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An Empirical Analysis of Differences in Environmental Transparency Across Firms

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AN EMPIRICAL ANALYSIS OF DIFFERENCES IN ENVIRONMENTAL TRANSPARENCY ACROSS FIRMS

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Abstract

In recent years, many firms have voluntarily taken actions to gradually increase the transparency of their corporate social responsibility (CSR) efforts. Using data on a sample of U.S. firms, this paper empirically examines the factors that encourage firms to choose different levels of CSR transparency. This adds to the previous literature that has focused only on the binary decision to engage or not to engage in CSR, as opposed to the extent and comprehensiveness of voluntary CSR reporting. Environmental transparency data are collected from the Roberts Environmental Center (REC) at Claremont McKenna College, while data for firm characteristics and toxic releases are collected from Standard & Poor's Compustat North American and the Environmental Protection Agency (EPA). Robust regression analysis of environmental transparency shows that consumer, investor, and community stakeholders significantly increase the level of environmental transparency. In addition, environmental transparency is higher among firms that compete internationally relative to those with only a domestic presence.

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I. Introduction

Corporate social responsibility (CSR), an overarching term for voluntary initiatives to take into account environmental and social issues, is increasingly becoming an important focus for firms around the world (Reinhardt et al. 2008). In some countries, such as Denmark, law requires CSR reporting, but the United States does not have similar legislation. Nevertheless, many firms in the United States voluntarily report on internal CSR efforts in formal reports or on a company website even though there is no regulatory requirement. This study aims to identify firm characteristics, particularly those related to financial and environmental performance, that explain the extent of voluntary environmental transparency, in the form of CSR reporting, among a sample of U.S. firms.

One difficulty with exploring CSR from an empirical perspective stems from the range of definitions used throughout the literature. These definitions vary from focusing on sacrificing profits to provide social welfare, to social actions by a firm that are not required by regulation (Reinhardt et al. 2008; Portney 2008; Lyon and Maxwell 2008). For the purpose of this paper, I apply Portney's (2008) definition of CSR, "a consistent pattern, at the very least, of private firms doing more than they are required to do under applicable laws and regulations governing the environment, worker safety and health, and investments in the communities in which they operate" (p. 261). This definition has the advantage of clearly distinguishing between CSR activities and compliance activities. For example, if a polluting firm invests in a single device to bring its emissions to some required level, it is only choosing to improve the environment as a reaction to governmental regulation. However, if the same firm decides to create an action plan to further reduce its emissions over several years, then the firm would be engaging in CSR

by going beyond regulatory compliance to improve the environment over a consistent timeframe.

This study uses data for CSR transparency from the Roberts Environmental Center (REC) at Claremont McKenna College (CMC). The REC creates a Pacific Sustainability Index (PSI 3.00) and uses this measure to rank firms within an industry on their CSR efforts as reported on their websites and/or formal CSR reports. Since the REC's methodology uses only information reported directly by the firm, it provides a useful measure of firm transparency. However, since a firm voluntarily reports CSR activities, it can be subject to misreporting that can potentially inflate a firm's score. Specifically, I use data collected by the REC for the years 2009-2012 to create an environmental intent score for each firm. The environmental intent score is comparable across the various sectors.

I find that being dependent on investors, being a final good producer, having an international presence, and having a larger number of polluting facilities all contribute significantly to an increased level of environmental transparency. These results show that various stakeholder pressures do influence a firm into adopting voluntary environmental and transparency initiatives. In addition, I find that having more onsite emissions contributes to the level of transparency, but total emissions and offsite emissions do not. This result suggests that firms that pollute heavily onsite may attempt to skew the public's perception by providing detailed transparency information. This motivation does not seem present for those firms that transfer a large quantity of emissions offsite.

The remainder of the paper is as follows. Section 2 discusses the previous literature, with specific emphasis on the determinants of a firm engaging in CSR and

other voluntary initiatives. I explain my data in Section 3. Section 4 presents the empirical framework and results. Last, I offer some concluding remarks in Section 5.

II. Literature Review

A primary focus of the empirical CSR literature to date is examining the factors that influence a firm to engage in CSR activities. There have been many arguments for and against CSR since Friedman (1970) published his seminal critique, which argued that CSR is incompatible with the main goals of firms since their primary responsibility should be to increase profits. This argument stems from the idea that a firm's sole responsibility is to increase its profits, and any activities that do not contribute to this goal are irresponsible on the part of the firm. However, recent literature shows that CSR does increase the competiveness of a firm, which provides an incentive for firms to begin incorporating CSR into the firm's values and goals (Vilanova et al. 2009).

Moreover, Heslin and Ochoa (2008) identify five main motivations for a firm to adopt CSR practices. First, CSR can lead to growth in the market share for a firm, meaning that CSR can lead to increased sales. One channel through which this can occur is the use of CSR as a marketing tool to please current customers and help bring in new customers (Portney 2008). This aligns with current research suggesting that some consumers may be willing to pay significantly more for socially responsible goods (Jensen et al. 2003). One way for a firm to increase profits is by trying to market a product as superior to its competitors. Therefore, CSR may provide a sales advantage over firms that do not engage in CSR.

Second, CSR provides the opportunity for organizational learning from engaging in projects that increase a firm's core competencies (Heslin and Ochoa 2008). Because CSR activities can include a broad range of activities and initiatives, each firm is free to choose those activities that best align with the firm's organizational structure, production processes, goals, etc. By focusing its CSR activities in an area of core competency, the firm can potentially benefit from previously unexplored techniques. For example, Porter and van der Linde (1995) find that firms that attempt to reduce pollution become more efficient in other activities, which reduces costs.

Third, CSR can increase employee commitment and engagement for a firm (Heslin and Ochoa 2008). Firms engaging in CSR are more attractive for employees since CSR values extend internally, leading to a highly desirable work environment. Brekke and Nyborg (2004) show that firms engaging in CSR experience gains from labor-market screening. That is, firms engaged in CSR will be in high demand for individuals searching for employment, which results in these firms having an advantage for acquiring the best talent. Since engaging in CSR contributes to a positive work environment, it also increases productivity for current employees (Portney 2008). The benefits from talent acquisition and increased productivity are both reasons why a firm may begin CSR initiatives.

Fourth, pressures from external stakeholders can drive CSR since it may be interpreted as a signal of the trustworthiness of a firm (Heslin and Ochoa 2008). A positive view of the firm by external stakeholders is helpful when the firm attempts to embark on a new project or has legal troubles, which can be exemplified by the cases of Enron and BP (Portney 2008). Before the release of reports detailing high-level corporate

misconduct, Enron's public condemnation was slowed because of its history of corporate philanthropy (Portney 2008). In contrast, BP's history of ignoring stakeholders led to huge costs in 2007 for violating pollution regulations, since the public was quicker to criticize (Heslin and Ochoa 2008). These two examples show how having a favorable image as a result of CSR can reduce costs associated with legal disputes.

Lastly, CSR performance can lead to improved relations with financial analysts and investors (Heslin and Ochoa 2008). This increase results because donating to a socially responsible firm can lead to benefits associated with a standard charitable donation, such as tax write-offs, and increased utility to the investor. Recent literature theorizes that a firm's value would be lower if it did not engage in CSR initiatives (Zivin and Small 2005: Baron 2009).[1] The personal values of an investor are important since they play a role in which firms are chosen as a good investment. The previous theories have the underlying assumption that investors care about social welfare, and recent data shows that socially responsible investing is becoming more prominent (Portney 2008). This increase in socially responsible investing may provide a motive for firms to increase their CSR in order to attract more investors.

All of these determinants of CSR have the same aim: to improve a firm's bottom line in order to increase competitiveness (Portney 2008). While CSR activities may be welfare-enhancing, there is some evidence of firms engaging in forms of CSR that benefit the firm but not society. First, a firm that is generally on the defensive about an issue

[1] Zivin and Small (2005) develop a model in which investors receive utility from consumption and donations. The model shows that when a firm changes policies to include CSR, the investor receives utility. In addition, if a large amount of investors have strong preferences for philanthropy, having social policies may maximize firm valuations. Baron (2009) also provides a model where consumers and investors receive utility from buying products or investing in firms, respectively.

might engage in CSR to deflect attention away from the actual problem (Portney 2008). In other words, a firm may use CSR in order to overshadow any bad publicity with some good publicity. Similarly, a firm may attempt to "greenwash" its public image by increasing its CSR transparency without comparable increases in the amount of effort used in CSR initiatives. Bazillier and Vauday (2010) find that "light greenwahsing" may be a credible strategy for certain firms based on empirical evidence.

These issues that result from CSR transparency demonstrate that studying the determinants of a firm initially engaging in CSR may not be an adequate representation of the extent of CSR actions in a firm. Anton, Deltas, and Khanna (2004) show that pressures from liability threats and pressures from consumers, investors, and external stakeholders play a significant role in the comprehensiveness of a firm's environmental management system (EMS). An EMS is a voluntary initiative within a firm for self-regulating pollution and other environmental performance metrics. Since both an EMS and CSR are voluntary multi-dimensional programs, the results that determine the comprehensiveness of an EMS are likely to be similar to the determinants of the extensiveness of a firm's CSR transparency.

This paper attempts to add to the literature by exploring the factors that contribute to the comprehensiveness of a firm's CSR transparency. The previous literature has focused on the binary decision to adopt a CSR policy or not, but has failed to examine the extent to which firm characteristics explain differences in the level of CSR a firm chooses to adopt.

III. Data

I use data from three sources, the Roberts Environmental Center (REC) at Claremont McKenna College (CMC), Standard & Poor's Compustat North America, and the Environmental Protection Agency (EPA). These data sources are ideal for my purposes as they include detailed information on environmental transparency (REC), financial characteristics (Compustat), and environmental exposure (EPA). I discuss each in turn.

The REC produces annual reports for various sectors (i.e., industries) characterizing the CSR efforts of the firms analyzed. Recent sector reports include the largest firms in each sector, up to 30 firms, based on Fortune 500 and 1000 rankings. Past reports include all firms that are ranked on the Fortune 500 and Fortune 1000 lists, and this number could exceed thirty firms. For each firm, the REC reports a score based on its Pacific Sustainability Index (PSI). The PSI is a comprehensive measure accounting for several aspects of CSR. Specifically, a firm's overall PSI score is a combination of sub-scores in the following six content areas: environmental intent, environmental reporting, environmental performance, social intent, social reporting, and social performance. Information is collected by student analysts who award points for specific questions in each content area based on information available through the firm's website. As such, PSI scores are based on the CSR image of the firm as projected from its website.

My analysis examines the firm characteristics that contribute to differences in a measure of environmental intent based on information from the REC reports. I focus on the environmental intent content area rather than the more comprehensive PSI score because inconsistencies across sector reports complicate a cross-industry analysis using

PSI scores. That is, PSI scores are not comparable across sector reports. Similar inconsistencies would arise if I instead focused on other content areas such as environmental reporting, social reporting, and social intent. The content areas focusing on environmental and social performance examine changes in the firm's performance since the previous time the firm was included in a report. While an interesting issue, exploring dynamic aspects of CSR is beyond the scope of my analysis. Thus, environmental intent provides the most appropriate measure of transparency and minimizes challenges associated with inconsistencies across sector reports.

To create the measure of environmental intent used in my analysis, which I refer to as EI Score, I collect information from various sector reports produced by the REC for the years 2009-2012.[2] In choosing reports for inclusion in my study, I focus on sectors that were likely to include publicly traded firms for whom I could readily access financial information and those with a domestic presence that would likely be subject to U.S. environmental regulations.[3]

I focus attention on the information that the REC reports use to create the reported score for environmental intent content area, which I refer to as the REC EI Score. The REC EI Score is the percentage of the total points possible that can be awarded based on responses for specific questions in the environmental intent content area. Some of the REC reports included in my analysis contain sector-specific questions in the environmental intent content area. Thus, the REC EI Scores are not comparable across

[2] See Appendix Table 1 for a list of reports used in the study.
[3] Excluded reports include New York Public Companies (2009), Entertainment (2009), China's Largest (2009), Pharmaceuticals (2009), Liberal Arts Colleges (2010), Airline (2010), U.S. Universities (2011), U.S. Cities (2011), Government Agencies (2011), U.S Universities (2012), and Global Capital Goods (2012).

industries. In order for my measure, EI Score, to be consistent across industries, it is created using only those questions in the environmental intent content area that are common across sector reports. This standardization involved deleting any unique sector-specific questions.[4] Table 1 shows the thirteen questions that are standard across all industries and are used to calculate EI Score.

Each question has a maximum of two points where one point indicates a discussion of intentions, visions, or plans, and one point is awarded for specific evidence of implementation. Therefore, EI Score is the percentage, ranging from 0 to 100, of points awarded out of a total of twenty-six possible points (i.e., a maximum of two points for each of the 13 questions). The fact that there are two points for each question is important since it reduces the ability of the firm to engage in greenwashing. If a firm is transparent in stating its intentions, visions, or plans but does not provide specific evidence of implementation, a firm can only receive discussion points, theoretically. This means that the maximum EI Score a greenwashing firm can receive is 50 (i.e., 13/26). This is not meant to say that a firm that scores 50 or below must be attempting to greenwash the public, but that the methodology of calculating the EI Score does not allow a greenwashing firm to score 100 (i.e., 26/26). This EI Score is used to create the dependent variable EI SCORE, which has a mean of 55.52 and a standard deviation of 26.75.

[4] Because of the standardization process, only some of the standardized *EI Scores* differ from *REC EI Scores*. The reports in which *EI Score* differs from *REC EI Score* include: Consumer Food, Food Production, and Beverages (2009), Chemicals (2009), Consumer Food, Food Production, and Beverages (2011), General Merchandisers (2011), Household, Apparel, and Personal Products (2012), and Chemicals (2012).

Data for firm financial characteristics are from Standard & Poor's Compustat North America dataset accessed from the Wharton Research Data Service (WRDS). Compustat provides fundamentals and market information for publically held North American firms. I collected data for onsite and offsite emissions from the Environmental Protection Agency (EPA) using the Toxic Release Inventory (TRI) tool. The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and the Pollution Prevention Act of 1990 mandate the EPA to collect data regarding toxic releases and transfers of specific chemicals annually.

Table 2 includes definitions and summary statistics for each variable collected from the various data sources. All variables measured in dollars are adjusted for inflation using the Consumer Price Index with a base year of 2011. In addition, continuous variables are lagged five years because I argue it takes time for a firm to respond to pressures from stakeholders, and an EI Score today is likely the result of these past pressures.

As mentioned earlier, firms may have incentives to become more environmentally transparent because of pressures from consumers, investors, the local community, and other stakeholders. The explanatory variables I include in my analysis proxy for these pressures. Specifically, firms whose production processes are highly polluting may feel increased pressure from the general community regarding their emissions. In this case, a highly polluting firm may benefit more from informing the public of its environmental record by making information transparent and accessible. All emissions variables are measured in thousands of pounds. ONSITE emissions are direct discharges from a facility into the surrounding area, while OFFSITE emissions are transferred from the

facility and eventually released elsewhere. These variables have means of 4,284.84 and 1,251.56 with standard deviations of 14,778.23 and 7,045.10, respectively. TOTAL RELEASES measures the total quantity of ONSITE and OFFSITE emissions produced by a firm based on the TRI data. TOTAL RELEASES has a mean value of 5,536.40 with a large standard deviation of 16,411.91. To allow for possible nonlinear effects of the returns to transparency, I also include the square of TOTAL RELEASES in the model.

The size of the firm, specifically the number of facilities it owns, might have an effect on the level of environmental transparency the firm adopts. The more polluting facilities a firm has, the more communities the firm's production activities may impact, thus creating a larger pool of stakeholders. The variable FACILITIES measures the number of facilities the firm owns that are subject to the reporting requirements of the TRI. The mean number of FACILITIES is 14.02 with a standard deviation of 15.79. In addition, to serve as a control for firm size with regards to emissions, the average emissions per facility (TOTAL RELEASES/FACILITIES) and emissions per sales dollar (TOTAL RELEASES/SALES) are included in the model. These variables have means of 416.74 and 724.24 with standard deviations of 1,468.47 and 2,354.28, respectively.

Even with the pressures faced from stakeholders, a firm needs to be able to respond to these pressures adequately. How adequately a firm is able to respond can be equated to the level of innovation of a firm. R&D/SALES is the ratio of R&D expenditures per unit of sales, which proxies for the level of innovation. R&D/SALES has a mean of 0.02 with a standard deviation of 0.03. If a firm is pressured to adopt CSR initiatives, how quickly and effectively it responds will be dependent on its level of efficiency and innovation. Thus, a firm with a high R&D/SALES ratio should be more

effective at changing policies than a firm with a with a lower R&D/SALES ratio, which should result in a higher EI SCORE.

To appear less risky to investors, a firm may have an incentive to become more environmentally transparent, which allows investors to track and monitor a firm's environmental performance. In addition, firms that are largely dependent on the capital market are likely to have increased environmental transparency. The firm's sales-to-asset ratio (SALES/ASSET) serves as a proxy for the degree to which a firm depends on capital markets. The mean and standard deviation for SALES/ASSET are 1.27 and 0.86, respectively. This ratio measures a firm's efficiency in managing its assets. A firm with a smaller sales-to-asset ratio requires a larger investment to generate sales revenue, and is thus more dependent on capital markets. If firms that are highly dependent on the capital market are more transparent, then they may have higher values of EI SCORE, all else equal.

Firms that produce final goods sell products directly to the consumer, as opposed to firms that sell intermediate products and have little direct contact with the end use consumer. Because of this relationship, firms that produce final goods may be more likely to feel pressure from consumers and may be more likely to increase their environmental transparency in response to such pressures. I follow the procedure used in Harrington and Khanna (2008), which uses 4-digit Standard Industrial Classification (SIC) codes, to create the dummy variable FINAL GOOD, which has a mean of 0.41 and

a standard deviation of 0.49. Firms that are classified as final good producers are given a value of one and all other firms are given a value of zero.[5]

Firms that are competitive abroad may face different pressures than those with only a domestic presence. A firm with an international presence has to compete with different firms and appeal to different types of consumers. If preferences for environmental quality are stronger abroad than they are domestically, then having an international presence may encourage a firm to increase its environmental transparency. Compustat North America characterizes firms as domestic, international, or both. By assigning a value of one to firms denoted as international or both, and zero to domestic firms, I created the dummy variable INTERNATIONAL, which has a mean of 0.24 and a standard deviation of 0.43. Finally, to control for any factors common to firms within particular industries that influence EI Score, I include industry fixed effects based on 2-digit Standard Industrial Classification (SIC) codes.[6]

IV. Empirical Analysis and Results

Before turning to a formal econometric analysis, I present the results of difference of means tests to provide some suggestive evidence on the relationship between EI SCORE and various firm characteristics. For continuous variables, I calculate the mean EI SCORE at the 25th and 75th percentile. For binary variables, I compute the mean EI SCORE for each value of the binary variable, 0 and 1. Table 3 reports these means and

[5] SIC codes categorized as final goods: 2000, 2030, 2040, 2060, 2080, 2082, 2085, 2090, 2111, 2250, 2253, 2511, 2531, 2621, 2731, 2750, 2771, 2820, 2834, 2840, 2842, 2844, 2851, 2870, 2911, 3011, 3089, 3420, 3430, 3523, 3570, 3571, 3577, 3579, 3630, 3640, 3651, 3661, 3711, 3721, 3841, 3842, 3845, 3861, 3911, 3942, 3944, 3949, 4100, 4813, 4833, 4922, 4953, 5000, 5013, 5094, 5110, 5141, 5160, 5172, 5200, 5331, 5411, 5651, 5661, 5731, 5990, 6159,6331, 7011, 7200, 7370, 7372, 7373, 7510, 8721, 9997.

[6] See Appendix Table 2 for the creation of industry fixed effects using 2-digit SIC codes.

their differences as well as p-values that indicate whether these differences are significant. The results suggest that differences in the mean EI SCOREs for ONSITE, OFFSITE, TOTAL RELEASES, FACILITES, TOTAL RELEASES/FACILITIES, SALES/ASSET, and INTERNATIONAL are statistically significant. For example, the 75^{TH} percentiles of TOTAL RELEASES and FACILITES have mean EI SCOREs that are 15.6 and 17.8 points higher than the mean EI SCOREs of the 25^{th} percentiles, respectively. Also, the mean EI SCORE for international firms is 17.9 points higher than the mean EI SCORE for domestic firms. While informative as they help to identify some firm characteristics that may help to explain differences in EI SCOREs across firms, the difference of means tests are limited in that they fail to isolate the influence of particular factors while holding constant the effects of others. A formal econometric model does not suffer from this limitation.

Following Anton et al. (2004)[7], I estimate the following empirical model:

(1) $$\text{EI SCORE}_{it} = \alpha_0 + D_{it}\beta + X_{it-5}\delta + \varepsilon_{it}$$

where EI SCORE represents the EI Score for firm *i* in reporting year *t*, *D* represents a vector of firm characteristics that are binary (FINAL GOOD, INTERNATIONAL, INDUSTRY FIXED EFFECTS), *X* represents a vector of firm characteristics that are continuous (R&D/SALES, SALES/ASSET, FACILITIES), and ε is an error term with the usual properties.

I estimate three specifications. Specification 1, the primary specification, follows specifications adopted in the literature and adds to equation (1) by also including TOTAL RELEASES and its square. Specification 2 is identical to Specification 1 but also

[7] Anton et al. (2004) investigated the determinants of the comprehensiveness of a firm's environmental management system (EMS).

includes industry fixed effects. While not of independent interest, the industry fixed effects can represent important controls in the analysis. Specification 3 is identical to Specification 1 except it replaces TOTAL RELEASES and its square with two emissions variables to distinguish between ONSITE and OFFSITE releases. This is attempting to see if there is any difference in having more ONSITE emissions versus OFFSITE emissions. It is important to take a look at these variables separately since ONSITE emissions occur at the facility and are more easily attributed to the firm. Specifications 4 and 5 attempt to take emissions relative to firm size into account by replacing TOTAL RELEASES and its square with TOTAL RELEASES/SALES and TOTAL RELEASES/FACILITIES, respectively (the latter specification also excludes FACILITIES in levels given it is included in the denominator of the ratio of TOTAL RELEASES/FACILITIES).

Table 4 presents the results.[8] The estimated coefficients on the first four variables included in Table 4 are consistent across all five specifications. The estimated coefficient on SALES/ASSET suggests lower EI SCORES among firms with higher SALES/ASSET ratios. A one unit increase in the SALES/ASSET ratio reduces EI SCORE by between 5.3 and 7.4 points depending upon the specification. A SALES/ASSET ratio of 1 means that a firm has an equivalent amount of net sales revenue to cover the costs of its assets. A higher SALES/ASSET ratio means that the firm is less reliant on investors since the firm will have more net sales revenue to cover the value of the assets. Thus, the negative and significant coefficient on this variable is consistent with expectations, based on Heslin and Ochoa (2008). The estimated coefficient on FINAL GOOD suggests that, relative to

[8] Appendix Table 3 looks at the same specifications with non-lagged variables, and the results are not qualitatively different from Table 4.

producing an intermediate produce, producing a final good increases EI SCORE by between 7.4 and 12 points. Being a FINAL GOOD producer means that a firm directly sells a good or service to the consumer, which makes consumers the firm's biggest stakeholder. This follows the intuition suggested by Portney (2008) that public pressures from direct consumers can significantly pressure a firm, and in this case, result in a higher level of environmental transparency.

The estimated coefficient on INTERNATIONAL suggests that, relative to solely domestic firms, being involved internationally increases EI SCORE between 16.6 and 17.1 points. This follows the expectation that having an international presence provides different pressures than being only involved domestically, and these pressures would result in a greater degree of environmental transparency. First, being involved internationally involves increased competition with the increased number of international firms. These firms may be more transparent than domestic firms for various reasons, and in order to keep being competitive, increasing transparency might be necessary. Second, international consumers might have different values than domestic consumers. If consumers in other countries value environmental initiatives more, it makes sense that international firms might feel pressured to become more transparent. Finally, international firms may be subject to different legal requirements regarding environmental transparency, which would cause them to have a higher level than a similar domestic firm.

The estimated coefficient on FACILITIES suggests an increase in EI Score of between 0.4 and 0.5 points from each additional facility. This is consistent with Heslin and Ochoa's (2008) argument that firms with a larger number of polluting facilities will

need to increase their environmental transparency since they will have a larger number of external stakeholders. Also, it may be easier for a larger firm to become more transparent because of higher levels of efficiency. In addition, larger firms may have a larger pool of stakeholders from the various communities in which their facilities operate, resulting in a greater pressure for transparency. The results of Specification 2 suggest that while the industry fixed effects are jointly significant, their inclusion does not substantially change the results. The inclusion of the industry fixed effects is, however, important since various industries have different pressures that may contribute to the overall level of environmental transparency adopted by firms within each industry. For example, firms in the chemical industry are likely to face different pressures than firms in the retail industry, and therefore will have different factors contributing to their respective levels of environment transparency.

The estimated coefficient on R&D/SALES is not statistically significant. This is inconsistent with the finding of Anton et al. (2004), of a more comprehensive EMS among firms with higher values of R&D/SALES. Two factors may explain the divergent results. First, innovation could have a differential impact on the incentives to adopt a more comprehensive EMS than on those to be more environmentally transparent. Second, the variable R&D/SALES could be a poor proxy for innovation. In theory, it should be easier for a firm with a high level of innovation to have a higher level of transparency. However, this insignificance may stem from the fact that CSR initiatives are adopted over time. Having a high level of innovation might be important when initially implementing CSR initiatives throughout the firm, but this may subside over time. In addition, using

R&D may actually be capturing some element of firm size, rather than innovation as intended (i.e., larger firms can afford to engage in R&D over smaller firms).

Finally, the only environmental variable that has a significant effect on EI SCORE is ONSITE releases, which has an estimated coefficient of 0.2 for every one million pounds of toxic emissions. The other emissions variables, TOTAL RELEASES, and OFFSITE, do not have statistically significant coefficients. In addition, the variables that attempt to control for firm size, TOTAL RELEASES/SALES and TOTAL RELEASES/FACILITIES, do no have statistically significant coefficients. This does not follow the expectation that firms releasing excessive amounts of total pollutants would benefit from higher levels of environmental transparency. These results suggest that only firms with extremely high levels of direct pollution from their facilities increase their transparency. Therefore, since onsite releases can be directly traced to the firm, this increased transparency may actually be an attempt at greenwashing, which is consistent with Portney (2008), who explains that a firm might engage in CSR to draw attention away from other problems.

V. Conclusions

CSR represents a growing aspect of many corporations operations, and subsequently sparks a lot of discussion as to what would motivate a firm to conduct certain activities. The previous literature has focused on why a firm would engage in voluntary CSR, but no existing study focuses on why a firm would adopt various levels of transparency when voluntarily reporting CSR activities. This study utilizes a measure for environmental transparency provided by the Roberts Environmental Center (REC) at

Claremont McKenna to see if firm and environmental characteristics, collected from Compustat North America and the Environmental Protection Agency, are determinants of this measure. The econometric results show that the determinants of environmental transparency are largely consistent with what pressures a firm into CSR in the first place. These results show that various stakeholder pressures, such as consumers, investors, and the general community, push firms into adopting various voluntary initiatives.

The results also suggest that firms may be involved in aspects of greenwashing. This is consistent with the findings that overall total toxic releases do not contribute to the level of environmental transparency, but onsite toxic releases do. Firms are well aware that onsite emissions are most easily attributed to them. Thus, the firm can respond in two possible scenarios: creating an increased level of transparency to please the public or transferring emissions offsite. The latter is evident in some firms by the fact that increased offsite emissions do not significantly affect the overall level of transparency.

Using REC reports and matching data with Compustat and the EPA resulted in a lower than anticipated number of observations. Ideally, it would have been better to have a measure for environmental transparency that encompassed more firms so more observations could have been utilized in the econometric analysis. This would also increase the relevance of the empirical findings to a more diverse set of industries.

It will be interesting to see what future studies regarding CSR and transparency reveal. First, a study should examine if these results are comparable using a different measure of environmental transparency. In addition, another study should compare various aspects of CSR transparency and see if there are any differences in the determinants. For example, whether or not there are significant differences in the

determinants of environmental transparency, social transparency, and overall CSR transparency.

Finally, it will be interesting to see what future legislation regarding firm responsibility takes place. It seems that most firms have specific market pressures that initiate CSR and transparency efforts. It would be worthwhile to analyze whether CSR in countries where it is mandated is as effective as CSR in countries with no formal legislation.

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Tables

TABLE 1—PSI QUESTIONS AND TOPICS USED TO STANDARDIZE THE ENVIRONMENTAL INTENT SCORE

PSI ID #	Question Topic
4	Report contact person
5	Environmental visionary statement
6	Environmental impediments and challenges
9	Environmental policy statement
10	Climate change/global warming
11	Habitat/ecosystem conservation
12	Biodiversity
13	Green purchasing
16	Environmental education
19	Environmental management structure
20	Environmental management system
21	Environmental accounting
23	Stakeholder consultation

TABLE 2—DESCRIPTION AND SUMMARY STATISTICS OF VARIABLES

Dependent Variable	Description	Mean	Std. dev.
EI SCORE	Score of environmental transparency	55.52	26.75
Independent Variables	**Description**	**Mean**	**Std. dev.**
$ONSITE_{t-5}$	Onsite discharges of toxic emissions (‘000 pounds)	4,284.84	14,778.23
$OFFSITE_{t-5}$	Offsite transfers of toxic emissions (‘000 pounds)	1,251.56	7,045.10
TOTAL $RELEASES_{t-5}$	Total toxic emissions (onsite + offsite) (‘000 pounds)	5,536.40	16,411.91
$FACILITIES_{t-5}$	Number of facilities with toxic emissions	14.02	15.79
TOTAL RELEASES/ $FACILITIES_{t-5}$	Average total toxic emissions per facility	416.74	1,468.47
TOTAL $RELEASES/SALES_{t-5}$	Total toxic emissions-sales ratio (pounds per dollar)	724.24	2,354.28
$R\&D/SALES_{t-5}$	R&D expenditures-sales ratio	0.02	0.03
$SALES/ASSET_{t-5}$	Sales-total assets ratio	1.27	0.86
FINAL GOOD	Dummy (= 1 if firms sell final goods; = 0 otherwise)	0.41	0.49
INTERNATIONAL	Dummy (= 1 if firms active abroad; = 0 otherwise)	0.24	0.43

N = 177

TABLE 3—DIFFERENCES IN THE MEAN EI SCORE FOR THE TOP AND BOTTOM PERCENTILES OF THE INDEPENDENT VARIABLES

Continuous Variables	Percentile 25	Percentile 75	Difference
$ONSITE_{t-5}$	45.56	63.50	-17.95***
			(0.00)
$OFFSITE_{t-5}$	46.92	57.09	-10.17**
			(0.05)
$TOTAL\ RELEASES_{t-5}$	46.67	62.31	-15.64***
			(0.00)
$FACILITIES_{t-5}$	44.00	61.81	-17.81***
			(0.00)
$TOTAL\ RELEASES/\ FACILITIES_{t-5}$	48.03	58.55	-10.51*
			(0.07)
$TOTAL\ RELEASES/SALES_{t-5}$	52.05	53.08	-1.03
			(0.85)
$R\&D/SALES_{t-5}$	53.79	61.97	-8.27
			(0.12)
$SALES/ASSET_{t-5}$	63.81	52.53	11.28**
			(0.04)
Binary Variables	**Value 0**	**Value 1**	**Difference**
FINAL GOOD	53.04	59.13	-6.09
			(0.14)
INTERNATIONAL	51.18	69.05	-17.88***
			(0.00)

N=177
P-values are in parentheses
All values rounded to two decimal places
*Statistically significant at the 10% level; **statistically significant at the 5% level;
***statistically significant at the 1% level

TABLE 4—DETERMINANTS OF ENVIRONMENTAL TRANSPARENCY SPECIFICATIONS

Variables	(1)	(2)	(3)	(4)	(5)
$R\&D/SALES_{t-5}$	-82.99	-42.81	-81.71	-93.60	-73.01
	(66.36)	(80.80)	(66.11)	(64.45)	(69.07)
$SALES/ASSET_{t-5}$	-7.16***	-5.35***	-6.56***	-7.43***	-6.82***
	(1.80)	(1.98)	(1.85)	(1.75)	(2.03)
FINAL GOOD	8.60**	12.00***	8.53**	8.11**	7.39*
	(4.02)	(4.35)	(3.89)	(3.92)	(3.99)
INTERNATIONAL	16.95***	16.66***	16.58***	17.14***	17.12***
	(4.80)	(4.87)	(4.64)	(4.72)	(4.98)
$FACILITIES_{t-5}$	0.39***	0.50***	0.36***	0.41***	
	(0.11)	(0.11)	(0.10)	(0.10)	
$TOTAL\ RELEASES_{t-5}/1000$	-0.09	-0.21			
	(0.43)	(0.35)			
$TOTAL\ RELEASES_{t-5}/1000\ (Square)$	0.00	0.00			
	(0.00)	(0.00)			
$ONSITE_{t-5}/1000$			0.19**		
			(0.10)		
$OFFSITE_{t-5}/1000$			-0.38		
			(0.24)		
$TOTAL\ RELEASES/SALES_{t-5}$				0.00	
				(0.00)	
$TOTAL\ RELEASES/FACILITIES_{t-5}$					0.00
					(0.00)
INTERCEPT	53.12***	56.70***	52.55***	53.86***	58.33***
	(4.07)	(9.12)	(4.06)	(4.08)	(3.83)
INDUSTRY FIXED EFFECTS	NO	YES***	NO	NO	NO
R^2	0.197	0.248	0.214	0.195	0.138

N = 177
Robust standard errors are in parentheses
All values rounded to two decimal places
*Statistically significant at the 10% level; **statistically significant at the 5% level;
***statistically significant at the 1% level

Appendix

APPENDIX TABLE 1—ROBERTS ENVIRONMENTAL CENTER (REC) REPORTS USED IN THIS STUDY

Year	Industry
2009	Consumer Durables and Motor Vehicles
2009	Forest and Paper Products
2009	Consumer Food, Food Production, and Beverages
2009	Utilities, Gas, and Electric
2009	Energy and Utilities
2009	Capital Goods - Industrial and Farm Equipment
2009	Chemicals
2010	Aerospace and Defense
2010	Mining, Crude Oil, and Oil Production
2010	Petroleum Refining
2010	Metals
2011	Consumer Food, Food Production, and Beverages
2011	General Merchandisers
2011	Energy and Utilities
2012	Consumer Durables and Motor Vehicles
2012	Household, Apparel, and Personal Products
2012	Chemicals

APPENDIX TABLE 2—CREATION OF INDUSTRY FIXED EFFECTS

Industry	2-digit SIC
Agriculture, Forestry, and Hunting	01, 02, 07, 08, 09
Mining	10, 12, 13 ,14
Construction	15,16,17
Manufacturing	20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39
Transportation, Communications, and Utilities	40, 41, 42, 44, 45, 46, 47, 48, 49
Wholesale Trade	50, 51
Retail Trade	52, 53, 54, 55, 56, 57, 58, 59
Financial, Insurance, and Real Estate	60, 61, 62, 63, 64, 65, 67
Service Industries	70, 72, 73, 75, 76, 78, 79, 80, 81, 82, 83, 84, 86, 87, 89
Auxiliaries	91, 92, 93, 94, 95, 96, 97, 99

Source: United States Census Bureau

APPENDIX TABLE 3—DETERMINANTS OF ENVIRONMENTAL TRANSPARENCY SPECIFICATIONS (NON-LAGGED)

Variables	(1)	(2)	(3)	(4)	(5)
$R\&D/SALES_t$	41.89	102.13	27.46	29.99	34.93
	(88.46)	(99.70)	(91.00)	(88.57)	(92.77)
$SALES/ASSET_t$	-9.31***	-5.83	-9.47***	-9.61***	-8.33**
	(3.27)	(4.00)	(3.21)	(3.22)	(3.55)
FINAL GOOD	7.27*	10.42**	6.77*	7.05*	6.56*
	(3.80)	(4.18)	(3.77)	(3.75)	(3.87)
INTERNATIONAL	13.08***	14.11***	13.26***	13.85***	13.90***
	(4.33)	(4.46)	(4.37)	(4.35)	(4.48)
$FACILITIES_{t-5}$	0.41***	0.48***	0.41***	0.42***	
	(0.13)	(0.13)	(0.10)	(0.10)	
$TOTAL\ RELEASES_t/1000$	-0.02	-0.19			
	(0.41)	(0.37)			
$TOTAL\ RELEASES_t/1000$ (Square)	0.00	0.00			
	(0.00)	(0.00)			
$ONSITE_t/1000$			0.22***		
			(0.06)		
$OFFSITE_t/1000$			-1.79***		
			(0.58)		
$TOTAL\ RELEASES/SALES_t$				0.00	
				(0.00)	
$TOTAL\ RELEASES/\ FACILITIES_t$					0.00**
					(0.00)
INTERCEPT	53.33***	37.78**	54.32***	53.83***	57.61***
	(4.07)	(15.21)	(4.72)	(4.80)	(4.62)
INDUSTRY FIXED EFFECTS	NO	YES***	NO	NO	NO
R^2	0.191	0.232	0.215	0.183	0.135

N =180
Robust standard errors are in parentheses
All values rounded to two decimal places
*Statistically significant at the 10% level; **statistically significant at the 5% level;
***statistically significant at the 1% level.