurement errors.

⁴ Commercial pressures include those from competitors, customers, suppliers, trade associations and SRI funds. Non-market pressures include those from media, environmental organizations, local community and regulators. Internal pressures include those from corporate management, other facilities in the firm, employees and shareholders).

Only a few studies examine the motivations for adopting environmentally responsible manufacturing practices (Curkovic et al., 2000) and pollution prevention activities (Cordano and Frieze, 2000). The former study shows the influence of total quality management systems while the latter study finds that managerial attitudes and other social psychological factors strongly influence the preferences of managers for source reduction activities.

This paper makes several contributions to this literature. Like the latter set of studies it includes both objective and constructed measures of perceived pressures and measures of managers and parent company attitudes towards the environment. The objective measures assume that all firms with a particular characteristic face the same pressures (for e.g. that all facilities that sell final products face the same intensity of consumer pressure) and that the influence of this measure (e.g. being a final producer) on adoption is the same for all facilities. This does not capture the full extent of the heterogeneity among these facilities in the extent to which stakeholder pressures influence environmental management in their facilities because different corporate managers may interpret similar demands from these stakeholders differently. Moreover, the intensity of the demands perceived to be placed on the firm is not necessarily independently determined but developed interactively and open to negotiation between firm managers and external stakeholders; it is therefore firm-specific (Gunningham et al., 2003). We also use perceived measures of environmental behavior instead of objective measures since the former may provide more realistic assessments, based on manager perceptions, of the extent to which their facility is implementing EMPs and P2 activities for pollution control.

This framework is used to examine the motivations for the adoption of EMPs and P2 activities using a diverse set of indicators of adoption. It also considers pressures from a highly disaggregated set of stakeholders, thereby providing insights on specific pressures that are important. Moreover, it examines the effects of managerial attitudes while controlling for the

effects of these other stakeholder pressures. Identification of these relationships can contribute to understanding of the factors that are likely to lead firms to adopt both EMPs and P2 activities and to the design of more effective policies to promote beyond compliance behavior.

Conceptual Framework

There are several theories that have been put forward to explain why firms voluntarily undertake actions to improve their environmental performance beyond compliance. Viewing the firm as a rational actor, environmental economists have suggested that firms may see it as being in their self interest to voluntarily, because it could enable firms to influence markets for their products, obtain higher prices for their products, and lower their costs of labor and capital and the costs of environmental regulations (Khanna, 2001).⁵ This literature suggests that the potential to preempt the threat of mandatory regulations, shape future regulations, gain competitive advantage and market share (by appealing to consumers and lowering costs and improving internal efficiency), build a corporate reputation with communities and environmental interest groups and lower the costs of capital by reducing risks of liabilities for lenders and stockholders can provide economic incentives for firms to voluntarily invest in environmental measures. Differences in adoption of EMPs can then be explained by differences in the extent to which individual firms expect to achieve these benefits and in the costs of adoption they have to incur, assuming they have perfect information on both. The underlying premise of economic models explaining corporate environmental behavior is that firms are profit maximizers; thus preferences of the management for the environment and their moral beliefs and desire to be environmentally responsible are typically not incorporated in these models.

⁵ This is in contrast to the more traditional view in environmental economics of a firm as being a competitive price taker in the output and input markets and maximizing profits while reacting passively to regulatory constraints. Environmental actions in this framework impose costs and divert productive resources, consequently firms have no incentive to go beyond compliance with the regulatory constraints they face (see Cropper and Oates, 1992).

The “new institutionalistic” theories of organizational behavior broaden the view of the firm from a rational actor influenced by objective economic costs and benefits to being influenced by complex motivations stemming from normative beliefs, desire for conformity, political and cultural values. Institutional theorists go beyond the debate between “rational” models on the one hand and “normative” or “moral” models on the other to describe how rational, normative and cognitive decision processes can coexist (Suchman and Edelman, 1996). They view organizations as complex social actors whose behavior is shaped as much by their cultural environments as by rational calculations. By emphasizing the power of cultural systems to shape managerial behaviors these theorists recognize that organizations may respond to social and moral norms and legitimacy, even when the threat of legal sanctions is remote. This literature, however, has been critiqued for placing too much emphasis on the homogeneity of organizations and not explaining the diversity in observed organizational response to similar institutional pressures (see Hoffman, 2001).

Heterogeneity in organizational response to institutional pressures could be due to internal forces within the firm that cause inertia or cultural barriers to change (Hoffman, 2001) and managerial attitudes towards environmental responsibility (Gunningham et al., 2003)⁶. Several case studies of firms suggest that managers’ attitudes and commitment play an important role in filtering, interpreting and prioritizing the signals they receive from the external environment and in facilitating or impeding proactive environmental management (Nash, 2000). Cordano and Frieze (2000) find that managerial knowledge and attitudes towards environment were key determinants of their preference for P2 activities.

⁶In an indepth study of paper and pulp mills in the US, Gunningham et al. (2003) find that two mills subject to the same external pressures responded differently due to differences in managerial attitudes or environmental management style⁶ and this strongly influenced their environmental performance.

We develop an empirical framework that recognizes that complex interactions between the institutional environment, organizational dynamics and managerial attitudes shape organizational behavior. Traditionally, firms were expected to undertake environmental protection only to the extent that they were coerced to do so by regulatory constraints or by citizen actions, such as private lawsuits or boycotts. Increasing concerns for environmental quality among consumers, investors, lenders, competitor firms and communities have created a more diverse cultural setting which induces firms to view environmental protection as being central to the core objectives of the firm and not as being external to the market environment (Hoffman, 2001). We seek to measure the effects of this expanding field of environmental pressures on two constructed measures of environmental behavior of a facility, extent of *Implementation of EMPs* and *P2 Practices*. The former is measured using information provided by survey respondents about the extent to which environmental goals, policies, standards and a variety of other practices are implemented in the facility. These include environmental audits, environmental cost accounting, employee training in environmental management and compensation for contributions to environmental performance. The latter is measured by extent to which respondents perceived that pollution prevention practices, raw material substitution and recycling were practiced at their facility. Specific survey questions included to elicit this information are reported in Table 1.

We postulate that each of these dependent variables is influenced by a combination of internal and external variables as in Roome (1992) and Gunningham et al. (2003). The external variables include demands of external stakeholders of the firm, such as, regulators, consumers, interest groups and investors as well as observed characteristics of facilities that proxy for the types of pressures they might face. The internal variables include observed measures of the technical capacity of the firm, organizational resources to undertake innovative management as

well as constructed measures of the attitudes of the managers of the facility and of the parent company towards the environment and perceived barriers to implementation. Thus the external and internal variables considered here could have a direct influence on *P2 Practices* as well as induce more intensive *Implementation of EMPs*.

Motivations for Implementation of EMPs and P2 Practices

Firms may voluntarily adopt EMPs and P2 practices to achieve compliance with existing and anticipated regulations more cost-effectively by identifying innovative approaches to improve environmental performance by integrating it with operational decisions as well as by reducing the likelihood of inspections and enforcement actions. Firms may also seek to preempt and shape future regulations by showing environmental stewardship and good faith efforts at improving environmental performance (see survey in Khanna, 2001). Regulatory pressures have been found to be an important motivator of voluntary environmental management by a number of studies and surveys of firms, notably Henriques and Sadorsky (1996), Dasgupta *et al.* (2000), Potoski and Prakash (2005), Florida and Davison (2001). Additionally, the threat of potential liability for Superfund sites and anticipated Clean Air Act regulations for hazardous air pollutants also motivated firms to adopt more comprehensive environmental management system (Khanna and Anton, 2002; Anton *et al.*, 2004). On the other hand, several studies find that regulatory pressures were not important for influencing certain practices (e.g. Total Quality Environmental Management (Harrington *et al.*, forthcoming) or in some industries (e.g. pulp mills (Kagan *et al.* 2003). We include a latent construct *Regulatory Pressures* based on indicator variables listed in Table 2.

Facilities may also implement EMPs and/or P2 practices to realize market opportunities through their interactions with external stakeholders, such as consumers and investors, with

which firms have contractual relationships, as well as with communities and environmental interest groups that enforce the firm's "social license to operate" (Gunningham et al., 2003). Consumers, stockholders and other investors can influence firm behavior by signals transmitted through product and capital markets. Facilities may also undertake environmental management and P2 to build reputational capital by showing good faith efforts at improving environmental performance and being accepted by local communities and interest groups.

Among the few studies examining the influence of investors in motivating corporate environmental behavior among publicly traded firms, Henriques and Sadosky (1996) find that pressure from shareholders was significant in motivating firms to adopt an environmental plan while Khanna and Anton (2002) find that publicly traded firms with a higher ratio of capital assets per unit sales and therefore more dependent on capital markets were more likely to adopt a more comprehensive environmental management system. We include a latent variable that measures *Investor Pressure* (see Table 2) and a dummy variable, *Public* equal to 1 if the firm was publicly owned. Publicly owned firms may be more likely to face pressure from diverse stockholders to be environmentally responsible and less risky. They may also have lower costs of adopting EMPs and P2 practices because they have greater access to financial resources and economies of scale since they are typically part of a multifacility operation. They are also more likely to be willing to bear risks since costs of bearing risks are spread over many investors. A detailed study of costs of adopting EMPs finds this to be the case (Darnall and Edwards, 2006).

Empirical evidence of the effect of green consumers on incentives for corporate environmental management is mixed. While consumer surveys indicate that consumers are willing to pay more for products with environmentally friendly attributes, revealed behavior in the market indicates that this willingness to pay is very small. Firms in closer contact with consumers, or spending more on advertising per unit sales or more visible to the public were

found to be more likely to undertake some voluntary environmental initiatives (Khanna and Anton, 2002; Anton *et al.*, 2004; King and Lenox, 2000). However, both Harrington *et al.* (forthcoming) and Anderson *et al.* (1999) find that neither regulatory nor consumer pressures played a significant role in motivating the adoption of Total Quality Environmental Management or the ISO 9000 standard. Khanna *et al.* (2006) also find that market pressures from consumers, environmental groups and communities had an insignificant effect on P2 activities of firms. We construct a latent variable as a proxy for *Consumer Pressure*. We also include a dummy, *Retail*, equal to one if the facility sells its output to final consumers. Communities and environmental interest groups demand social responsibility from firms and can affect a firm's image and reputation through boycotts and negative publicity. Surveys suggest that firms that perceive these pressures and have a stronger desire to improve their relations with their communities and seek external recognition are more likely to adopt EMPs and P2 practices (Henriques and Sadorsky, 1996; Florida and Davison, 2001; Coglianese and Nash, 2006). We include a latent variable, *Interest Group Pressure* to capture these pressures.

A few studies have examined whether firms in more competitive business environments were more likely to participate in voluntary programs in order to gain a competitive advantage by differentiating their product, or by lowering waste (pollution) and enhancing efficiency. Khanna and Anton (2002) find that firms operating in less concentrated industries, that is under more competitive conditions, are more likely to adopt a more comprehensive environmental management system. This could suggest that such firms are seeking to lessen competition by differentiating their products through their environmental attributes and by acquiring a credible environmental reputation. Dasgupta *et al.* (2000), on the other hand, did not find that a desire for international competitiveness, proxied by export orientation or multinational status, was a significant motivator for Mexican firms to adopt ISO 14001 while Harrington *et al.*

(forthcoming) did not find any effect of market structure on adoption of total quality environmental management. We include two variables to capture the market environment of the facility. First we construct a latent variable, *Competitive Pressure* to capture the facility's perceptions of the extent to which it influences environmental management. We also include the a dummy variable, *Multinational*, equal to one if the facility was part of a multinational parent company and thus exposed to global competition.

Some studies have also investigated the role of internal factors such as managerial attitudes towards the environment in motivating environmental management. Following Ajzen's (1985) theory of planned behavior to examine preferences for P2, Cordano and Frieze (2000) suggest that "attitudes towards a behavior arise from a person's beliefs about the consequences resulting from its performance and that person's affective response to those consequences." As a person's attitudes towards a behavior become more favorable, their intention and effort exerted to perform the behavior is likely to increase. These attitudes might be affected by beliefs about the benefits and costs of voluntary environmental management. They find that managerial attitudes influenced preferences for source reduction activities.

Coglianesse and Nash (2006) find that facilities that had greater support from top management within the facility and from the parent company for participation in the National Performance Track program were more likely to do it. Nakamura et al., (2001) found that perceptions of managers' recognition of personal responsibility to protect the environment had a strong influence on the extent to which environmental policies were integrated into corporate policies and practices while Delmas and Toffel (2004) found that internal pressures from management, other facilities in the firm, employees and shareholders were important in determining the comprehensiveness of the environmental management system adopted. We include a latent variable, *Managerial Attitude*, to capture these effects.

The availability of proven techniques for waste reduction and improved environmental management and pressures from stakeholders to adopt them do not guarantee that they will be adopted. While the above factors capture the benefits of environmental management, it is also important to consider the barriers to improving environmental performance, which might provide disincentives for adoption of EMPs and for undertaking P2 activities. Ashford (1992) identifies several barriers to adoption of waste reduction measures that include: lack of information about their impacts on future profitability, lack of managerial capacity and capital to incur transition costs of reorganizing production, uncertainty about the performance of new technologies. We construct a latent variable *Barriers to Implementation*, to capture these disincentives for adopting EMPs and/or P2 practices. The indicator responses from the survey used to construct each of these latent variables are described in Tables 1 and 2.

Data

The data were obtained from a survey of for-profit facilities that employed 10 or more employees and workers in primarily in one of the following six industry sectors in Oregon in 2004. These sectors include: Construction of Buildings (NAICS 236), Food Manufacturing (NAICS 311), Wood Product Manufacturing (NAICS 321), Computer and Electronic Product Manufacturing (NAICS 334), Truck Transportation (NAICS 484), and Accommodation (NAICS 721) ⁷. Names of all facilities in these sectors were obtained from the Oregon Employment Department (OED) ⁸. A total of 1,964 facilities meeting the size and sector criteria were identified

⁷ The North American Industry Classification System (NAICS), replaces the earlier Standard Industry Classification (SIC) system. NAICS codes contain up to six digits; however, sectors were defined at the 3-digit level to obtain adequate sample sizes in each sector.

⁸ The choice of industry sectors was based on careful consideration of several factors. This study was intended to provide a comprehensive view of business environmental management among facilities of varying sizes, characterized by a variety of organizational characteristics and voluntary environmental management approaches, and subject to varying environmental regulations. The selected sectors were chosen to capture both manufacturing

to receive the survey after telephone contacts to identify the person with the most knowledge about facility environmental management. The survey was developed and administered using a Tailored Design Method (TDM) protocol (Dillman, 2000). The survey asked questions in four general areas: environmental management, environmental practices, environmental performance, and facility characteristics (e.g. annual revenues). The Likert agreement scale was used to assess perceptions of upper management and parent company attitudes, the extent to which environmental management practices and P2 activities have been implemented (see Appendix 1)⁹. The Likert-type ordered-response scale was used to assess perceptions of customer, investor, lender, regulatory and competitive influences, barriers to environmental management, managerial attitudes and parent company support.

Approximately 3.9% of eligible facilities declined to participate after the phone call. The facilities that declined had slightly smaller numbers of employees on average, 16 employees as compared to 24 for respondents. A total of 689 responses were obtained, representing an overall response rate of just over 35%. To test for potential self-selection bias, the OED list of facilities, the sample of 1,964 facilities identified to receive the survey, and the set of respondents were compared by facility size and geographic location. No bias was detected based on average or median employment levels, or proportions of facilities located in each county, between these groups. Additionally, the Oregon Department of Environmental Quality operates three

and non-manufacturing industries of importance to the Oregon economy, in sufficient numbers to facilitate sector-specific analysis. The six sectors included in this study are among those that employ the greatest numbers of individuals, that operate the greatest numbers of facilities, and that generate the most substantial corporate tax revenues in Oregon (ORS 2005, DOR 2004, USCB 2003).

⁹ A 5-point scale was chosen for this study for several reasons, based on determinations by Clark (1995) and Lehman and Hulbert (1972). First, the 5-point scale has been found to be approximately as effective as a continuous scale at estimating the mean response. With the addition of each point, the differences between continuous and discrete scales decrease rapidly up to the level where five or six points are included. After this, adding points results in less measurement improvement. Furthermore, due to the length and intensity of this survey, a 7-point scale was considered too detailed for respondents. Conversely, a 3-point scale was considered too limited. Fewer points on the scale may not capture adequate variation, which increases the likelihood of a departure from the assumption of a normal distribution, a requirement for many statistical tests (Jacoby 1971).

geographic regulatory regions. No bias was detected based on comparisons of proportions of facilities located in these regions in the OED list, the survey sample, or the set of respondents.

Two follow-up mailings were sent to facilities that had not yet responded. A total of 403 facilities responded to the initial mailing, 151 facilities responded after the second mailing, and 75 facilities responded after the third and final mailing. To determine if the responses were biased according to mailing wave, we conducted a one-way analysis of variance with each of the survey questions as the response variable and mailing wave (first, second, or third) as the factor variable. The means of the survey responses across mailing waves were found to be different for only three survey questions (out of 49 tested). In those three cases these differences were very small in magnitude. We therefore conclude that the responses are not biased according to when the survey was returned ¹⁰.

Estimation and testing in SEM's assumes that the observed (or indicator) variables are distributed multivariate normal and are continuous. West et al (1995) explain that if multivariate normality is violated, then maximum likelihood estimation may produce χ^2 goodness-of-fit statistics that are inflated (i.e., reject too many true models) and biased standard errors for estimated parameters (i.e., too many significant results). Categorical variables can cause estimated goodness-of-fit statistics, parameter estimates, and standard errors to be biased. We find that our data violate these two assumptions.

To assess normality, we apply the Kolmogorov-Smirnov test to each of our observed indicator variables. We reject the null hypothesis that each variable is distributed univariate normal. If any of the observed variables differ greatly from univariate normality, then the multivariate distribution cannot be normal. We therefore conclude that our sample violates the

¹⁰ Our ANOVA results indicated that there were differences in some facility characteristics across mailing waves. For example, the average facility revenue in surveys returned after the second mailing wave was higher. These differences do not appear to be systematic.

assumption of multivariate normality. Our survey responses are measured using a five-point scale, another potential source of bias. West et al (1995) report, however, that the bias may be small when the number of categories for each observed variables is large enough. Three or more categories per variable is a general rule of thumb and West et al (1995) recommend five or more. To minimize the bias resulting from categorical variables, all of our survey responses are measured using a five-point Likert-type scale. Since we are interested mainly in the regression weights in the structural model (the coefficients on the variables that explain EMP adoption and P2 practices adoption), a potentially serious consequence of non-normality is that estimated standard errors are too low, particularly when there is a high degree of skewness or when the observed variables are each skewed to a different degree. This means that test of significance will too often fail to reject insignificant parameters when using maximum likelihood estimation. To address this, we use nonparametric bootstrapping to generate significance levels for the parameter estimates. Summary statistics showing the characteristics of the survey respondents are shown in Table 3.

Empirical Framework

We employ SEM to assess the factors and facility characteristics that motivate *Implementation of EMPs* and adoption of *P2 practices* by firms. SEM is a technique for statistical analysis that estimates the parameters that describe the causal relationship between dependent and independent variables by minimizing the difference between the sample covariance matrix and the population covariance matrix formed with the dependent and independent variables. Bollen (1989) describes SEM as a set of regression equations that invoke less restrictive assumptions and allows for errors in measurement of explanatory and dependent variables, as well as for errors in equations. An SEM consists of two components: a

measurement model and a structural model. These two components make up two sets of equations that are estimated simultaneously.

The measurement model connects a latent variable of interest to one or more indicator variables using a linear function. Each indicator variable is a continuous variable that is represented as having two causes, a single underlying latent variable that is not directly observed but is a formal representation of a concept and a measurement error.¹¹ These errors are assumed to be independent of each other and of the latent factors. The measurement model does not analyze associations between latent variables. The measurement model is similar to factor analysis used to reduce many indicator variables to a few latent factors.

We perform the analysis in three steps. First, we estimate the measurement model and assess reliability, consistency and validity of each of the latent variables. Second, we assess the goodness of fit of the overall model to evaluate how closely our observed model fits the observed data. Third, we estimate the two-equation structural model with the latent variables *Implementation of EMPs* and *P2 Practices* as dependent variables and with the seven latent factors and four observed characteristics of the facility as explanatory variables.

Measurement Model

We first evaluate whether the latent variables we have constructed represent reasonable and identifiable distinct concepts. To do this, we perform a Confirmatory Factor Analysis (CFA) and use the results to evaluate the measurement model based on three criteria: indicator reliability, internal consistency, and discriminant validity. The CFA estimates our unobserved latent variables as linear combinations of indicator variables. We use the indicator loadings (ie,

¹¹ Measurement errors reflect two kinds of unique variance: (1) a random error and (2) a systematic variance due to things the indicator measures besides its underlying factor, such as the effects of a particular method of measurement.

regression coefficients) and error term variances from the regressions in the CFA to construct the statistics described below.

Indicator reliability is how well an observed indicator variable explains variation in the latent construct it is measuring. We tested indicator reliability by assessing the significance, sign, and strength of each indicator loading on to the hypothesized latent variable. The indicator loadings for each latent construct are reported in Tables 1 and 2. Note that for each latent variable, the estimate of one indicator loading is set to 1. This is because latent variables, being unobservable, have no natural scale. All of these indicators loadings are significant at the 1 percent level. We thus conclude that our measurement model has adequate indicator reliability.

Next, we assessed the internal consistency of the observed indicator variables used to measure each latent construct using three different methods.¹² Internal consistency is the degree to which indicator variables that measure the same latent construct are correlated with each other. We use three ways to check internal consistency for a latent variable: Cronbach's alpha, composite reliability, and average variance extracted. Results are presented in Table .

The first check of internal consistency is Cronbach's alpha. As a general rule of thumb, Cronbach's greater than 0.70 indicates that a latent variable exhibits adequate internal consistency (Kline 2005). The second check of internal consistency is composite reliability. We calculated the composite reliability for each latent construct by dividing the squared sum of the standardized factor loadings by the variance of the error terms in the measurement equations plus the squared sum of the standardized factor loadings. Composite reliability greater than 0.70 indicates the latent variable has adequate internal consistency (Delmas and Toffel 2005). The third check of internal consistency is average variance extracted, defined as the proportion of the

¹² This concept is also commonly referred to as convergent validity and is based on the premise that the observed indicator variables should covary highly if they measure the same latent variable. (see Bagozzi et al 1991 [p. 425], Kline 2005 [p. 60]).

variance in the indicators that is explained by the latent variable.¹³ The total variance of the observed indicator variables is made up of an unexplained portion (the variance of the measurement errors) and an explained portion (the variance in the indicators that is due to the latent variable). For an adequate measurement model, the average variance extracted should be greater than 0.50. This would indicate that the variance explained by the latent variable is greater than the variance due to measurement error (Fornell and Larcker 1981).

The results presented in Table 4 indicate that our hypothesized latent constructs have good internal consistency. The composite reliability for each latent variable is above the accepted threshold of 0.70, except for Customer Pressure which is only slightly below. The average variance extracted for all nine latent variables is well above the accepted threshold of 0.50. We conclude that our observed indicator variables do an adequate job of measuring the latent constructs of interest in to our study.

Lastly, we tested for the discriminant validity, the degree to which measures of each of the latent variables are different. If the hypothesized latent variables in the measurement model truly are distinct concepts, then the latent variables should not be highly correlated (Bagozzi et al 1991). Following Delmas and Toffel (2005) we evaluate discriminant validity by comparing the shared variance between pairs of latent variables with the shared variance between the latent variables and their indicators. We compute the shared variance between two latent variables by squaring the correlation between the two latent variables. We compute the shared variance between the latent variables and their indicators as the average variance extracted (as described above). Discriminant validity is adequate if the shared variance between two latent variables is less than the shared variance between the latent variables and their indicators.

¹³ Note that the part of the variance in the indicators that is due to the latent variable is the sum of the squared standardized factor loadings. For each latent variable, the average variance extracted is calculated as the sum of the squared item standardized loadings divided by the sum of the variance of error terms and the squared item standardized loadings (Fornell and Larcker 1981).

Table 5 is a matrix that helps evaluate the degree of discriminant validity of our measurement model. Elements on the diagonal are the square root of the average variance extracted for each latent variable. These elements represent the shared variance between indicator variables within the same latent variable. Off-diagonal elements are the correlation between two latent variables. These elements represent the shared variance between distinct latent variables. In a measurement model with a high degree of discriminant validity, diagonal elements will be greater than all other elements in the same row or column. Put another way, this means that the indicator variables that make up any latent variable are more highly correlated with each other than is another latent variable with that latent variable. The results in Table 5 show that our measurement model exhibits adequate discriminant validity because each diagonal element is greater than all other elements in its row and column.

Structural Model

Our dataset contains missing values because many survey respondents did not provide an answer for every question. Of the 689 surveys forms that were returned, 199 had responses for every question used in the present model. This means that 490 responses had missing values for at least one question. We assume these missing values are missing at random and use the expectation maximization (EM) algorithm in SPSS to impute the missing values and generate a complete data set.¹⁴ Since our data set consists of categorical indicator variables that are non-

¹⁴ The EM algorithm is an iterative, maximum likelihood based technique for imputing missing values. Each iteration consists of two steps. The first step (the expectation- or E-step) finds the expected values of the missing variables given the values for all of the non-missing values. This is by accomplished by replacing each missing value with the predicted value from regressing the missing value on all remaining observed (non-missing) values. The second step (the maximization- or M-step) uses the newly completed data set to generate maximum likelihood estimates of the mean vector and covariance matrix. The EM algorithm repeats until the difference between covariance matrices in subsequent iterations meets some convergence criteria. More details on the strengths and weaknesses of the EM algorithm and alternative methods can be found in Enders (2001), Peters and Enders (2002), and Allison (2003).

normally distributed, we also obtain bootstrapped p-values to provide a better measure of the significance of the estimated parameters than one based on the maximum likelihood method. To examine if our results are sensitive to the method used to impute missing values, we also use the Full Information Maximum Likelihood (FIML) procedure in AMOS to obtain parameter estimates. The FIML estimation method does not impute missing values. Rather, parameters and standard errors are estimated directly using all of the observed data. In the course of the FIML procedure a likelihood function for each individual observation is estimated based on the (non-missing) variables (Enders 2001). The drawback of this method is that we cannot bootstrap significance levels for the parameter estimates using AMOS and hence only the ML estimates are reported for this case.

We estimated four different models to examine the determinants of EMP adoption and P2 practices simultaneously as functions of the seven latent factors described above and facility characteristics. Model I includes only the latent constructs as explanatory variables while Model II also includes facility characteristics as explanatory variables. Model III expands Model II to include industry sector dummies to control for differences in EMPs or P2 practices across sectors. Models I-III allow for correlation in the error terms of the two dependent variables, *Implementation of EMPs* and *P2 Practices*. Model IV does not allow for correlation across the error terms of the two dependent variables but instead hypothesizes that *Implementation of EMPs* have a direct effect on adoption of *P2 Practices*.

We present the results of four models in Tables 6 and 7 below. Table 6 presents the estimation results for our model explaining EMP adoption. Table 7 presents estimation results for the model explaining adoption of practices. Note that these models are estimated simultaneously; the results are presented in separate tables to improve clarity of the presentation.

All four models show that managerial attitudes have a statistically significant effect on the extent to which facilities implement EMPs and adopt P2 practices. We also find that facilities that perceived stronger investor pressures and were publicly owned were more likely to adopt EMPs. However, neither of these factors are important in explaining the adoption of P2 practices. Infact, investor pressures had a negative but insignificant impact on the adoption of P2 practices. We also find robust evidence that facilities that faced stronger regulatory pressures were more likely to adopt P2 practices. The impact of regulatory pressures on adoption of EMPs was positive but statistically significant in only the models using the EM imputed missing values. To the extent that the bootstrapped standard errors are more appropriate than the ML standard errors, we can conclude that regulatory pressures have an important influence on both *Implementation of EMPs* and adoption of *P2 Practices*. Furthermore, facilities that perceived stronger barriers to implementation of environmentally friendly production methods were less likely to adopt EMPs; this perception however did not have a statistically significant impact on adoption of P2 practices.

As compared to the Construction sector (NAIC 236), facilities in the food (NAICS 311) and wood products (NAICS 321) appear to be more likely to adopt EMPs and P2 practices. However, facilities in the transportation sector (NAICS 484) were more likely to adopt EMPs while those in the Computer and Electronic Product Sector (NAICS 334) were more likely to adopt P2 practices compared to the Construction Sector.

We do not find any evidence that perceived consumer pressures or interest group pressures played a role in motivating the *Implementation of EMPs* and adoption of *P2 Practices*. We also do not find larger facilities as being more likely to be environmentally proactive. There is some evidence that facilities with multinational status or facing stronger competitive pressures

were more likely to implement EMPs. These factors however had an insignificant impact on the P2 adoption decision.

In Model IV we assume a recursive model while testing the hypothesis that facilities that adoption of EMPs was likely to lead to greater adoption of P2 practices. We find statistically significant support for this hypothesis using both the p-values from the EM imputed model and the FIML model. However, this result needs to be interpreted with caution because the assumption that the error term of the latent constructs representing EMP adoption and P2 practice adoption are likely to be correlated. The positive effect of EMP adoption on P2 practices could then simply be picking up the effect of some unobserved variables that lead the facility to adopt more EMPs and P2 practices.

To assess the goodness of fit of the specified models with the observed data we report five measures of fit in Table 8 (see Kline, 2005). Lower values of the Model Chi-square (χ^2) indicate a better fit, however, its value increases with sample size and for non-normal distributions (Bollen, 1989; Shah and Goldstein, 2006). To correct for this, we divide the χ^2 by the degrees of freedom (df) in the model; a value less than 5 represents adequate fit (Bollen, 1989). Lower values of the Root Mean Square Error of Approximation (RMSEA) indicate better fit; a value less than 0.5 indicates close fit while a value between 0.05 and 0.08 indicates adequate fit and a value greater than 0.10 indicates unacceptable fit (Brown and Cudeck 1993). The values for the ratio of χ^2/df and the RMSEA, reported in Table 8, indicate an acceptable fit with Model III having the closest fit.

Conclusions

Our empirical analysis sheds some light on the factors that can explain the different levels of greening of firms, as measured by their adoption of EMPs and/or P2 practices. In particular,

we find that perceived regulatory pressures have a statistically significant impact on the adoption of both EMPs and P2 practices. We also find that managerial attitudes, that capture a diverse set of beliefs ranging from a sense of moral responsibility towards the environment to the expectation that improvements in environmental performance will improve long term financial performance, have a strong influence on the decision to implement EMPs and adopt P2 practices. Other factors such as investor pressures and competitive pressures are significant in motivating firms to adopt the visible forms of greenness, namely adoption of EMPs, but not to invest in innovative pollution reduction technologies. Our results also show that perceptions matter; even firms with the same observed characteristics such as public ownership or multinational status can differ in their environmental behavior depending on their perceptions about investor or competitive pressure. We find no evidence that consumer or interest group pressures play any role in motivating environmental management.

This analysis has several implications for public policy. It suggests that simply relying on market forces to lead to corporate greening may not be enough. These forces may either not be strong enough or simply lead firms to make symbolic efforts at environmental management. It is therefore important to have strict enforcement of existing regulation and a threat of stringent regulations in the future to motivate a change in corporate environmental behavior. Moreover, the expectation of tougher regulations in the future, even if they do not mandate specific technologies, can stimulate green technological innovation. It creates incentives for firms to find innovative and cost-effective approaches to improve environmental management. Finally, our findings suggest that public policy efforts for encouraging corporate environmental management should be targeted towards private, domestically oriented facilities that would otherwise have fewer incentives to do so.

Table 1: Construction of Latent Dependent Variables (with summary statistics)

Latent Variable	Survey Question	Mean	Std. Dev.	N	CFA Indicator Loadings*
Environmental Management Practices	Environmental goals guide operational decisions (Q.12a)	2.88	1.2	631	0.926
	Environmental responsibility is emphasized through well-defined environmental policies and procedures (Q.12b)	2.84	1.3	640	1.108
	Our environmental standards are more stringent than mandatory governmental requirements (Q. 12c)	2.85	1.3	616	0.986
	We conduct environmental audits for our own performance goals, not just for compliance (Q. 12d)	2.66	1.4	619	1.163
	Employees receive incentives for contributions to environmental performance (Q. 12e)	1.91	1.0	634	0.682
	We use environmental cost accounting (Q. 12f)	1.96	1.1	604	0.804
	We make continuous efforts to minimize environmental impacts (Q. 12g)	3.7	1.2	642	0.852
	We require our suppliers to pursue environmentally friendly practices (Q. 12h)	2.53	1.3	614	0.959
	Employees are conscious of the importance of minimizing negative environmental impacts (Q.12i)	3.58	1.2	635	0.863
	An adequate amount of training in environmental management is provided to all employees (Q. 12j)	2.89	1.3	638	1.065
	Facility environmental achievements are given prominent coverage in facility annual reports (Q. 12k)	2.16	1.2	602	1
Pollution Prevention Practices	Pollution prevention is emphasized to improve environmental performance (Q. 14a)	3.59	1.2	641	1.66
	Efforts have been made to reduce spills and leaks of environmental contaminants (Q. 14b)	4.39	0.9	649	1.068
	We choose raw materials that minimize environmental impacts (Q. 14c)	3.46	1.1	622	1.657
	We have modified our production systems to reduce waste and environmental impacts (Q. 14d)	3.71	1.1	617	1.735
	We have modified our production to reduce environmental damage during production, consumption, and disposal (Q. 14e)	3.47	1.2	609	1.802
	We have increased recycling and reduce landfilling of our solid waste (Q. 14f)	4.21	1.0	642	1

*All indicator loadings were statistically significant at the 1% level

Table 2: Construction of Latent Explanatory Variables (with summary statistics)

Latent Variable	Survey Question	Mean	Std. Dev.	N	CFA Indicator Loadings*
Regulatory Pressures (encouraging environmental management)	Complying with current government environmental regulations	4.1	1.2	661	1.000
	Taking environmentally friendly actions to reduce regulatory inspections and make it easier to get environmental permits	3.21	1.5	634	1.534
	Being better prepared for meeting anticipated environmental regulations	3.29	1.4	644	1.459
	Preempting future environmental regulations by voluntarily reducing regulated pollution beyond compliance levels	2.98	1.4	634	1.686
	Preempting future environmental regulations by voluntarily reducing unregulated impacts	2.68	1.4	618	1.526
Investor Pressure	Satisfying investor or owner desires to reduce environmental risks and liabilities	3.39	1.5	658	1.000
	Protecting or enhancing the value of the facility or parent firm for investors or owners	3.31	1.5	649	1.074
	Satisfying lenders' desires to reduce environmental risks and liabilities	2.39	1.4	617	.718
Consumer Pressure	Customer desire for environmentally friendly products and services	2.85	1.4	654	1.000
	Customer willingness to pay higher prices for environmentally friendly products/services	2.34	1.3	636	.826
	Ability to earn public recognition and customer goodwill with environmentally friendly actions	2.72	1.4	662	.806
Interest Group Pressure	Environmental interest groups' perception that environmental protection is a critical issue	2.26	1.3	647	1.000
	Preventing boycotts or other adverse actions by environmental interest groups	1.75	1.2	648	.751
	Promoting an environmentally friendly image to environmental interest groups	2.42	1.4	663	1.091
Competitive Pressure	Investing in cleaner products and services differentiates our products or our facility	2.84	1.4	650	1.000
	Improving environmental performance helps us keep up with competitors	2.59	1.4	656	.987
	Environmentally friendly actions result in product or process innovations	2.51	1.3	642	1.024

	Environmentally friendly actions can reduce costs	2.96	1.4	645	.875
	Being environmentally responsible attracts quality employees and reduces employee turnover	2.48	1.4	655	.946
	Being environmentally responsible improves employee morale, motivation and productivity	2.77	1.3	658	.930
Managerial Attitudes (of facility's upper management)	Moral responsibility to protect the environment	4.27	0.9	658	1.000
	Support for protecting the environment even if substantial costs are incurred	3.42	1.2	653	1.388
	Improvements in environmental performance will improve long-term financial performance	3.39	1.1	637	1.401
	Customers and other stakeholders care about the environmental impacts of its products	3.72	1.0	641	1.291
	Advances in technology can solve environmental problems while increasing profits at the same time	3.41	1.1	622	1.141
	Facility should help conserve society's limited natural resources	4	1.0	642	1.048
Barriers to Implementation: For increasing the environmental friendliness of processes, products and/or services	High upfront investment expense	3.63	1.4	615	1.000
	Availability of knowledgeable staff	2.77	1.2	621	.749
	High day-to-day costs	3.29	1.3	605	1.059
	Significant upfront time commitment	3.21	1.3	620	1.099
	Uncertain future benefits	3.11	1.3	600	1.042
	Risk of downtime of delivery interruptions during implementation	2.86	1.4	602	1.021
	Degrees of freedom				1091
	Number of estimated parameters				134
	Chi-square				4925.52
	Chi-square/df				4.52
	CFI				0.82
	RMR				0.086

*All indicator loadings were statistically significant at the 1% level

Table 3: Summary Statistics of Facility Characteristics

	Percent of Sample
Facility revenues (\$ Million)	16.8
Retail	44.7
Public Ownership	10.4
Multinational Status	12.7
Construction of Buildings (236)	19.6%
Food Manufacturing (311)	15.4%
Wood Product Manufacturing (321)	17.3%
Computer and Electronic Product Manufacturing (334)	7.4%
Truck Transportation (484)	18.9%
Accommodation (721)	20.5%

Table 4: Measures of Internal Consistency

Latent Variable	Cronbach α	Composite Reliability	Average Variance Extracted
Customer Pressure		0.695	0.584
Interest Group Pressure	0.905	0.756	0.751
Investor Pressure	0.892	0.694	0.601
Regulatory Pressure	0.851	0.842	0.959
Competitive Pressure	0.853	0.820	0.674
Management Attitude	0.922	0.845	0.813
Barriers to Implementation	0.821	0.802	0.619
Implementation of EMPs	0.905	0.893	0.708
P2 Practices	0.892	0.815	0.707

Table 5. Discriminant Validity Matrix

	Customer Pressure	Interest Group Pressure	Investor Pressure	Regulatory Pressure	Competitive Pressure	Managerial Attitudes	Barriers to Implementation	Implementation of EMPs	P2 Practices
Customer Pressure	0.764								
Interest Group Pressure	0.705	0.866							
Investor Pressure	0.519	0.561	0.775						
Regulatory Pressure	0.444	0.567	0.641	0.979					
Competitive Pressure	0.726	0.668	0.616	0.603	0.821				
Managerial Attitude	0.486	0.482	0.583	0.456	0.706	0.902			
Barriers to Implementation	0.146	0.127	0.201	0.175	0.132	-0.075	0.787		
Implementation of EMPs	0.410	0.473	0.552	0.496	0.579	0.661	-0.088	0.841	
P2 Practices	0.358	0.400	0.465	0.531	0.539	0.618	0.015	0.743	0.841

Table 6: Determinants of EMP Implementation

	MODEL I EM imputed missing values	MODEL II EM imputed missing values	MODEL IIIa EM imputed missing values	MODEL IIIB FIML imputed missing values	MODEL IVa EM imputed missing Values	MODEL IVb FIML imputed missing values
Barriers To Implementation	-0.137*** (0.000, 0.002)	-0.126*** (0.000, 0.002)	-0.127*** (0.000, 0.002)	-0.123*** (0.000)	-0.127*** (0.000, 0.002)	- 0.123*** (0.000)
Managerial Attitudes	0.597*** (0.000, 0.002)	0.581*** (0.000, 0.003)	0.570*** (0.000, 0.002)	0.564*** (0.000)	0.570*** (0.000, 0.002)	0.564*** (0.000)
Competitive Pressure	0.091 (0.149, 0.140)	0.105 (0.088, 0.103)	0.122* (0.048, 0.051)	0.125* (0.053)	0.122* (0.048, 0.051)	0.125* (0.053)
Regulatory Pressure	0.17** (0.003, 0.015)	0.163** (0.005, 0.030)	0.121* (0.043, 0.092)	0.102 (0.105)	0.121* (0.043, 0.092)	0.102 (0.105)
Investor Pressure	0.127*** (0.002, 0.006)	0.113** (0.006, 0.011)	0.115*** (0.005, 0.006)	0.126*** (0.004)	0.115*** (0.005, 0.006)	0.126*** (0.004)
Interest Group Pressure	0.074 (0.146, 0.148)	0.044 (0.376, 0.367)	0.023 (0.650, 0.623)	0.031 (0.572)	0.023 (0.650, 0.623)	0.031 (0.572)
Consumer Pressure	-0.036 (0.453, 0.415)	-0.026 (0.584, 0.560)	0.006 (0.903, 0.897)	0.001 (0.983)	0.006 (0.903, 0.897)	0.001 (0.983)
Multinational Firm	--	0.185 (0.080, 0.110)	0.203* (0.055, 0.090)	0.227** (0.044)	0.203* (0.055, 0.090)	0.227** (0.044)
Publicly Traded	--	0.278** (0.015, 0.011)	0.265** (0.020, 0.018)	0.241** (0.046)	0.265** (0.020, 0.018)	0.241** (0.046)
Retail Sector	--	-0.018 (0.742, 0.695)	-0.04 (0.487, 0.550)	-0.053 (0.382)	-0.04 (0.487, 0.550)	-0.053 (0.382)
Facility Size	--	0.001*** (0.022, 0.004)	0.001 (0.029, 0.005)	0.001 (0.209)	0.001 (0.029, 0.005)	0.001 (0.209)
NAICS 236	--	--	-0.004 (0.967, 0.948)	0.013 (0.888)	-0.004 (0.967, 0.948)	0.013 (0.888)
NAICS 311	--	--	0.188** (0.033, 0.033)	0.204** (0.029)	0.188** (0.033, 0.033)	0.204** (0.029)
NAICS 321	--	--	0.176** (0.048, 0.046)	0.201** (0.033)	0.176** (0.048, 0.046)	0.201** (0.033)
NAICS 334	--	--	-0.036 (0.757, 0.844)	-0.024 (0.847)	-0.036 (0.757, 0.844)	-0.024 (0.847)
NAICS 484	--	--	0.204** (0.023, 0.023)	0.212** (0.025)	0.204** (0.023, 0.023)	0.212** (0.025)

p-values are in parentheses. For the models with EM imputed values, the first number in the parenthesis is the ML p-value and the second one is the bootstrapped p-value. For the FIML models, the ML p-value is reported. *** indicates statistically significant at the 1% level; ** indicates statistically significant at the 5% level and * indicates statistically significant at the 10% level. For the models using EM imputed missing values, the stars are assigned based on the bootstrap standard errors.

Table 7: Determinants of Adoption of P2 Practices

	MODEL I EM imputed missing values	MODEL II EM imputed missing values	MODEL IIIa EM imputed missing values	MODEL IIIB FIML imputed missing values	MODEL IVa EM imputed missing values	MODEL IVb FIML imputed missing values
Implementation of EMPs	--	--	--	--	0.302*** (0.000, 0.001)	0.292*** (0.000)
Barriers To Implementation	-0.002 (0.919, 0.827)	0.001 (0.966, 0.895)	-0.005 (0.788, 0.666)	-0.003 (0.883)	0.033 (0.075, 0.171)	0.033* (0.097)
Managerial Attitudes	0.363*** (0.000, 0.004)	0.359*** (0.000, 0.004)	0.327*** (0.000, 0.004)	0.312*** (0.000)	0.155** (0.002, 0.011)	0.148*** (0.005)
Competitive Pressure	0.034 (0.364, 0.306)	0.034 (0.364, 0.327)	0.046 (0.209, 0.200)	0.049 (0.202)	0.009 (0.781, 0.723)	0.012 (0.725)
Regulatory Pressure	0.199*** (0.000, 0.001)	0.207*** (0.000, 0.001)	0.191*** (0.000, 0.001)	0.188*** (0.000)	0.155*** (0.000, 0.001)	0.158*** (0.000)
Investor Pressure	-0.009 (0.710, 0.773)	-0.015 (0.555, 0.651)	-0.004 (0.858, 0.906)	-0.003 (0.899)	-0.039 (0.078, 0.151)	-0.040* (0.093)
Interest Group Pressure	-0.005 (0.871, 0.865)	-0.011 (0.714, 0.693)	-0.011 (0.717, 0.740)	-0.008 (0.816)	-0.018 (0.506, 0.515)	-0.017 (0.572)
Consumer Pressure	-0.015 (0.610, 0.599)	-0.013 (0.653, 0.658)	-0.010 (0.728, 0.731)	-0.010 (0.749)	-0.012 (0.646, 0.688)	-0.011 (0.715)
Multinational Firm	--	0.020 (0.753, 0.736)	0.004 (0.954, 0.911)	0.005 (0.936)	-0.057 (0.304, 0.357)	-0.061 (0.314)
Publicly Traded	--	0.040 (0.566, 0.578)	0.008 (0.909, 0.886)	0.008 (0.905)	-0.072 (0.232, 0.292)	-0.062 (0.338)
Retail Sector	--	0.035 (0.296, 0.304)	0.030 (0.380, 0.421)	0.023 (0.514)	0.042 (0.169, 0.207)	0.038 (0.233)
Facility Revenue	--	0.000 (0.144, 0.015)	0.000 (0.641, 0.518)	0.000 (0.962)	0.000 (0.467, 0.246)	0.000 (0.527)
NAICS 236	--	--	0.082 (0.106, 0.107)	0.074 (0.168)	0.083 (0.067, 0.078)	0.070 (0.149)
NAICS 311	--	--	0.206*** (0.000, 0.001)	0.191*** (0.000)	0.149*** (0.002, 0.001)	0.132** (0.010)
NAICS 321	--	--	0.24*** (0.000, 0.002)	0.232*** (0.000)	0.187*** (0.000, 0.002)	0.173*** (0.000)
NAICS 334	--	--	0.217*** (0.002, 0.001)	0.206*** (0.005)	0.228*** (0.000, 0.002)	0.213*** (0.002)
NAICS 484	--	--	0.046 (0.385, 0.306)	0.041 (0.460)	-0.016 (0.739, 0.770)	-0.021 (0.679)

p-values are in parentheses. For the models with EM imputed values, the first number in the parenthesis is the ML p-value and the second one is the bootstrapped p-value. For the FIML models, the ML p-value is reported. *** indicates statistically significant at the 1% level; ** indicates statistically significant at the 5% level and * indicates statistically significant at the 10% level. For the models using EM imputed missing values, the stars are assigned based on the bootstrap standard errors.

Table 8: Goodness of Fit Statistics

	MODEL I	MODEL II	MODEL IIIa	MODEL IIIB	MODEL IVa	MODEL IVb
	EM imputed missing Values			FIML imputed missing Values	EM imputed missing values	FIML imputed missing values
Degrees of freedom	1091	1251	1451	1451	1451	1451
Number of estimated parameters	134	180	260	318	260	318
Chi-square	4913.31	5289.13	5766.55	4661.551	5766.554	4661.551
Chi-square/df	4.50	4.23	3.97	3.21	3.97	3.21
RMSEA	0.071	0.068	0.066	0.057	0.066	0.057

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