ABSTRACT

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Directed By: Professor Sally S. Simpson
Department of Criminology and Criminal Justice

This work integrates three bodies of literature, namely that on corporate crime, environmental performance, and corporate citizenship. Traditionally, corporate crime researchers have failed to (1) measure environmental crime with self-reports and (2) integrate theoretical explanations of compliance and overcompliance. At the same time, the environmental performance literature has not fully explored the relevance of the parent company. This investigation addresses this intersection by studying firm-level environmental performance. In particular, it adds corporate citizenship—the degree to which firm culture promotes or inhibits a moral commitment to society that is broader than "mere compliance"—as a new explanation for environmental behavior. The results vary according to the measure of citizenship, but generally suggest that citizenship adds little to our understanding of environmental performance. The discussion section considers the limitations of these data, as well as the theoretical and policy implications of the findings.

CORPORATE CITIZENSHIP, SANCTIONS, AND ENVIRONMENTAL CRIME

By

Carole Elizabeth Gibbs

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Advisory Committee:
Dr. Sally S. Simpson, Chair
Dr. David Weisburd
Dr. Peter Reuter
Dr. Laure Brooks
Dr. John Horowitz

Dedication

This dissertation is dedicated to the memory of Douglas A. Smith (1954 – 2004).

Thank you for passing on your knowledge, for giving me your time, and most of all for your patience. I appreciated the training I received from you, but missed your guidance, in every step of this analysis. Those of us who were lucky enough to learn from you continue with your traditions. The “wheel of woe” and the asking of “naïve” questions have not stopped. And, in honor of you, I will forever drive Sally crazy by calling her my “mentrix.”

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CHAPTER 1: INTRODUCTION

Despite the extent and cost of corporate crime (Clinard and Yeager, 1980; Simpson, 2002; Sutherland, 1961), it receives substantially less research attention than street crime, even in the current context of headline making corporate scandals (e.g., Enron, WorldCom, etc). Criminology and criminologists have focused almost exclusively on violence, property, and drug crimes, offenses generally associated with society's lower classes. However, a small body of work has accumulated on the etiology of corporate crime and, to a lesser extent, the control of corporate crime.

On the etiological side, criminologists have found an association between a variety of company characteristics and corporate misconduct. Empirically, factors such as corporate structure (e.g., diversification, structural complexity, and size), finances (e.g., profitability), political environment, and corporate culture have been linked to corporate crime. Although the results are not always consistent, as a whole they suggest that firm-level factors are important to understand corporate crime.

On the control side, the deterrent effect of regulation has been the main emphasis. Studies have assessed the specific deterrent effect of EPA inspections (Deily and Gray, 1991; Gray and Deily, 1996; Laplante and Rilstone, 1996; Liu, 1995; Magat and Viscusi, 1990; Nadeau, 1997); EPA enforcement (Nadeau, 1997); and OSHA plant and industry inspections (Cooke and Gautschi, 1981; Gray and Scholz, 1993; Robertson and Keeve, 1983; Scholz and Gray, 1990;). However, there is relatively little work on deterrence at the firm-level and those studies are inconclusive; some show a deterrent effect while others find little enforcement response (Block, Nold, and Sidak, 1981; Braithwaite and Makkai, 1991; Jamieson, 1994; Simpson and Koper, 1992).

Bad Corporate Actors

Most of this research attempts to distinguish the characteristics of offenders and, to a lesser extent, how to return these offenders to compliance. The focus then is on the "bad corporate actors." Similar to the "hot spots" and cohort studies that identify chronic offenders, these studies identify and classify the criminal corporation, plant, or facility. Sutherland, for instance, found that 97 percent of the offenders in his sample of 70 corporations were recidivists and another 60 percent could be classified as habitual offenders (1961). Clinard and Yeager (1980) show that 50 percent of the 477 manufacturing corporations in their study re-offended during a two year tracking window (1975-1976). Although the percent of chronic offenders is much smaller, one can find similar patterns when looking at the environmental offender (Bandyopadhyay and Horowitz, 2006; Magat and Viscusi, 1990).

Extreme Volunteerism

Yet, criminologists have virtually ignored the flip side of the coin—the substantial degree of compliance and overcompliance among firms. Rates of compliance are particularly high in the type of crime of interest in this study--environmental crime. Studies of pulp and paper mills using data from the 1980s (Magat and Viscusi, 1990) and in the 1990s (Kagan, Gunningham, and Thornton, 2003) find compliance rates of 75 or higher. Overcompliance is also high. In a sample of mostly water treatment plants, Bandyopadhyay and Horowitz (2006) find that plants pollute only 60 percent of their permitted levels. This overcompliance is not limited to plants; firms also go above and beyond legal requirements and are encouraged to do so. For instance, the Environmental Protection Agency operates several programs in which firms may *volunteer* to reduce

pollution beyond what is required by law, including Green Lights (which later partnered with Energy Star Buildings Program), 33/50, and Wastewise programs.

This sort of compliance and even overcompliance occurs despite less than rigorous regulation. EPA policy states that facilities considered *major* sources of pollution must be inspected *once* per year. However, given the lack of resources at EPA and the enormity of the regulation task, this small amount of monitoring may not even be carried out. When violations are detected, penalties are limited. The bulk of the response to EPA violations is informal, cooperative in nature, and relatively lenient (Harrington, 1988; Hunter and Waterman, 1996). With the low risk of enforcement and the limited nature of the penalties, one might expect firms to pollute freely. Yet, they do not.

Explaining Compliance

Criminology has shown little interest in this extreme compliance and overcompliance. Hirschi's (1969) argument that we should shift the focus from studying crime to studying conformity has not filtered its way into the criminological work on corporate crime. Yet, we must ask: Why do firms comply with the law? Traditional economic models assume that regulation explains both compliance and noncompliance. Thus, firms are only likely to take costly measures to improve performance when it is likely that they will be caught and penalized. Yet, this assumption of "amoral calculators" does not explain why profit-maximizing companies would comply with laws that are weakly enforced (Kagan et al., 2003). Additional explanations are required to understand why firms comply (and even overcomply) with legal requirements when regulation is lax. As Kagan and colleagues state: "the degree of variation in, and the

motivation for, corporate behavior may be much broader than many researchers have imagined" (p. 52).

Corporate Citizenship

Although often overlooked in the criminological work on corporate crime, firms might comply because of moral obligation, or duty. The "normative case" for compliance can be grounded formally in theories of moral philosophy such as social contract theory. Corporations exist in society only with the cooperation and commitment of society. Thus, there is an implicit agreement that in order to have a "license to operate," firms must be responsive to societal needs (Smith, 2003). Firms may vary in the extent to which firm culture promotes ethical actions beyond what the law requires; the moral duty or obligation to contribute to and be responsive to societal needs. This "business ethics" approach to compliance suggests that firms can be arrayed on a continuum of corporate social performance or corporate citizenship, but this idea and its implications for the etiology and control of corporate crime has not made its way into criminology in a substantive way.

Current Study

In this study, I will explore the implications of corporate citizenship for understanding corporate compliance and returns to compliance. In theory, corporate citizenship may help explain the variation in compliance that does not seem to be accounted for by regulation. Corporations that take duty seriously, that are a different type of firm, may be less likely to offend. As Clinard and Yeager (1980) note, "A corporation that emphasizes profits above business ethics and ignores corporate

responsibility to the community, the consumers, or society is likely to have difficulty complying with legal norms" (p. 58).

The concept may also inform our understanding of how firms respond to sanctions. There is considerable variability in sanction response across companies. In the event of noncompliance, EPA generally begins sanctions at the lowest level of severity—warning letters or phone calls. Many firms return to compliance with this limited intervention. Yet, others do not. In these cases the EPA is forced to increase the severity of penalties to achieve a return to compliance. Corporate citizenship may account for these different responses to sanctions. As with the individual-level deterrence studies, sanction effects may vary because the main effects mask differences in the effect of sanctions by firm type; companies that are "good citizens" in the social performance arena can be considered a different type of firm than those that care less about social responsibilities. Firms on the high end of corporate social performance theoretically should have better compliance records, however, even good citizens may still have instances of noncompliance. Bandyopadhyay and Horowitz (2006) notes that certain seasons and random high-level discharges are problematic for many plants. In the event of noncompliance, good citizens may be more likely return to compliance even when the sanction is low. Those lower on the continuum of citizenship may need more stringent enforcement to achieve the same result.

It is important to bring corporate citizenship into criminology because the concept can inform both academic work and policy. Criminologists have explored a variety of firm-level factors that might lead to non-compliance, but have overlooked potential explanations for extreme compliance. Adding corporate citizenship to models of

corporate compliance may expand our knowledge of the etiology of corporate crime. In addition, if companies vary in citizenship in a way that is related to compliance, it may help regulators target limited enforcement resources. Regulators may be able to reduce the frequency of inspections for good citizens and redirect the time and resources toward the "bad corporate actors" (Ayres and Braithwaite, 1992; Gray and Scholz, 1993). Finally, there is little guidance for regulators to determine what kind of penalty to impose (aside from high evidentiary requirements for moving to the judicial system) on noncompliant firms. Information on corporate citizenship may help regulators determine what sort of penalty would be most effective at returning firms to compliance. The "bad" firm may require harsher, punishment-oriented strategies while the noncompliance of "good" firms may be resolved with more cooperative actions (Scholz, 1984). Studying these questions in relation to environmental crime is particularly important because of the potential harm associated with water (and other kinds of) pollution. For instance, reducing the level of oxygen in the water or dramatically changing the temperature kills aquatic organisms and disrupts the food chain. The damage is not limited to wildlife and the environment; toxic chemicals released into waterways can cause birth defects and death if ingested.

I will explore the etiology and control of environmental crime using a unique data set. These data build on the existing corporate crime literature by measuring noncompliance earlier in the process and by allowing for a more sophisticated construction of the dependent variable. In the few existing studies, researchers rely primarily on court case data to identify corporate environmental offenders. The data used in the current study are collected much earlier in the system. The Clean Water Act

(CWA) requires plants to report monthly water pollution levels to the Environmental Protection Agency (EPA). When pollution levels are higher than permitted amounts, the EPA has the authority to use sanctions (e.g., warning letters, administrative actions, civil and criminal cases). Thus, these self-report data circumvent the selection problem inherent in court case data (particularly in the environmental arena). In addition to providing information earlier in the crime production process, the self-report data allow the examination of gradations of conformity (compliance versus overcompliance). Self-reported pollution limits and discharges can be used to construct the degree of compliance and track it over time. Thus, with this unique data set, I can explore the relationship between citizenship and violations, compliance, and overcompliance.

These data also add to the environmental literature because they are designed to test firm-level questions. Researchers that have used EPA self-reports to examine environmental performance construct samples at the plant-level. However, the corporate crime literature suggests that firm characteristics (e.g., structure and culture) may produce similar records across plants owned by the same firm; thus, examining environmental performance at the firm-level may provide additional insight regarding the etiology of environmental behavior. In the current data, the sample was created at the firm-level and then plants owned by the firm were tracked. The data represent a universe of firms operating in the pulp and paper, steel, and oil industries in 1995 and all of their major water plants (in the same industry).

Although the questions of interest are ultimately posed at the firm-level, the descriptive analysis will begin at the plant-level. Given that the firm-level unit of analysis is new, it is important to explore the patterns of environmental behavior at both

levels. To compare to other environmental work, three measures from the previous literature are used to describe the plant-level patterns: a dichotomous measure of violation/compliance; the number of violations; and the compliance ratio (portion of limit that is discharged). The plant-level environmental information is next aggregated to the firm-level (by combining all plants owned by each company) and the patterns of environmental performance are described with the same measures at the firm-level. Given the research questions and their grounding in the corporate crime literature, the questions of interest are ultimately explored at the firm-level. Data on traditional predictors of firm misconduct such as firm size and finances have also been gathered. Added to these data are two corporate citizenship measures that allow an examination of the effect of corporate citizenship on environmental performance and returns to compliance. Given the complexities, newness, and limitations of the data, I explore these questions in a primarily descriptive way (i.e., correlations, mean differences, and simple regression models).

In the next section, I begin with a discussion of environmental crime and the legislation that created this analytic concept. Because the data utilized are drawn from the Clean Water Act, this piece of legislation is the main focus. Next, the definitions and assumptions of the corporate crime literature that suggest the need to examine firm-level environmental performance are outlined before moving into the relevant theoretical and empirical literature at the firm- and plant-level.

CHAPTER 2: BACKGROUND AND LITERATURE

In the United States, efforts to protect the environment began over 100 years ago (i.e., the Refuse Act of 1899) and environmental legislation has since grown (Shover and Routhe, 2005). Although federal legislation existed prior to the 1960s and 1970s, the majority of environmental protection laws were passed during this period of environmental activism (Clifford, 1998). Toward the end of the 20th century legislators extended the list of environmentally harmful behaviors by passing the Clean Air Act (1963); the Federal Water Pollution Control Act (1972); the Resource Conservation and Recovery Act (1976); the Clean Water Act (1972); the Toxic Substances Control Act (1976); and the Comprehensive Environmental Response, Compensation and Liability Act (1980). The Environmental Protection Agency (EPA) is charged with implementing and overseeing these pollution control acts. It was created in 1970 by executive order to be one of the agencies that regulates and manages health and environmental policies passed by Congress. The EPA has no overall environmental protection strategy; legislation and regulation vary for each pollution control act (Clifford, 1998). Water pollution regulations, the focus of this study, are among the few laws that require firms to submit self-reports of pollution behavior.

The first comprehensive federal regulation of water pollution was the Federal Water Pollution Control Act of 1972. In 1977 the act was amended and renamed the Clean Water Act (CWA). It was amended again in 1981 and a new Clean Water Act was passed in 1987. The ultimate goal of the acts was to reduce water pollution from point

source;[1] thus, the acts created the National Pollution Discharge Elimination System (NPDES) to regulate the discharge of pollutants into the water. Potential polluters must submit an application for a permit to discharge and are assigned technology-based limits (Clifford, 1998; Freedman and Jaggi, 1993). Industrial users must submit reports (usually monthly) of permitted and actual levels of pollutants released into the water.

The environmental movement and subsequent legislation spawned the term "environmental crime." Because this is a relatively new analytic and legislative designation, definitional clarify has not yet been achieved. This ambiguity is due in part to the diversity of behaviors that could be called environmental crime (e.g., ranging from littering to wildlife endangerment to intentional discharge of hazardous substances into waterways) and variation in the potential harm associated with these acts. Environmental crime can be defined legally as a violation of statutes designed to protect the ecological and physical environment (Shover and Routhe, 2005). Some authors argue that the use of the word "crime" requires that the act fall under criminal law, which requires proof of intent; other violations should be called environmental "illegalities" (Shover and Routhe, 2005). Yet, the law makes no such distinction. Under the CWA, criminal sanctions may be used for violations designated as negligent, knowing, knowing endangerment, or knowing falsification of information or tampering with monitoring equipment (Clifford, 1998). For example, violations may be designated as "negligent" if a company dumps a highly toxic chemical into a local river without knowledge about potential harm if the company should have known that the chemical would cause considerable damage

[1] A point source is an identifiable waste stream, usually a pipe or a ditch that is tied to an industry or facility (Clifford, 1998; Freedman and Jaggi, 1993). Point sources are contrasted with nonpoint sources—"an unconfined contamination of water from the land into a body of water" (Clifford, 1998, p. 100). Examples of nonpoint sources include runoff from city streets or agricultural fields (Clifford, 1998).

(Clifford, 1998). Thus, legally, criminal enforcement of the CWA does not require intent.[2] In addition, Sutherland argues for the inclusion of behaviors that fall under regulatory law in the study of crime because the only distinction between regulatory violations and "crime" is the process by which they are sanctioned (see above). For this study, environmental crime is defined as acts that violate legislative requirements, whether punishable by civil, regulatory, or criminal sanctions. Environmental crimes may be too diverse to make blanket statements that apply to every subtype. Thus, it is important to focus on narrowly defined forms of environmental crime to advance theoretical understanding and inform policy decisions while also assessing similarities and differences across crime types to build more general knowledge (Shover and Routhe, 2005). To this end, I focus on one type of environmental crime: industrial discharges.

At the facility-level, industrial discharges are the result of complex production processes and may have many determinants aside from deliberate human or corporate action. For example, industrial discharges that are above the permitted levels are sometimes the result of uncontrollable factors such as seasonal weather patterns and random spikes (Bandyopadhyay and Horowitz, 2006). Some might also consider environmental performance to simply be the result of production levels; when production is low the facility will comply or even overcomply (pollute significantly less than legally allowed). However, these factors do not eliminate the behavioral component. In fact, it

[2] The legislation has little guidance as to where the line falls between administrative, civil, and criminal enforcement. Thus, in practice, those cases that receive the most severe enforcement (criminal) are those in which intent can be established (Clifford, 1998). Because of the difficulty associated with establishing intent in environmental crimes, criminal sanctions are rarely utilized (Clifford, 1998).

may be much stronger than one might assume.[3]

The bulk of previous work on environmental performance has been conducted at the facility-level (e.g., plants, mills, and oil refineries) because facilities hold environmental permits. Yet, plants are often owned by larger entities—corporations. As shown in Figure 1A and 1B, the structure of the corporation and its ancillary units can take two different forms (i.e., functional or multidivisional). Each organizational structure has implications for how the corporation/parent company interacts with its subsidiaries and facilities. The parent company has more direct control over daily decisions in the functional form while the ancillary units are more independent in the multidivisional form. Regardless, in both forms the levels of management in each

[3] First, seasonal variations are built into permits; facilities are given higher limits on pollution during problematic seasons (e.g., during extremely cold months some facilities are given higher limits on pollution because they cannot run as efficiently). The EPA also attempts to take random spikes into account when constructing permits. For example, although monthly limits are more stringent (to achieve an overall low level of pollution), facilities are given higher limits for daily pollution levels to account for random spikes. While one might argue that the leniency given during certain months or on a daily basis are not enough to address the problem, these issues are built into the permit to some degree. Thus, any remaining differences across firms in environmental performance (violations, compliance, or overcompliance) are likely the result of steps the firm has taken (e.g., technology, equipment, checks on the system) to achieve the desired performance.

Second, production levels are built into permits. Permits are based on an estimate of actual production levels, rather than plant capacity. In addition, permits can even include tiered limits—limits that vary according to current production levels. Research also indicates that environmental performance is not simply the result of production levels. Kagan et al. (2003) find that production and environmental performance are not even closely correlated. In their sample of 14 pulp and paper mills, the correlation between production and two types of pollutants are low and are not statistically significant. As the authors note, "The efficacy of primary and secondary effluent treatment systems varies primarily *not with the volume of wastewater processed* but with the *capacity and efficiency of the systems* and *how well they are maintained and operated*" (p. 61, italics added). Larger mills have to build larger systems to have pollution levels similar to those of smaller mills, but can maintain a clean record if the equipment and controls are well designed and operated (Kagan et al., 2003).

Overall, factors such as season, randomness, and production may account for some variation in environmental performance. However, it is unlikely that these factors account for all of the variation. Evidence suggests a behavioral element to environmental performance. If the remaining variation is all due to accidents and human error, then the patterns of environmental performance should not be predictable.

subunit connect all units to the parent company and its policies. While it is important to recognize the different units involved in industrial pollution, the corporate crime literature provides compelling reasons for exploring firm-level compliance.

INSERT FIGURES 1A and 1B HERE

Corporate Crime: Definitions and Distinctions

Although falling under regulatory law and commonly referred to as "noncompliance" rather than "crime," Sutherland justifies the criminological study of illegal (non-criminal) acts in his seminal work—*White-Collar Crime*.[4] Sutherland (1961) referred broadly to crime committed in the course of one's occupation as "white-collar crime," but typological definitions of white-collar crime have since parceled out a smaller number of more homogeneous behaviors for study (Braithwaite, 1985). Corporate crime has been distinguished from other forms of white-collar crime by the motivation for and the beneficiary of the offense. Clinard and Quinney (1973) distinguish corporate crime from occupational crimes as those committed by corporate officials (and the corporation itself) for the corporation. Similarly, Braithwaite (1984) defines corporate crime as "conduct of a corporation, or of employees acting on behalf of a corporation, which is

[4] Sutherland argued that the main difference between crimes of the lower class and white-collar crimes was the implementation of the law. People in positions of power have control over what becomes law and what body of law their behaviors fall under. Studying convicted offenders limits the true variability in crime because few white-collar criminals are criminally convicted. Definitions of white-collar crime must go beyond the criminal law to include regulatory violations; behaviors that would have a reasonable expectation of conviction if tried; and behaviors that would result in conviction if not for social or political influence. Thus, Sutherland subsequently defined white-collar crime as "a crime by a person of high social status and respectability in the course of his [sic] occupation" (Sutherland, 1949, p. 9).

proscribed and punishable by law" (p. 6).[5]

These definitions clearly prioritize the organizational context as a conceptual key to understanding corporate crime.[6] It is argued that "most corporate crimes cannot be explained by the perverse personalities of their perpetrators" (Braithwaite, 1984, p. 2). Instead, these definitions locate the causes of corporate crime in the goals, structure, and culture of the organization (Pearce, 2001). The organizational goal most commonly linked to crime is profitability. In the context of slowing or falling profits, managers and employees may resort to criminal practices to attain performance goals (Shover and Bryant, 1993). Structural complexity refers to the degree of spread and segmentation in an organization's structure. The argument is that complexity may provide opportunity because it decreases communication and managerial control (Finney and Lesieur, 1982). Corporate culture, generally thought of as a shared set of norms and values that give rise to typical behavior patterns, may contain crime-facilitative components (Shover and Bryant, 1993).

As with corporate crime in general, it has been argued that the origin of and the responses to environmental crime are significantly linked to organizational forces

[5] Some scholars have argued that the corporate crime concept is too narrow; however, Pearce (1993) argues that corporations are unique entities and the separation of corporate from occupational crime is justified. First, corporations have very unique and narrow goals as compared to other kinds of organizations; they are explicitly designed to pursue profit. When costs must be cut to maximize profits firms may resort to illegal methods. The design of corporations also makes them unique. Public corporations have shareholders, who may also be more concerned with profits than the methods used to obtain them. In addition, responsibilities are dispersed throughout corporations making it difficult to ever pinpoint an individual at fault. The difficulty associated with penetrating the complex structure protects corporations from legal liability. Corporations are also frequently protected from the consequences of their own actions. For instance, employees tend not to live in areas polluted by environmental noncompliance. Finally, globalization has created powerful multi-national corporations, making it difficult for nation states to control firm behavior. I would argue that corporations are unique entities and the case for studying their behavior separately is compelling.

[6] The organizational focus is not meant to endow a corporation with volitional properties. Scholars still recognize that decisions are made and actions are taken by human beings (Cressey, 1995).

(Shover and Routhe, 2005). On a limited basis corporate crime scholars have begun to examine the association between organizational variables and environmental crime, considering it one type of corporate crime (Hill, Kelly, and Agle, 1992; McKendall and Wagner, 1997).

In this study, corporate citizenship is added as a theoretical explanation of environmental performance and sanction responsiveness. I will explore how citizenship relates to various levels of performance (violations, compliance, and overcompliance) while taking into account the traditional organizational-level predictors and some explanations drawn from the environmental literature (i.e., variability in discharges). To proceed, a definition of corporate citizenship is necessary. Although not fully developed, the idea of citizenship has been raised in other fields and mentioned (but never tested) in some environmental literature. Firm citizenship may explain a substantial degree of the variation in firm environmental records.

Defining Corporate Citizenship

Much of the work on corporate citizenship has been done in the business and society field. Thus, this section begins with an outline of the work in this field that has attempted to define citizenship in a more concrete manner. The problems with using these models of corporate citizenship are briefly discussed and a more conceptually useful definition is provided.

A variety of terms have been used to describe the relationship between business and society. The ideas begin with the assumption that business and society are interpenetrating and thus firms must be socially responsible to this shared environment. Therefore, at the most basic level, businesses have some obligation to society beyond

profitability. Yet one might ask specifically what kinds of obligations businesses have and how business should define this vague term "society" (Clarkson, 1995). Scholars have made some progress in trying to answer these questions, but each new development has been treated as a "free-standing, implicitly competing idea" (Wood, 1991, p. 691), often with yet another new term placed on an only slightly modified definition. While some of these free-standing ideas have been pulled together under the rubric of "corporate social performance," fundamental differences remain within and between the competing perspectives producing confusion as to the appropriate terminology, conceptual definitions, and measurement frameworks.

Modern academic discussion of the relationship between business and society began in the 1950s with the term "social responsibility," but debate surrounding the concept was most rigorous in the 1970s (Carroll, 1999). While business and society scholars were attempting to define the social obligations of the business community, economists were aggressively denying any such obligations. To acknowledge both economic and social concerns, scholars included economic responsibility in the definition of social responsibility. For example, in Carroll's (1979) three-dimensional model, social responsibility is "the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time" (p. 500). Carroll (1979) purposely brings economics into the definition of social responsibility to counter those who argue that "social" responsibilities are subversive to economic success (e.g., Friedman, 1962).

Recently, however, a new approach has influenced conceptualization of business "responsibility." Wood (1991) argues that Carroll's four principles of social responsibility (economic, legal, ethical, and discretionary) are not principles at all, rather

they are the domains within which principles are enacted. A principle, she argues, "expresses something fundamental that people believe is true, or it is a basic value that motivates people to act" (p. 695). Social responsibility is the expectation society places on business as an economic institution, on individual organizations, and on the individuals within the organization and these principles (should) motivate human and organizational behavior.[7] In general, scholars describe social responsibility as societal expectations of business that provide the motivation for socially responsible behavior by companies.

Over time, researchers shifted the focus to more pragmatic concerns, arguing that social responsibility placed too much emphasis on motivation rather than performance (Ackerman and Bauer, 1976). The term "corporate social responsiveness" loosely refers to the method companies use to fulfill a social obligation (Carroll, 1991). For instance, Carroll (1979) defines the responsiveness component as "a philosophy, mode, or strategy behind business (managerial) response to social responsibility and social issues" (p. 501). Carroll (1979) draws on earlier work that describes four possible strategies: 1) a reactive process in which the company consistently fights the requirements; 2) a defensive process in which the company does only what is required; 3) an accommodative approach in which the firm is somewhat progressive; and 4) a proactive response in which the firm leads the industry. This approach is too descriptive for Wood (1991) who argues that

[7] The Principle of Legitimacy describes societal expectations of business as an institution that must avoid abusing its power; it is based on the idea that society has the right to maintain a balance of power among institutions and to define legitimate functions. The Principle of Public Responsibility represents responsibilities at the organizational-level; businesses are responsible for outcomes related to their specific involvements in society. Thus, the content of responsibility might vary by company, depending on its areas of primary and secondary involvement. The Principle of Managerial Discretion states that managers are also obligated to make choices toward socially responsible outcomes in every domain of social responsibility.

social responsiveness should outline the actual processes the company goes through to ensure socially responsible behavior. For example, she discusses environmental assessment (monitoring and assessing environmental conditions, knowing the context); stakeholder management (understanding toward whom the corporation has responsibilities); and issues management (devising and monitoring internal and external processes for managing a company's response to social issues) as social responsiveness. Over time, responsiveness has come to be synonymous with the process companies have in place to ensure that social concerns are addressed.

The term "corporate social performance" (CSP) has pulled the above ideas into a single framework while adding a third component—"social issues management." This component consists of issue identification, issue analysis, response development (Wartick and Cochran, 1985). Policy is a direct extension of the social responsiveness process. However, "social issues management" is described as a process and is, thus, difficult to distinguish theoretically from responsiveness. Consequently, Wood (1991) treats the third component as outcomes rather than issues management. Outcomes may include social impacts, programs used to implement responsibility and responsiveness, and policies developed to handle social issues. Thus, as a whole, corporate social performance is a three-part model. Although the specific models vary, the general theme is that corporate social performance involves policies, actions, or social impacts that result from specific processes designed to address social issues (social responsiveness) and are motivated by principles of social responsibility. For example, Wartick and Cochran (1985) describe social performance as the "underlying interaction among the principles of social responsibility, the process of social responsiveness, and the policies

developed to address social issues" (p. 758). Wood (1991) argues that social performance is not an interaction, but rather "A business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm's societal relationships" (p. 693).

The three-dimensional model of corporate social performance has also been challenged by other approaches. Largely because of difficulties experienced when trying to collect data that fits into these conceptual models (an issue to which I will return), Clarkson (1995) advocates stakeholder satisfaction, regardless of companies' motives for keeping stakeholders happy, as a measure of CSP. Rather than attempting to identify responsibilities, stakeholder theory begins by looking at potential groups and the relation of the firm to these groups (Freeman 1984). As Clarkson notes, companies are free to decide the extent to which they will "acknowledge, recognize, or pursue obligations and responsibilities to their stakeholders" (p. 105). While there are legal requirements for obligations to some stakeholders (health and safety of employees), companies do not have legal obligations for some behaviors (employee career development). Any evidence of acknowledging some stakeholders may be evidence of corporate social performance. He suggests that we can place corporations on the four-part descriptive scale originally proposed by Carroll (1979) to further distinguish among firms (Reactive, Defensive, Accomodative, Proactive).

The models discussed here (which are only the most prominent of many variations) differ substantially from one another. Even after reviewing the business and society literature it is unclear whether corporate social performance is a set of

responsibilities, a state, a process, an outcome, or the management of stakeholders. Despite the different approaches, all of them have a common thread; consistent with the earlier (more abstract) definitions, each approach defines social performance/citizenship as a commitment to society that is broader than "mere compliance." Given this commitment, the current models mainly differ in what criteria distinguish "good" from "bad" corporate citizens. Firms might rank higher in citizenship because they take on additional (social) responsibilities; have specific decision-making processes; have certain policies, or have good relationships with multiple stakeholders. However, it seems that any of these criteria could be potential *outcomes* of good citizenship/social performance; the firms' sense of commitment to society likely produces these outcomes. And in fact, conceptualizing citizenship in this way fits nicely into the criminological literature on corporate culture.

Criminologists generally define corporate culture in terms of its potentially criminogenic components (Hochstetler and Copes, 2001; Shover and Hochstetler, 2002). For Barnett (1986), industry culture is "a set of commonly shared attitudes, techniques, and rationalizations which condition the likelihood that owners, managers, and employees within the typical industry enterprise will use illegal means to pursue economic goals" (p. 555). However, culture is likely a broader construct than techniques of neutralization and may include attitudes toward the social role of business—concern for the publics' wants and desires (Stone, 1975, 1991). Qualitative work suggests that organizational messages regarding the moral importance of competing goals (e.g., profitability versus environmental safety) confront managers in the workplace (Yeager, 2005).

Conceptualizing citizenship as one part of corporate culture is also consistent with other work. Scholars have made theoretical arguments that ethical climate is only one dimension of organizational culture (Cullen and Stephens, 1989; Victor and Cullen, 1988). In addition, Maignan et al. (1999; 2001) find that citizenship is empirically associated with other elements of corporate culture.[8]

Conceptualizing citizenship as a state is consistent with some of the business and society models and criminological work on corporate culture, but the issue of motivation remains. Why do some firms act as good citizens? Is it economics? Is it morality/altruism? Some scholars even suggest that motivation is irrelevant (Clarkson, 1995). Yet, citizenship as a moral obligation can be consistent with social responsibility and social performance models as well as stakeholder theory.[9] In addition to being consistent with the business and society models, the idea of moral obligation has a larger theoretical basis; it can be grounded formally in theories of moral philosophy such as social contract theory. Corporations can only exist in society with the cooperation and

[8] Using survey measures of the economic, legal, ethical, and discretionary obligations to various stakeholder groups, Maignan et al (1999, 2001) explore the cultural antecedents of citizenship. The authors define culture as the pattern of assumptions a group has invented, discovered, or developed to cope with problems. Based on this definition, the authors expect that organizational culture may influence how decision-makers manage relationships with stakeholders. The authors test three dimensions: market orientation (extent to which a firm adopts the marketing concept and puts the customer at the center of its strategy), humanistic orientation (importance attributed to support and harmony among workers), and competitive culture (importance assigned to winning and rewarding employees for outperforming one another). Using LISREL, the authors find that humanistic culture, market orientation, and humanistic orientation are all significantly associated with citizenship. Competitive culture is not significantly associated with citizenship, either as a facilitator or an inhibitor (Maignan, Ferrell, and Hult, 1999). Using regression the authors find that a customer-centered market orientation is significantly associated with higher levels of overall citizenship and each of its dimensions. The other elements of culture are not consistently related to citizenship: humanistic orientation is positively associated with economic citizenship and competitive orientation significantly decreases legal citizenship (Maignan and Ferrell, 2001).

[9] Although economic motives for citizenship are sometimes acknowledged, moral obligation is included as motivation for citizenship in the social responsibility and the three-dimensional social performance models. While some scholars argue that motivation is irrelevant to stakeholder theory (Clarkson, 1995), others discuss instrumental and normative motivations for stakeholder management, much like the social performance models (Donaldson and Preston, 1995).

commitment of society. Thus, there is an implicit agreement that in order to have a "license to operate," firms must be responsive to societal needs (Smith, 2003).[10] Theoretical perspectives in criminology also allow for the consideration of duty among economic actors. Etzioni (1988) suggests that although the economic actor will seek pleasure, the actor will also seek duty. Finally, at least some firms seem to use a deontological basis for ethical decisions. Victor and Cullen (1988) find that employees are able to discern different types of ethical environments and these vary by firm; some firm climates train employees to base ethical judgments on egoism (self-interest); some on benevolence (joint-interest); and others on principle (deontology).[11]

Thus, I consider corporate citizenship to be a state (of corporate culture) that is motivated by morality and altruism. I define corporate citizenship as the degree to which firm culture promotes or inhibits a moral commitment to society that is broader than "mere compliance." After reviewing the literature on the etiology of corporate crime, corporate compliance, and plant-level environmental record, I will outline why and how firm citizenship may be linked to environmental record. I will then review the literature on sanction effects at both the firm and plant-level before linking citizenship to sanction responsiveness.

The relevant literature is drawn from several fields that vary in terms of the approach (explaining crime versus explaining conformity), the unit of analysis (the firm versus the plant) and the data (case data versus self-reports). The firm-level corporate

[10] The idea of the moral obligations of business is also grounded in history. Several authors have traced these ideas back to Christian Scriptures, Jewish traditions, Eastern religious and philosophical traditions, and Western Philosophers (Bowie, 1991; Epstein, 1998).

[11] Victor and Cullen (1988) suggest that benevolence (joint-interest) is the basis for social responsibility while I argue that social responsibility has a deontological basis. This difference in conceptualization is not unusual; it reflects the state of the social responsibility literature.

crime focuses almost exclusively on explanations of firm offending, with little emphasis on conformity (or extreme conformity).[12] With one exception (Dooley and Fryxell, 1999) the subset of studies using environmental crime as the dependent variable are limited methodologically. Because very little data exists on corporate crime—especially at the firm-level with regard to environmental crime—they primarily examine court case outcomes and responses to hypothetical vignettes (see, e.g., Clinard and Yeager, 1980; Hill et al., 1992; Alexander and Cohen, 1996; McKendall and Wagner, 1997; Paternoster and Simpson, 1996; Simpson, 2002).

Research at the plant-level is most common. These studies examine the actual environmental record of the plant (self-reports) rather than relying on a subset of violations. The studies use 1) self-reports of violations; 2) of the level of pollution; and 3) of the pollution relative to the permit as the dependent variable. Because of the substantial degree of compliance and overcompliance in the environmental area, the plant-level literature attempts to explain conformity more often than the corporate crime literature (with some exceptions).

While the approach and unit of analysis differ, many of the explanations for compliance and/or violation are similar across the two fields. For example, firm characteristics (profits, size) are theorized as critical to our understanding of corporate *misconduct*. Many of these same characteristics have been applied to at the plant-level. For example, plant size has been linked to environmental *violations*. In addition, some

[12] An alternative view would be to treat the "opposite" side of the risk factors as "protective" factors linked to compliance. For example, low profitability may increase corporate crime because of profit squeeze (strain), the perceived benefits of crime (neoclassical), or the constrained access to goals (anomie). Firms that are economically healthy and viable, however, are protected from the risks. Therefore, firm profits or some other "protective factors" may increase compliance.

plant-level studies have included parent company characteristics to predict plant violations and pollution levels.

The explanations for compliance and overcompliance are also similar. The few studies (mostly outside of criminology) that have examined pro-social corporate outcomes (compliance and overcompliance) generally discuss formal sanctions and extra-legal sanctions (e.g., stock market sanctions, community pressure). These explanations for compliance are mirrored in the plant-level literature. In the following review the two bodies of literature are integrated when the explanations overlap. Differences in the unit of analysis are noted. However, in some instances the plant-level literature contains explanations that are unique from the firm-level research. These studies are discussed separately.

Etiology of Noncompliance

Theoretical explanations and empirical studies of corporate crime *generally* focus on explaining criminal participation; firm-level theories and studies often point to factors that might increase the willingness of corporate decision-makers to engage in corporate misconduct (Shover and Bryant, 1993). Performance pressure, organization size, and organizational structure and complexity have been theoretically and empirically linked to various types of corporate crime, although not always consistently (see McKendall and Wagner, 1997 for summary). Theoretical explanations also emphasize a role for corporate culture, although empirical studies that measure culture are limited.

Performance Pressure

Firm Profit

Early research showed that firm profitability decreased the likelihood of illegal corporate behavior, including unfair trade (Staw and Szwajkowski, 1975) and antitrust (Asch and Seneca, 1976). Using more sophisticated methods, some more recent studies tend to find a null relationship between firm profitability and crime. Firm profit is unrelated to financial crimes (Jamieson, 1994; Simpson, 1986) and non-financial crimes such as discrimination cases (Baucus and Near, 1991) and OSHA and environmental cases (Hill et al., 1992).

Some studies do, however, find a weak but significant negative relationship between firm profit and the same offense types. Firm profitability decreases total, environmental, labor, and manufacturing cases (Clinard and Yeager, 1979, 1980) as well as willful and repeat OSHA violations (McKendall, DeMarr, and Jones-Rikkers, 2002). Profit trends have also been linked to corporate misconduct. Firms experiencing a decline in financial performance over a five year period (1971-1975) are more likely to be charged with violations (Keane, 1993). Low rates of growth in sales, employment, and/or assets lead to more convictions for environmental crime (Alexander and Cohen, 1996; Clinard and Yeager, 1980) and total firm misconduct (Clinard and Yeager, 1980). Firm financial performance is also a factor in managers' decisions to offend. Vignette study results suggest that managers are significantly more likely to engage in price fixing, bribery, fraud or EPA violations if the act will give the organization an edge over foreign competition or the act will result in substantial savings for the firm, controlling for individual-level predictors (Paternoster and Simpson, 1996).

Still, a few studies find profitability to be positively correlated with offending. Using EPA and U.S. Coast Guard enforcement actions as a measure of environmental violations, McKendall and Wagner (1997) find that profitable firms have more serious environmental violations (e.g., court proceedings) per 1,000 employees than smaller firms. Simpson (2002) also finds that managers' intentions to offend were higher when the firm was experiencing a growth in sales.[13]

Despite the variability in findings, theoretical discussions of corporate and white-collar crime continue to include poor financial performance since it may increase offender strain. However, other explanations for the relationship can be drawn from neoclassical or anomie perspectives. The neoclassical model suggests that firms may offend because the financial benefits outweigh the costs of crime (Cohen, 1999). Anomie theory suggests that companies will innovate when legitimate means to ends are blocked or when legitimate behavior does not pay off (Vaughan, 1983). Regardless of the theoretical rationale, firm economic health has figured prominently in explanations for corporation crime.

The environmental literature has also examined the relationship between firm profits and *plant-level outcomes*. The literature is equivocal. Studies by Gray and colleagues find that firm profits (net income over capital stock) are unrelated to air pollution at the plant-level (Gray and Deily, 1996; Gray and Shadbegian, 2005). However, others find that firm profits are negatively correlated with pulp and paper plant emissions and positively correlated with plant control technology (Kagan et al., 2003). In

[13] Simpson (2002) reports several other effects that are counter to other vignette findings. Unlike Paternoster and Simpson (1996), Simpson (2002) finds that intentions to offend are higher when the act will save the firm a small amount of money (as opposed to a large amount) and are lower when the firm is losing ground to foreign competitors.

addition, higher gross return of the parent company is associated with fewer water violations among pulp and paper plants (Helland, 1998).

Industry Profit

Studies indicate a significant association between industry profitability and corporate crime. The specific direction of the effect varies by crime type and study. Baucus and Near (1991) find a curvilinear relationship between industry growth rate and discrimination, antitrust, and product liability cases among Fortune 500 firms; firm misconduct was higher during times of industry scarcity (low profits) and industry munificence (high profits).

Industry munificence/growth in sales has been linked to financial offenses (Alexander and Cohen, 1996; Jamieson, 1994) as well as environmental and total convictions (Alexander and Cohen, 1996). Although the findings are consistent for environmental crimes (Alexander and Cohen, 1996; Clinard and Yeager, 1980) the effect is reversed for other types of misconduct.

Also consistent with Baucus and Near (1991), some studies find that firms in depressed industries engaged in more illegality as well as specific crime types (Clinard and Yeager, 1980; Keane, 1993). Likewise, Simpson (1986) finds that industry profitability (manufacturers' added value) significantly decreases antitrust offending, although the effect varies by anticompetitive crime type.

Organizational Structure

Size

Overall the literature suggests a positive relationship between organization size and financial crimes (Asch and Seneca, 1976; Baucus and Near, 1991; Dalton and

Kesner, 1988; Jamieson, 1994; Simpson, 1986) as well as non-financial crimes such as discrimination (Baucus and Near, 1991) and environmental cases (Alexander and Cohen, 1996). This relationship has been established using a variety of firm size measures, including counts of employees, sales, gross revenues, net profits, capacity to render services, and quantity of assets held by the firm (McKendall and Wagner, 1997). However, the findings are not entirely consistent. For example, McKendall and Wagner (1997) find that size (average sales) is unassociated with serious and nonserious environmental violations. Similarly, firm size does not significantly influence managers' intentions to engage in bribery, pricefixing, fraud, or EPA violations (Paternoster and Simpson, 1996; Simpson, 2002).

The majority of the studies that find an association between size and illegal behavior use absolute measures of the dependent variable that do not take company size into account (e.g., violation counts/non-rates). Some argue that absolute measures best reflect the hypothesis and opportunity theory explains the positive relationship between firm size and offending—large firms simply have more opportunities to engage in illegal activities. However, other researchers argue that proportionate measures should be used to take into account differences in activity/opportunity (McKendall and Wagner, 1997). Any remaining association between size and offending may suggest that large firms are criminogenic in other ways (not just opportunity). The theoretical disagreement suggests that a solid conclusion cannot be drawn. However, some studies that use a proportional measure continue to find an association between firm size and violations *per unit size*, particularly for EPA (Clinard and Yeager, 1980; Hill et al., 1992) and total (Clinard and

Yeager, 1980) violations.[14] While further study and theoretical discussion is clearly needed, the evidence suggests that larger firms engage in more illegal behavior.

Environmental studies have also examined the effect of *firm size on plant-level emissions* and violations. Several studies find that firm size (measured as number of employees or sales) is unrelated to air pollution (Gray and Deily, 1996; Gray and Shadbegian, 2005) and to the number of water pollution violations at plants (Yeager, 1987). However, Grant and colleagues find that larger firms (number of employees) own plants with higher Toxic Release Inventory emissions rates (Grant and Jones, 2003; Grant, Jones, and Nell, 2004).

Finally, environmental studies have examined the relationship between *plant size* and *plant noncompliance*. Overall the literature also suggests a positive relationship across regulatory area. Major manufacturing plants have more water violations (Yeager, 1987); larger plants tend to have higher toxic release inventory emissions rates (Grant, Bergesen, and Jones, 2002; Grant and Jones, 2003; Grant et al., 2004); and larger plants are less likely to be in compliance with air pollution regulations (Gray and Deily, 1996; Gray and Shadbegian, 2005). On the other hand, Bandyopadhyay and Horowitz (2006) find that large Publicly Owned Treatment Works (water treatment plants) have a lower probability of violation than small ones.

Complexity

Structural complexity represents the "degree of spread and segmentation in an organization's structure, reflecting the combined effects of horizontal, vertical, and

[14] Interaction effects may explain the variability in findings. Although a lack of profit may provide motivation for illegal behavior and organizational size may provide opportunity, a strong ethical climate can reduce these effects (McKendall and Wagner, 1997).

spatial differentiation" (McKendall and Wagner, 1997, p. 627). Structural complexity may provide opportunity because it decreases communication and managerial control (Finney and Lesieur, 1982). Employees may engage in behavior with little risk of detection but they also may not receive information necessary to make law abiding choices (McKendall and Wagner, 1997). Using survey and 10K information about the number of sites and number of divisions, McKendall and Wagner (1997) find that structural complexity is unrelated to environmental offending.

Studies have also examined diversification; firms that operate in more industries are likely to have complex structures as they increase the spread and segmentation in operations. Most empirical studies have found that diversification is unrelated to different types of corporate misconduct, measured by court and agency cases (Clinard and Yeager, 1980; Cochran and Nigh, 1987; Hill et al., 1992; McKendall and Wagner, 1997). However, diversification does emerge as a significant predictor in the single study that examines actual emissions (legal Toxic Release Inventory emissions) rather than case outcomes. Dooley and Fryxell (1999) aggregate plant-level releases up to the firm-level and find that diversified firms (the number of two-digit industry categories in which the firm operates) with extensive depth in each industry (number of four digit industry categories in which a firm operates divided by the number of two-digit categories) have higher emissions than firms using other diversification strategies. This effect is mainly due to the breadth of the diversification (rather than the depth).

Organizational decentralization might also result from structural complexity. Firms that have more spread and segmentation in structure may have less centralized control. Using survey measures of the locus and dispersion of decision making, two

studies find that decentralization is unrelated to environmental and/or OSHA offenses (Hill et al., 1992; McKendall and Wagner, 1997).

Regardless of how it is measured, complexity has more consistent effects when *the plant environmental record* is examined in the *larger corporate context*. The number of sites owned (Gray and Deily, 1996) or being a large plant embedded in a wider corporate structure (Grant et al 2002) increases illegal behavior. In addition, chemical plants that are subsidiaries of larger organizations have significantly higher TRI (legal) emissions rates (Grant and Jones, 2003).

Corporate Culture

In addition to the connections drawn between profits, company structure (e.g., size, diversification, etc), and firm behavior, organizational misconduct is also linked to corporate culture. In fact, organizational culture has been employed to explain many aspects of organizational performance. Yet, a review of the empirical evidence on the organizational culture reveals the need for further work to demonstrate its relevance. In addition to a lack of consensus on the definition of culture, the studies tend to suffer from methodological weaknesses (Shover and Hochstetler, 2002).

Although culture is considered an important part of the explanation, there is little consensus on the definition of corporate culture. Approaches range from the beliefs of top management to dress norms and stories people tell (for a review, see Shover and Hochstetler, 2002). One definition stresses that culture is created when firms make the initial investment to establish a particular set of values in workers; this investment produces a culture that is defined in terms of homogeneity in tastes, technologies, and beliefs (Lazear, 1995). Once established, workers will behave in the desired fashion

without intensive monitoring by the firm. "Corporate cultures evolve endogenously, having lives of their own," although the process by which it evolves is not well understood (Lazear 1995, p. 90).[15] Specific definitions of corporate culture vary on several fronts: whether culture operates as an incentive or a control mechanism; whether culture is explicit or implicit within the firm; and whether we can define the aspects of and observe culture itself or only manifestations and reflections of culture are observable. Despite this variation, most of the definitions of culture include the notion of a shared set of norms and values that give rise to typical behavior patterns.[16] While many agree that culture is shared norms and values, ideas regarding exactly what is shared are less developed.

In part because of the definitional ambiguity but also because of methodological flaws, research on organizational culture as it relates to any kind of organizational performance is lacking. Most research on organizational cultures utilizes a case study method. Although clearly appropriate for small homogeneous units, this method has also been applied to complex organizations. "Studies in which probability samples, longitudinal designs and clearly specified models are employed are exceedingly rare"

[15] Although the development of corporate culture is not well understood, scholars have argued theoretically that both external and internal environment contribute to the creation of corporate culture. External environment, such as economic trends and cultures of competition, have been mentioned as a possible factors. Researchers have also argued that industry has a powerful influence on organizational culture, as companies could not survive if they developed strategies, structures or processes that conflicted with industry success (Gordon, 1991). Yet, while the culture of all companies within an industry may be similar they are not identical. Although external environment likely contributes to corporate culture, many scholars agree that internal factors, particularly the stance taken by top management, is the critical determinant of culture (Hochstetler and Copes, 2001).

[16] Although cultures may give rise to typical behavior patterns, organizational cultures are not necessarily completely homogenous, especially as they increase in size and complexity (Hochstetler and Copes, 2001; Shover and Hochstetler, 2002). Scholars have distinguished "strong" cultures as those where patterns of belief are shared throughout the company. It is also possible that different units may develop distinct cultures or even subcultures (Gordon, 1991). Research on ethical climates also shows variation in climate within organizations. However, despite the variation, firms can usually be characterized according to a dominant ethical climate (Victor and Cullen, 1987).

(Shover and Hochstetler, 2002, p. 8). Most studies of the effect of organizational culture on *crime* suffer from the same shortcomings discussed above (e.g., definitional ambiguity, case study approach) in addition to often focusing on high-profile or unusually harmful (i.e., atypical) crimes (Lee and Ermann, 1999). Even when using well-specified models, culture is often not directly measured and instead is invoked post hoc to explain unusual findings (Shover and Hochstetler, 2002). For instance, Clinard and Yeager (1980) speculate (although they have no direct measures) that organizational culture explains the residual variation in violation rates across industry that is not explained by economic predictors. Simpson and Koper (1992) find that companies located in the auto or oil industries are significantly more likely to recidivate than firms in other industries, including can, chemical, steel, and tire industries. Because the authors control for certain financial and legal conditions, they suggest that some unmeasured trait of the industry, either structural or cultural, significantly influences corporate recidivism. However, industry culture is not directly measured.

Despite these limitations, a body of work has begun to accumulate which, as a whole, can provide insight into the behavioral consequences of corporate culture. Diane Vaughn's (1996, 2001) case study of the Challenger launch decision is one of the most well-known and comprehensive studies. It goes a long way toward demonstrating that organizational culture can have an enormous impact on decision-making. Specifically, Vaughn found that three factors—cultural belief system in the work group, the culture of production, and structural secrecy—produced a culture at NASA that (over time) accepted technical deviation. The work groups saw the launch of the Challenger under uncertain conditions to be conforming and normal, not deviant.

Additional data links culture to criminal outcomes. In qualitative interviews, 40 senior, division, and middle level executives in the folding-box industry explained the price-fixing conspiracy cases that occurred in the industry in 1977 in cultural terms. Executives discussed company culture broadly, arguing that the distinct history of the industry led to a different set of rules and frequent (illegal) price agreements (Sonnenfeld and Lawrence, 1978).

Quantitative studies that include culture are limited. Evidence suggests that the ethical nature of firm culture—measured with survey data—may influence environmental offending in interaction with other firm characteristics, although the direct effects were not significant (McKendall and Wagner, 1997). Yet, using a different research design, the effects are mixed. Paternoster and Simpson (1996) find that managers report higher intentions to engage in pricefixing, bribery, fraud, and EPA violations when illegal behavior is common in the firm even after controlling for individual moral evaluations. In contrast, reporting on another study Simpson (2002) finds little effect of industry or firm culture (the act is common within the firm or industry) on managers' intentions to offend. The direction of the effect was positive as expected, but not significant.

Plant-level studies bolster the relevance of firm culture. The compliance rate at plants owned by the same firm is significantly related to compliance at the plant under study. Thus, the culture of the company may transcend the plants to create a similar environmental record across plants (Gray and Deily, 1996).

Etiology of Compliance

Other studies of environmental behavior attempt to explain compliance. Many of these explanations apply at both levels of analysis—firm and plant. Some specific

examples apply to only one entity (e.g., firms deal with shareholders), but the theoretical construct (extra-legal sanctions) applies to both.

Costs and Benefits: Legal

The traditional economic assumption is that firms (or plants) comply when the costs of noncompliance are higher than the benefits. They comply to avoid legal sanctions. The firm-level deterrence literature is fairly mixed, but some studies—including those conducted at the plant-level—suggest that EPA *inspections* act as a deterrent. However, inspections represent additional EPA monitoring rather than enforcement. EPA *sanctions* may have less of an impact. When violations are detected penalties are limited (Cohen, 2000). The bulk of the response to EPA violations is informal, cooperative in nature, and relatively lenient (Hunter and Waterman, 1996).[17]

Whether sanctions act as a deterrent is an empirical question. Yet even if sanctions do not act as a deterrent in the traditional sense, they may still explain compliance. Plants may comply because they may not realize how low penalties are for violations. Hammit and Reuter (1988) cite survey evidence that small quantity hazardous waste generators overestimate the chances of government monitoring (as cited in Cohen 2000). An alternative argument is that firms/plants comply to avoid increased enforcement (Harrington, 1998). Firms with a history of noncompliance may be

[17] For instance, EPA considers the determination that "no current action is warranted" an enforcement action (Hunter and Waterman, 1996). Using NPDES data for the years 1975-1988 and 1986-mid 1994, Hunter and Waterman (1996) rate enforcement actions in a severity scale ranging from zero to seven. The authors find that of the more than 27,000 enforcement actions conducted in the earlier time period, only 102 (0.4 percent) were the most severe kinds of sanctions (civil penalties or contempt actions). By far, actions that ranked between 0 and 2 on the scale were the most common response to violation. The category including warning letters (ranked 2 on the scale) represented 40 percent of the actions (20 percent of the actions received a score of zero severity). When penalties are issued, they tend to be low. In 1995 the mean administrative fine imposed by the EPA was $32,000; fines ranged from $500 to $5000. In 1995, only 1000 firms were fined (Cohen, 2000).

subjected to higher monitoring and larger fines. The threat of increased sanctions encourages other firms to remain compliant without enforcement agencies actually increasing overall levels of enforcement. In deterrence lingo, firms remain compliant because of experiences with vicarious punishment.

Regulation may also explain overcompliance (polluting less than legally allowed). Although current regulations do not require firms to overcomply, some scholars believe that overcompliant firms gain a more powerful and influential voice in the formation of future regulations and hence a competitive advantage. Overcompliance signals lawmakers that tighter restrictions are possible; in turn, tighter restrictions increase the costs for rival companies (Harford, 1997). Overcompliance may be anticipatory behavior on the part of companies who anticipate more stringent future regulation (Arora and Cason, 1996). However, given the high degree of compliance/overcompliance, it seems that additional explanations are necessary.

Costs and Benefits: Extra-Legal

Firm Shareholders

Harford (1997) suggests that firms may comply because of shareholders. Shareholders will not invest in firms that engage in environmentally risky practices; this places too much risk on their investment. Thus, firms will comply in order to attract and please investors. Evidence does suggest that firm stock prices suffer following negative publicity about the firm's environmental record. The EPA's Toxic Release Inventory (TRI) requires firms to publicly report legal emissions over a specified amount. When the first disclosure TRI was made, researchers found a significant reduction in the market

value for some firms. The average firm experienced a -0.3 percent negative abnormal return (Hamilton, 1995).

Reputation can work as a cost or a benefit. In fact, losing individual and firm prestige can lead to company reform (Fisse and Braithwaite, 1983). As Simpson (1998) states, "informal social control exerts more power over human behavior than does formal social control and, in the case of corporate crime, it may be even more relevant in the crime control equation than it is for street criminals" (p. 105). On the other hand, reputation may provide rewards. Firms have taken notice of consumer willingness to pay more for environmentally friendly products. Firms with more consumer products may overcomply to establish a reputation as a "green" company and attract these customers (Arora and Gangopadhyay, 1995).

Community Pressure

Community and other informal pressure (e.g., from consumer boycotts, employees, and environmental groups) represents the plant-level equivalent and may push plants to be compliant. For example, Kagan et al. (2003) discusses the idea of "social license;" that plants must meet social expectations for emissions in additional to legal expectations. The authors show that mills with more active local environmental groups and those that had been subjected to anti-chlorine campaigns by Greenpeace had lower pollution emissions (Kagan et al., 2003; Gunningham, Kagan, and Thornton, 2004). Similarly, another study showed that TRI emissions were related to the number of associations, churches, and small retail establishments in a county (Grant et al., 2004). However, the relationship between community characteristics and pollution levels may depend on neighborhood type: poor and minorities communities tend to have higher

levels of pollution. Moreover, results may also depend on model specification and the dependent variable of interest. When studies include plant with community characteristics, the latter are no longer associated with emission rates (Grant et al., 2002; Grant and Jones, 2003; Grant et al., 2004). Using a different pollution measure [Publicly Owned Treatment Works (POTWs)] Bandyopadhyay and Horowitz (2006) find that POTWs in poorer, nonwhite communities have a higher probability of violation. Community pressure may also not be as effective with certain types of plants.

Other Plant-Level Explanations

The plant-level literature contains some explanations that are unique from the corporate literature. Three of these explanations (i.e., plant age, compliance costs, and versatility) are designed to explain violations or pollution levels. Two (i.e., environmental management system and plant variability) are relevant for compliance and/or overcompliance.

Additional Plant Characteristics

Plant age is linked to environmental record. Manufacturing plants with older permits tend to have more water pollution violations (Yeager, 1987) and plants that were in operation before 1960 are less likely to be in compliance with air pollution regulations (Gray and Shadbegian, 2005). Plant age may be linked to the cost of compliance. Steel plants (Gray and Deily, 1996) and pulp and paper plants (Helland, 1998) with a higher compliance cost are more likely to be in violation of air regulations or to have a water violation in any quarter. Upgrading older plants to meet standards is likely to be more expensive than the cost of adding technology to newer plants.

Versatility of Offending

One study has examined whether plants in violation of one permit tend to be in violation of others (e.g., air and water). Gray and Shadbegian (2005) find versatility in environmental offending. Steel plants in violation of their water permits and plants in violation during OSHA inspections are less likely to be in compliance with air pollution requirements.

Environmental Management Style

Plants may also (over)comply because they have a strong environmental management system. Thornton, Kagan, and Gunningham (2003) create a typology of environmental management styles based on managers' expressed attitude toward environmental problems, actions taken to address stakeholder demands, and explanations for those actions. In contrast to the "Environmental Laggards," "True Believers" are managers driven to environmental excellence by moral commitment to the environment (Thornton et al., 2003). Excellence was not contingent on the cost of investment in environmental performance (perceiving environmental expenditures as affordable when others did not), but is influenced by each strand of their proposed "license to operate" (legal, social, and economic license). Environmental management style had the strongest relationship with environmental performance; average emissions for True Believers were substantially lower than emissions associated with other management styles.

Plant Variability

Other studies suggest that the uncertain nature of the pollution process may provide the motivation for environmental performance, overcompliance in particular. Plant-level discharges are quite variable from month-to-month and on a daily basis because of seasonal changes and random large discharges. Plants might pollute below

the permitted levels (overcomply) on a regular basis to compensate for this variation and maintain a good overall record (Bandyopadhyay and Horowitz, 2006). Using a monthly compliance ratio (reported discharges/permitted level), Bandyopadhyay and Horowitz (2006) find that water treatment plants with higher variability (standard deviation of the log of the monthly compliance ratio) pollute less on average. However, variability does not explain all of the POTW overcompliance. Plants pollute only 60 percent of permitted levels (overcomply by 40 percent) even when accounting for the effect of variability (Bandyopadhyay and Horowitz, 2006). Consistent with Kagan and colleagues' (2003) qualitative interview data, plants seem to intentionally overcomply.

Summary: Plant and Firm Behavior

Firm and plant characteristics help us understand illegality and compliance in general as well as environmental crime specifically. Financially strained firms may be more likely to violate the law. In addition, larger firms and larger plants are more likely to violate the law. Firm-level studies suggest that structural complexity, diversification, and decentralization are unrelated to environmental offending. Yet, the plant-level studies are quite consistent. Plants embedded in more complex structures violate the law more often and discharge more pollution. Few studies have examined how firm or industry culture may influence environmental offending at the firm-level. However, the plant-level studies suggest that firm culture transcends plants. Firm and plant-level studies also show that extralegal concerns (shareholders and reputation) are quite relevant to environmental compliance.

This review of the literature raises the issue of the unit of analysis. Only one study in this review examined firm-level self-reported pollution (Dooley and Fryxell,

1999). Most of the environmental studies, particularly those using self-report data, are conducted at the plant-level. Some of the plant-level studies show that firm characteristics are not significant predictors of plant-level environmental performance (Gray and Shadbegian, 2005; Yeager, 1987); others find that some firm characteristics are independent predictors of plant-level performance (Grant and Jones, 2003; Gray and Deily, 1996; Helland, 1998; Kagan et al., 2003); and other studies find that firm characteristics interact with plant-level characteristics (Grant et al., 2002). Thus, the research suggests that firm characteristics may influence plant-level outcomes, but plant characteristics are more consistently associated with plant environmental performance. In addition, other plant-level predictors (e.g., community pressure) are also relevant. If there are relevant predictors at the plant-level that cannot be aggregated to the firm-level and the pollution process actually occurs at the plant-level, is it appropriate to aggregate to the firm-level? This question is addressed in the following section.

Unit of Analysis

Aggregating to the firm-level means that some plant-specific factors will not be captured in the analysis. For example, one cannot aggregate the community characteristics of facilities located in different states.[18] In addition, because pollution actually occurs at the plant, aggregation to the firm-level may not be appropriate. For example, Clinard and Yeager (1980) produce few significant findings when examining EPA cases at the firm-level (explaining only 9 percent of the variation in the outcome) leading Yeager (1993) to speculate that using firm and industry level predictors may be

[18] This is more of a problem for some predictors than others. Omitted variables must be correlated with both the outcome and the predictors of interest in order to create bias.

inappropriate, especially when the decisions and pressures relevant to compliance are made and experienced at lower levels (division, factory, etc) in the firm.[19]

However, I argue that firm-level analysis is valid. First, it has a strong theoretical basis in the corporate crime literature and is supported in the empirical literature. Gray and Deily (1996) find that the compliance rate at other plants owned by the same firm is significantly related to compliance rate at the plant under study; firm culture does seem to transcend across plants. Grant et al. (2002) find that large plants have significantly higher emissions rates when they are branch plants; the interaction effect is particularly strong for branches with out-of-state headquarters, which may indicate something about the parent company approach (locating polluting firms some distance from headquarters). This fact points "to the merits of an alternative way of understanding environmental degradation that focuses less on the dangerous chemicals used by manufacturers and more on the organizations that manage them" (Grant et al., 2002, p. 402).

Despite the evidence, one cannot ignore the fact that the effects of firm characteristics on plant-level behavior are mixed and plant-level factors have much stronger effects. However, some firm-level factors may actually condition the effect of plant-level factors. For example, Gunningham et al. (2004) suggests that plant response to social pressure for compliance depends on the plant environmental management system. Although the authors do not provide a full description of how an environmental management style develops and operates, they find some evidence that environmental management systems may be dictated by the parent company (e.g., one plant terminated talks with community groups based on the instructions of the head office).

[19] He also notes that the studies are limited by incomplete data agency case data that undercounts pollution offenses. This problem does not exist in the current data.

The failure to explore the role of citizenship is an important omission in both the environmental and corporate crime literatures (plant and firm-level) is. I attempt to fill this gap.

Corporate Citizenship and Compliance

Some work has been done that supports the idea that citizenship may be related to firm-level outcomes. Integrated/expanded rational choice studies established a link between morality and intentions to engage in street crime as well as corporate crime. Although business decisions are typically viewed as amoral considerations of costs and benefits (in the narrow sense), managers who believe that illegal acts are highly objectionable on moral grounds report lower intentions to offend (Simpson, 2002). Morality of the law has a modest effect in predicting government-rated compliance (Braithwaite and Makkai, 1991). Similarly, May (2004) is able to distinguish two sets of motivations for compliance—"affirmative" and "negative"—among a randomly selected sample of homebuilders in Washington state. He conceptualizes affirmative motivations as those arising from a sense of obligation to comply while negative motivations arise from fear of the consequences associated with violation of regulatory law. In relative ranking, homebuilders report that affirmative motivations are a more important consideration for compliance than fear of sanctions.

Although not defined or discussed in terms of citizenship, some firm-level studies contain measures that might capture citizenship to some extent. Ethics and morality provide the basis for citizenship. Ethical codes in corporations are designed to govern the conduct of employees. Overall, the literature suggests that ethical codes in and of themselves have little impact on violations (Mathews, 1987; McKendall et al., 2002), but

ethical codes must be taken seriously by top management to be effective (Clinard, 1983). Demonstrating a consistent and sincere commitment to ethical practices is not enough. Top management must also find ways to convey this commitment down the ranks (Sonnenfeld and Lawrence, 1978). In fact, more serious self-regulation programs (i.e., more than codes of conduct) significantly affect intentions to offend among MBA students and executives (Simpson, 2002).

Measures that indicate more effort or a more serious commitment on the part of firms might better capture citizenship. For instance, compensation criteria send a strong signal "down the ranks" as to what kind of behavior will be rewarded. In the Sonnenfeld and Lawrence (1978) interviews, executives suggested that personnel reward practices contribute to price-fixing. In many of the convicted companies, performance evaluations (as well as bonuses and commissions) were based primarily on profits. Hill et al. (1992) examined this question with quantitative data; the authors find that companies that use little non-financial data to evaluate divisions have higher levels of EPA and OSHA violations.[20] This "management by numbers" (using rate of return as the primary evaluation criteria) indicates that managers should do what is necessary to increase profits in the short-run and ignore other (social) concerns. In fact, division reward practice was one of the few items that predicted EPA and OSHA citations.[21]

[20] Although the authors provide a list of items used in the survey questionnaire, it is somewhat unclear which items specify "non-financial" considerations. However, some do seem to be more social in nature. For example, Hill et al. (1992) asked managers about the extent to which industry relations were used to evaluate division performance.

[21] The authors also include a dichotomous measure of incentive systems. Firms scored 1 if division evaluation standards are exclusively based on rate of return and 0 if it incorporates a more holistic standard. This measure did not significantly predict violations. Although not highly correlated with the previous measure, it is unclear whether each measure contains a unique the piece of information.

From the conceptual and empirical literature reviewed thus far, I expect corporate citizenship to be significantly related to firm environmental record. Three research hypotheses are derived to test this relationship. As previously discussed, compliance with environmental regulations is quite common among industrial firms. Although some firms continue to violate, many do not. Good citizens are likely to lead this trend. Thus, I hypothesize that "good citizens" will be in compliance more often than "bad citizens" after controlling for the known predictors of corporate crime.

However, even "good citizens" can find themselves in violation of environmental law due to random fluctuations in discharges and seasonal rises (Bandyopadhyay and Horowitz, 2006). In addition, although decisions are conditioned by corporate culture and as a result are likely to be consistent across employees, there still may be employees who act in a manner inconsistent with corporate citizenship messages. Yet, "good citizens" should have fewer violations (when they violate) because they are likely to have more technology in place to temper seasonal and random variations in discharges and to have stronger controls over individual employee behavior. Thus, I hypothesize that when violations occur, "good citizens" will have fewer violations on average than "bad citizens" after controlling for the known predictors of corporate crime.

In addition to the high rate of compliance in the environmental arena, firms often overcomply; they pollute substantially less than legally allowed. As a result, much of the variation in firm record is in the degree of overcompliance. Good citizens have a moral commitment to society that is broader than "mere compliance;" thus, companies in this state may be more likely to exceed legal requirements than those that are not. In fact, the association between compliance and environmental overcompliance may stronger than

the relationship between compliance and the other environmental outcomes. Thus, I hypothesize that "good citizens" will overcomply more than "bad citizens" after controlling with the known predictors of corporate crime and environmental behavior. Corporate citizenship may also be related to responsiveness to EPA sanctions.

Sanctions and Recidivism

Although sometimes discussed in the literature as an explanation for compliance, sanctions have most often been examined in terms of recidivism. I begin this review of the literature with the criminological firm-level studies, most of which examines the effect of sanctions on other kinds of corporate misconduct (antitrust, etc). Research on regulation and environmental performance examines sanction effects at the plant-level. I review the plant-level literature before moving into a discussion of how citizenship may interact with sanction effects.

Firm-Level Literature

Block and colleagues (1981) examine the effect of antitrust enforcement on collusive pricing in the white bread industry. The authors find general and specific deterrent effects after controlling for the cost of bread making and production. Specifically, increases in antitrust enforcement budgets as well as antitrust prosecutions in the industry decrease overall price markups; reduce the prices of bakers in neighboring areas; and lower price markups for past colluders. However, Jamieson (1994) examines antitrust recidivism (companies with more than one violation between 1981 and 1985) in a sample of 277 violating companies and finds little evidence of a deterrent effect

associated with either Department of Justice (DOJ) law enforcement interventions or the Federal Trade Commission's (FTC) more compliance-oriented interventions.[22]

Simpson and Koper (1992) find only limited support for deterrence arguments when examining the recidivism of 38 corporations charged with one or more serious antitrust violations between 1928 and 1981. Proxy measures for sanction certainty (the number of nonserious antitrust cases brought against a firm one year prior to the current year) had no effect on reoffending. Nor did measures of sanction celerity (time between offense and case initiation). The authors find some relationship between sanction severity and recidivism (changing crime to felony status; FTC involvement); a guilty finding (versus no sanction) significantly inhibited future offending. Having a case brought civilly significantly increased the chances of reoffending, although criminal and administrative (FTC) cases did not have an impact. The firm's cultural and economic climates were far more important predictors of reoffending.

Most perceptual deterrence studies provide little evidence of a negative association between formal sanctions and corporate crime. First, corporate executives and managers report that formal sanctions are rarely considered when managers are faced with unethical situations (Simpson, 2002). Quantitative studies contain similar evidence. Braithwaite and Makkai (1991) found that perceptions of the sanction elements (additive or multiplicative) have little influence legal compliance in Australian nursing homes. In some vignette studies, informal sanctions were more salient predictors of intentions to offend than were formal sanctions. Formal sanctions were no longer significant once

[22] Compliance interventions are used to negotiate compliance and prevent corporate misconduct while deterrence strategies are focused on punishment after the fact. Jamieson (1994) considers DOJ as a more law enforcement type intervention because it is solely responsible for criminal prosecutions. The FTC, on the other hand, often uses negotiation and education to encourage conformity.

informal sanction threats, moral beliefs, shame, and personal benefits were entered into the model (Simpson, 2002). Paternoster and Simpson (1969), however, found that intentions to offend were affected by formal (and informal) sanctions among those low in moral restraint.

Overall, the support for deterrence theory in this literature is mixed. However, much of the plant-level literature finds deterrent effects for EPA inspections.

Plant-Level Literature

Despite the lax regulation, the literature on enforcement of the Clean Water Act (CWA) in the pulp and paper industry points to a specific deterrent effect associated with EPA actions (see Cohen, 2000 for summary). Most of these studies examine the effect of EPA inspections (monitoring) rather than enforcement actions/sanctions. Magat and Viscusi (1990) find specific deterrence effects of inspections on biological oxygen demand (BOD) level, compliance status, and non-reporting in the United States pulp and paper industry.[23] Laplante and Rilstone (1996) find that the expected inspection rate (two-stage model) decreases BOD and total suspended solids (TSS) emissions in the absolute and relative to allowable discharge levels in Canada.[24] Liu (1995) finds that increased monitoring does not reduce the number of known violations. Yet when he breaks inspections into "routine" and "discretionary" inspections, he finds that routine inspections increase the number of known violations while discretionary inspections (those targeted towards firms known to be out of compliance or with previous violations) have a deterrent effect. Nadeau (1997) finds that enforcement actions and monitoring

[23] BOD is a required measurement under the Clean Water Act; facilities discharging pollutants into the water must keep BOD below permitted levels.
[24] TSS is a required measurement for most facilities under the Clean Water Act; facilities discharging pollutants into the water must keep TSS below permitted levels.

actions (inspections and tests) both decrease the number of days a facility is in violation, although an increase in enforcement actions produces more of a deterrent effect than an increase in monitoring actions. Significant deterrent effects are also found for EPA enforcement of the Clean Air Act (CAA) in the U.S. steel industry (Deily and Gray, 1991; Gray and Deily, 1996). Deily and Gray (1991) find that enforcement and inspections (lagged) are significantly related to whether the steel mill is out of compliance in any quarter of any year.

Although not dealing explicitly with EPA standards, studies of OSHA regulation also find a deterrent effect for inspections (Bartel and Thomas, 1985; Viscusi, 1986); however, the literature is mixed in terms of plant-level specific deterrence. Additionally, as Gray and Scholz (1993) note, some studies fail to control for endogeneity between inspections and injury (Cooke and Gautschi, 1981; Robertson and Keeve, 1983; Scholz and Gray, 1990). Those that do are less apt to find a deterrent effect for OSHA violations (Smith, 1979; Ruser and Smith, 1991); but the research design employed in these studies (i.e., a natural experiment) does not completely overcome the methodological limits of earlier studies (Gray and Scholz, 1993). One study that controls for heterogeneity among plants, serial correlation in the dependent variable, and endogeneity between injuries and inspections finds that OSHA inspections with penalties do lead to a decrease in both frequency and severity of injury rates of the inspected plant. In fact, the effects continue for up to three years after the inspection (Gray and Scholz, 1993).

Despite the support for the deterrent effect of EPA inspections (monitoring), there is less evidence on the effect of EPA sanctions. In fact, only one of the above studies examines sanctions. The study finds a deterrent effect, but qualitative interviews at 14

pulp and paper plants suggest that the effects of regulation and sanctions are limited. When targeted at specific pollution problems, regulation seems to reduce pollution. But overall, regulatory jurisdiction did not covary with mill environmental performance, particularly mill overcompliance (Kagan et al., 2003).

Summary: Firm and Plant Deterrence

Overall the deterrence studies are mixed. At the firm-level, one study supports general and specific deterrence, one supports neither, and one has mixed findings. The perceptual studies are equally mixed. Work at the plant-level consistently finds a deterrent effect, primarily for regulatory inspections. There is less evidence on the effectiveness of EPA sanctions and the two existing studies are mixed. In both bodies of literature the work on corporate sanctions has been limited to main effects. It has not examined *under what conditions* deterrence may be effective. Sanction studies have not explored the role of corporate citizenship in sanction responsiveness. In the current study, I attempt to fill some of this gap by exploring the effect of sanctions for "good" and "bad" corporate citizens.

Corporate Citizenship and Deterrence

Studies of individuals have found that deterrence does not operate in a universal manner; deterrent effects vary by personality characteristics, demographic characteristics, and moral outlooks. In other words, deterrent effects vary by type of person. Silberman (2000) notes that firm-level factors may also influence how effective deterrence strategies are in reducing noncompliance. For example, small firms may "possess unique characteristics" that differ from larger firms and that could influence deterrence. In fact,

Gray and Shadbegian (2005) find that plants owned by larger firms are less responsive to inspections and more responsive to other enforcement actions.

Corporate citizenship may condition the effect of sanctions.[25] There is little empirical evidence to support this notion, but the case can be made theoretically. Individual-level deterrence studies show that when respondents judge a behavior to be morally offensive, the effect of formal sanctions on intentions to offend is insignificant (Bachman, Paternoster, and Ward, 1992; Burkett and Ward, 1993). This has been demonstrated among managers as well (Simpson and Paternoster, 1996; Simpson, 2002). Based on the rational choice literature, one can hypothesize that good citizens will be unaffected by sanctions. Because they are "acute conformists," sanctions may be unnecessary to produce conformity among "good citizens" (Pogarsky, 2002). Thus, in these data the environmental record of good citizens may change very little following a sanction (although the record will still be better than "bad" citizens).

Yet, the effects may be different in this study than in the rational choice literature. All of the rational choice studies examine the effect of *sanction threats* on *intentions to offend*. In this study firms have already been sanctioned. In addition, the rational choice studies all examine individuals; the unit of analysis in this study is the firm. A substantial body of literature shows that top management sets the ethical tone for the firm. Yet, even when top managers orient the tone of the firm toward good citizenship, the firm still may have instances of noncompliance (as I outlined above). The sanction the firm receives may serve as a signal to top management that internal controls need to be strengthened.

[25] Suggesting any links between sanctions and citizenship may seem counterintuitive given that good citizens are more likely to be in compliance. However, for the reasons outlined above, good citizens will not always maintain perfect compliance. Therefore, good citizens will also receive EPA sanctions.

Thus, sanctions may actually have a stronger effect on good citizens. Good citizens may improve their environmental behavior more than bad citizens after receiving sanctions.

Furthermore, good citizen firms may be more responsive to less punitive sanctions. Good citizens may respond more readily and improve their behavior more than bad citizens even when the sanction is mild and informal. In fact, Bardach and Kagan (1982) argue that aggressive enforcement of well-intentioned businesses can lead to a "culture of resistance" which may undermine norms of social responsibility. This culture of resistance may develop because the firm reacts in a defiant manner (Sherman, 1993). When a sanction is perceived as illegitimate, the sanction may actually increase future noncompliance.[26] There is some empirical basis for these ideas. Paternoster and Simpson (1996) find that managers are more likely to offend when the law in question is perceived as unfair; the opportunity to challenge the law significantly increases intentions to offend even among those high in moral restraint. Thus, punitive sanctions may have less of an impact on the environmental record good citizens than bad citizens.

The data I will use to test these questions comes from a project supported by a grant from the National Institutes of Justice. The principal investigator is Dr. Sally Simpson. As the graduate research assistant, I was primarily responsible for the collection and interpretation of the secondary data. However, at various points in the project other students worked on the secondary data as well; all references to "we" refer to the research team.[27] We believe the data collection effort constitutes a unique

[26] Punitive sanctions may also violate the norm of autonomy, or the notion that individuals (firms) should be left alone unless they have done something morally blameworthy (Vandenbergh, 2003).
[27] The research team included additional members who worked intermittently on the secondary data collection, although their primary contributions were to other parts of the grant data collection effort. They are Dawn Cecil, Natalie Schell, Brian Barth, Nadine Frederique, Lee Slocum, and Brian Wolf.

contribution to the literature in and of itself. First, collecting data on companies is extremely complex and difficult (e.g., data availability, contradictions across publicly-available sources, etc). Thus, we provide a framework and list of sources for others interested in collecting corporate data. Second, the data add to both the corporate crime and the environmental crime literatures. In the corporate crime literature, relatively few studies have examined environmental behavior as compared to financial crimes and the existing studies use court case data that capture a very narrow range of environmental illegalities. Our data provides comprehensive information on water pollution (and the potential to link to other kinds of pollution) and contains self-reports of pollution record rather than relying on end-of-system cases. Our data also adds a new (and we think important) perspective to the environmental crime literature. Most environmental studies focus on the plant and occasionally include parent company characteristics. Our data provides a comprehensive picture of environmental record at the firm-level; the sample was constructed at the firm-level and includes all major facilities owned by the parent company.

The following chapter provides an overview of the data collection, measures, and analytic strategy. The section begins with an explanation for why the pulp and paper, steel, and oil refining industries were selected for study. The specific steps that were taken to create the database are then described: compiling a universe of firms; tracking firm changes over time; linking firms to environmental facilities; and tracking facility ownership changes over time. Finally, some of the complexities of the data that had to be addressed to make effective and accurate use of the data are addressed before moving into the specific measures and analytic techniques used in this study.

CHAPTER 3: DATA COLLECTION AND MEASURES

The data in this study (collected for the NIJ grant) was gathered from a variety of secondary, publicly available sources. Because the data collection effort (described below) was arduous, the first step in the process was to narrow the industry focus. Four industries were selected that are similar but also distinct. The manufacturing industries selected for this project are known as potential sources of water pollution. In addition, there is overlap across these industries in the pollutants that result from the manufacturing processes. Yet, the technology and some pollution problems in each industry are unique, making it possible to study industry differences.

After selecting the industries of interest (i.e., pulp and paper, steel, and oil refining), data collection began. After gathering, verifying, and cleaning the data, we have a universe of all U.S. based, publicly traded companies operating primarily in one of four Standard Industrial Classifications (SIC) (Pulp Mills; Paper Mills; Petroleum Refining; Steel Works, Blast Furnaces, and Rolling) in 1995 linked to facilities (the EPA tracks compliance at the facility level) that are regulated by the EPA. Facilities were limited to those operating in the same SIC codes in order to ensure a similar culture between parent company and facility. Companies were retained for the study if they owned at least one facility operating in the same SIC code in 1995 that is categorized as a major discharger in the National Pollutant Discharge Elimination System (NPDES).[28] Firms/facilities were tracked for years 1995-2000. Therefore, any changes in either the

[28] Major industrial facilities are distinguished from minor dischargers by the facility's potential for discharging toxic wastes, the volume and type of wastewater, and whether the receiving water is used for drinking (Yeager, 1993). Although minor facilities are also required to have permits and report discharges, national EPA does not require that states submit compliance and enforcement data on minors. Thus, in this study we track only major facilities.

company (mergers, bankruptcy, etc) or the facility (closings, changes in ownership, etc) were recorded through the year 2000.

Creating the Firm Universe

Most researchers have examined plant-level environmental performance. Thus, the samples have been constructed at the plant-level and then (sometimes) parent company characteristics are attached to the sample of plants. In those studies, the samples may contain multiple plants owned by the same firm, but the data sets do not necessarily have information on all plants owned by the same firm. In this data set, we are adding a new level of analysis to the environmental crime literature—the firm. Thus, we began creating our sample at the company-level.[29]

Using Ward's Business Directory, Standard and Poor's Industrial Compustat, and Mergent Online we created a list of publicly-held U.S. based companies that had their *primary business* (as defined by the source) in pulp and paper, steel, or oil. The goal was to follow companies that were operating in 1995 through the year 2000 (even those that merged, closed, or filed bankruptcy during that time period). Some sources of information (e.g., Ward's Business Directory) were available on a yearly basis. Thus, we were able to compare the 1995 company list with the 2000 company list to determine and track which companies experienced some sort of change. For example, if a company that appeared in the 1995 Business Directory was no longer listed in 2000, we investigated

[29] We originally intended to use the EPA data itself to construct our sample because it contains both plant (compliance is tracked at the plant-level) and parent company information. However, discussions with EPA employees revealed that parent company/ownership is not a required field (40 percent missing in our data) and it is not tracked historically—when facilities change hands the current owner information is recorded over the previous ownership details. Thus, other sources were necessary to create the sample of companies.

and coded how/why the company changed. Because some sources of information (e.g., Compustat and Mergent's Online) were available only in the current version (as of 2002), we had to work backward to verify that the company was operating in 1995.[30] We used qualitative company histories (from Mergent's Online and the Business and Company Resource website), company websites, and annual 10K reports to complete these checks. We also used these sources to investigate contradictions across data source regarding primary industry, company status (i.e., private, international, US public), and company name (e.g., multiple entries with similar names). Final coding reflects the majority consensus across sources.

Although our preference was to restrict the sample to firms that operate primarily in one line of business to maintain cultural similarity between the various relevant units, in some cases this rule was violated. Some firms listed as parent companies in our data sources were actually owned by holding companies or conglomerates. Holding companies are a type of parent company that exists primarily to exercise financial control over other firms; the control is exercised through ownership of a majority of the controlled firm's shares. These cases were included in the sample because it is unlikely that a holding company—a financial "figurehead"—would have the same effect on firm culture as other structural arrangements.[31] A conglomerate is made up of a number of different companies that operate in diversified fields rather than having a single primary industry. Two companies with a conglomerate parent company were included in the

[30] We included companies listed as currently inactive in Compustat and Mergent's if they were operating at the beginning of our sample period, even if they closed during our time period. Although our focus is on companies already operating in 1995, we also included companies that had not yet begun operating in 1995 if they were spun-off of companies already in the sample in that year.

[31] Facilities sometimes had both the holding company and the operational subsidiary listed as owners in various sources. In all of these cases the only economic data available was that of the holding company. Thus, we listed the holding company as the owner and used its' economic data.

sample because we were able to obtain independent economic data on the lower-level companies, a fact that suggested each operated somewhat independently. [32]

In other cases we discovered that firms were actually subsidiaries (companies controlled by another company) of other companies operating in our industries of interest. This explained many of our multiple entries with similar names.[33] In these cases, we wanted to determine whether the ultimate parent or the subsidiary was responsible for environmental operations and if so, whether it was operating independently. If we were able to obtain unique economic data for the subsidiary and the ultimate parent annual report described it an independent operation, we listed the subsidiary as the parent company.[34] If the subsidiary did not have independent economic data and did not appear to operate independently according to our business sources, we kept the ultimate parent in the sample. We created dummy variables to reflect whether the company had a holding company, a conglomerate, or another company as its ultimate parent to determine if there are any substantive differences in the results with and without these companies in the analysis.

Changes in Compliance Over Time

Because we were following our companies from 1995 through 2000, it was necessary to track changes in the company over time (merges, bankruptcy, etc). We

[32] We did collect the economic data for the conglomerate parent as well and can determine whether substantive results change depending on which economic data is used.

[33] It would be tempting to assume that entries with similar names were the same company, yet this often is not the case. For instance, in many cases our company list contained both "X Steel Company" and "X Company." Without investigation we would have assumed that these were duplicate listings for one company. However, as we often found, one name actually reflected the parent company and the other a large subsidiary. Although quite complex to disentangle, these distinctions became quite important in determining 1) which entity was responsible for environmental operations and 2) which financial data to use (when both were available).

gathered information on bankruptcies and mergers from qualitative company histories (Mergent's Online and the Business and Company Resource Center) and firm annual (10K) reports; when possible the type of bankruptcy was noted. Companies were followed through bankruptcy if the company was not dissolved. Companies were also followed through mergers if the new entity continued to operate in the industry of interest. Although we planned to follow the original companies separately if they operated as subsidiaries of the newly merged entity, this rarely occurred. Although newly merged companies often retain the brand names of previously independent companies, the original companies generally did not continue as independent operations. Consistent with our U.S. based rule, companies that merged with or were acquired by international companies were not tracked post-merger.

Some companies and their facilities were tracked despite unusual ownership changes. In one instance we continued to follow a company even though it was acquired by a company operating in a different industry because our research suggested that it did continue to operate as an independent entity in the industry of interest. The original company had unique economic data embedded in the new parent company's annual (10K) report; it was also listed on the new parent company website as an independent subsidiary. Finally, some companies that reorganized facility ownership into joint ventures with other companies (not in the sample) were also followed. In these cases, we only tracked the facilities that were originally owned by a company in our sample/industries and as long as we were able to obtain some independent economic data on the joint venture.

[34] We did collect the economic data for the ultimate parent as well and can determine whether substantive results change depending on which economic data is used.

Economic Data

In fact, gathering economic data required several steps. As a first pass, we utilized existing sources that had already compiled the company information (i.e., Compustat and FIS Online). These databases had some limitations that required us to search for additional information in other places (e.g., 10K reports).

One small problem was differences in data item names across source. Although in most cases the data items had identical names across source, we would occasionally find items that had slightly different names in FIS Online. For example, "pretax income" is a standard measures available in Compustat; while FIS Online often did not have an item names "pretax income," it did include "income from continuing operations before income tax." We entered data items with different names when we thought it was reasonable to do so. When possible we identified companies for which economic data was available in both data sources and compared the data items with different names to make sure they contained identical information for that company (before using it for a company that was not in both sources). When this was not possible, we verified the categories with business school faculty at the University of Maryland to ensure that they were capturing the same piece of information.

Several additional problems occurred when tracking economic data for two companies that merged. First, the sources often retrospectively applied economic data for one of the original companies to the newly formed merger for years before it was formed (e.g., Pennzoil Company economic data was assigned to Pennzoil-Quaker State for years prior to the 1998 merger). We used 10K reports to determine which of the original companies to whom the economic data belonged. Second, economic data was often

missing for the year prior to mergers. Generally we were unable to supplement this information from other sources and it continues to be a source of missing data.

Some missing data problems were resolved using firm 10K reports. Most of the main sources did not contain economic data for joint ventures and subsidiaries. In some cases these entities did not have separate economic data from the parent company. However, in other cases we were able to find unique economic data for the smaller entity embedded in the parent company 10K reports. In addition, in a few cases the original data sources were missing certain years of parent company economic data for no apparent reason. We were often able to gather the data directly from firm 10K reports.

Finally, the original data source occasionally contained economic data for a parent company and a subsidiary with similar names. We used the 10K reports to authenticate the appropriate entity.

Linking Companies to Facilities

Because pollution actually occurs at the facility-level (e.g., plant, mill, refinery, etc), it was necessary to identify all facilities owned by our universe of firms. Although there may be variation due to the plant age and technology, the corporate crime literature provides compelling reasons to believe that firm structure and culture may produce similar environmental performance across plants. Therefore, aggregating plant-level performance to the firm-level provides a new method for examining and learning about environmental performance. In order to create a sample of facilities in which it is reasonable to aggregate to the firm-level, facilities were only included in the sample if they were operating in the same industry as the parent company. Under the assumption that facilities operating in the same industry as the parent company would maintain a

culture that is more similar to the parent company than those operating in a different industry.[35]

We used three sources to create a list of owned facilities: The Directory of Corporate Affiliations; Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI); and EPA's Permit Compliance System (PCS).[36] Some sources are published by company (e.g., the Directory of Corporate Affiliations) and others are compiled at the facility-level but include some ownership information. For example, the Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI) requires *facilities* to report air, land, and water releases to the EPA if the levels are above specified amounts along with the parent company name.

We began with the Directory of Corporate Affiliations because it seemed to be the most complete source of information by company. For companies published in the directory, we created a list of all facilities owned by our sample of companies that operated in the same industry (as the company) as of 1995. We next generated a list of all facilities in our SIC codes of interest that submitted TRI reports in 1995. Although TRI reports are done by facilities, they do report ownership information. Unfortunately, the ownership information was often clearly incorrect (e.g., company listed as owner before it existed; one facility listed twice with two different parent companies). Thus, all ownership information gathered from TRI was cross-checked with other sources (annual 10K reports, etc). We added facilities to the master facility file if a parent company in

[35] Future studies may find that facilities operating in different industries still maintain a culture that is similar to the parent company, indicating the powerful influence of firm culture. However, if this is not the case, it may suggest a boundary for examining environmental performance at the firm-level. The reach of the parent company may stop at industry lines.

[36] The Permit Compliance System (PCS) contains the EPA data on facilities permitted to discharge pollutants into U.S. waterways. We had access to the PCS data on all facilities in our industries for 1995 through 2000. EPA staff was very generous with their assistance.

our sample was listed as the owner but the facility was not already entered from the Directory of Corporate Affiliations. We did encounter companies listed as owners in TRI that we had not run across in our other sources; however, we often found that the company was privately owned, international, or not in our industries of interest. Very few companies were added to the sample based solely on TRI information (without being listed in Mergent's or Ward's) and all were verified with other sources (annual 10K reports, company histories, etc) before doing so.

Finally, we added facilities from our water pollution data itself—the Permit Compliance System (PCS). The ownership field in PCS is not a required field; it was populated only 60 percent of the time. However, we did use the information that was available. Facilities were added to the master list if a company in the sample was listed in the ownership field. In addition, facility names often match parent company names (e.g., XYZ Steel Refinery is owned by XYZ Steel Company). Thus, we also added facilities to the master list if the *facility name* in PCS indicated a particular company. If the facility name matched a parent company name we assumed it was owned by that company, even if ownership not explicitly listed in PCS. Because the ownership information in PCS is not always updated and the historical ownership is not retained, all PCS ownership information was also verified with the aforementioned sources.

Linking Facilities to the Environmental Data

The goal of the study is to examine compliance with the Clean Water Act, thus, we also limited the sample of facilities to those with EPA water permits. Facilities that were found in sources other than PCS then had to be matched to PCS. For example, the Directory is not published in conjunction with EPA; it is an independent source of

information. Thus, none of the facilities listed in this source had any EPA identifier linked to them. We first attempted to match using name and address, but that approach on a large scale was extremely difficult. In searching for a more efficient method, we learned about the EPA's Facility Registry System (FRS). The FRS is designed to allow matches across EPA data bases. It provides a single identifier (FRS number) that is linked to identifiers in all media programs (e.g., PCS, TRI, etc) at the state and federal level (National Academy of Public Administration Report). FRS also contains the facility name, address, a list of all ownership information drawn from every source, and all previous names of the facility.

To reduce coding error, we wanted to use official EPA identifiers to match our list of facilities to the permit data whenever possible. At the time, we had TRI number for some facilities, but the FRS system can only be queried with facility name or FRS number. We did not have FRS number matched to our facilities and many facilities have similar names—sorting through them by address can be arduous. Instead, we obtained and utilized the Sector Facility Indexing Project (SFIP) linkages from Abt Associates. SFIP targeted five industries (i.e., automobile assembly, pulp manufacturing, petroleum refining, iron and steel production, and the primary smelting and refining of nonferrous metals) and compiled data across EPA programs (i.e., Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Toxics Release Inventory, and Emergency Response Notification System). Thus, this source allowed us to look up facility FRS numbers using the TRI numbers (for the facilities we gathered from TRI) and PCS numbers (for the facilities listed in PCS) that had already been documented. The FRS

numbers were used to enter the FRS system. The FRS system contained additional helpful ownership information (described below).

Facilities added to our master list from the Directory of Corporate Affiliations did not have any EPA identifiers associated with them (either PCS or TRI). In both of these cases we had to search for these facilities in the FRS system by name and address. We accepted facilities as a match if the address information in each source was identical.[37]

Verifying Ownership and Tracking Changes Over Time

We began creating our universe of companies and facilities with 1995 matches. Although we now had permit numbers, there were often ownership contradictions within (i.e., TRI often had the same record twice with different ownership information) and between sources (i.e., two sources had the same facility listed with different owners). For all contradictions, we checked annual 10K reports and the Business and Company Resource Center company history and industry news reports to determine the correct owner in 1995 and over time.[38]

After establishing ownership in 1995, changes in ownership were tracked over time to determine whether the facility was still listed with the same company in 2000. If not, the

[37]The address match may have been pulled from the list of alternate addresses rather than the main address (a facility may have a PO Box and a street address or a location and a mailing address). Within these address matches, we sometimes found that the facility name in FRS differed from the name in our master file. In these cases, we examined the list of previous facility names in FRS to verify the match (facilities change hands and therefore names; some of the facility names in our 1995 PCS data were outdated).

[38] As a first pass we investigated all facilities owned by companies that merged during the sample period. Many of the facilities with multiple entries had one entry citing the pre-merger company as the owner and a second entry listing the post-merger company as the owner. In step two all facilities with contradictory information within PCS (e.g., one company was listed in one of the address fields and another company name was embedded in the facility name) were investigated. Finally, we examined all remaining contradictions. Contradictions across sources and within TRI were often the result of sales; one entry listed the original owner and the second listed the company that subsequently purchased the facility.

same sources were used to determine whether the facility changed hands, what company purchased it, and/or if it closed. In most instances firm annual reports were most useful to find this information. The Business and Company Resource Center and Mergent Online company histories, industry news reports, and the FRS system were also utilized.[39]

The FRS system contains a list of previous facility names and ownership information from every EPA database (for which the facility has a permit) but does not state when a facility was sold/purchased. Often the list of company names and the list of old facility names contain the old and new names which pointed us to annual reports to check.[40] We coded the transaction month as the first month of new owner control unless the source specifically said the transaction occurred at the end of the month. Finally, we examined the company histories reported on Mergent's Online to check for any ownership changes we may have missed.

At the end of this coding process, the database consisted of a universe of pulp and paper, steel, and oil companies that were operating a major pulp and paper, steel, or oil facility with a water permit in 1995 followed through 2000. The original universe of companies in these industries was winnowed considerably by the sample criteria. Therefore, it is important to understand how this "new" and more restricted sample of

[39] During this process, we sometimes noticed facilities that seemed to have environmental permits but that were not uncovered in our other sources. If additional facilities were listed in the 10K report but were not in our database, we checked any facility in the same city and state in PCS to see if it was a match. If it was clearly the correct facility (i.e., it had part of the company name in its name, the company was listed somewhere in the line of data for that facility, or it had a unique name that was also listed in the 10K) then we added the facility to the sample.

[40] In a few cases the information was not available in the annual 10K reports of either the seller or the purchaser (usually we later discovered that the purchaser was international and did not have to file 10K reports). In these cases The Business and Company Resource Center company histories and industry news reports often documented changes in facility ownership.

firms compares to the industry as a whole. If the sample represents only one portion of the industry (e.g., only large companies or only small companies) then caution should be used in generalizing the results to all firms in the industry.

Information on market share indicates that the sample contains the major players. According to the Market Share sales rankings (compiled by compiled by Gale Research Inc), the sample contains the top ten pulp and paper producers; the top eight iron and steel; and 7 of the top 10 petroleum refining companies (United States Environmental Protection Agency 1995). While our universe of companies contains some of the largest operators in each industry, it also includes some relatively small firms (e.g., those that own only one plant). Thus, we believe that our companies represent a substantial portion of the market but also provide a reasonable picture of the entire industry, including smaller firms.

The focus on publicly traded companies and specific industries in this study also narrows the number of EPA permitted facilities. Again, it is useful to compare the sample for this study with EPA permitted facilities more generally to understand what portion of the pollution problem the sample captures. Using the NPDES data for all facilities operating in the industries of interest, we can see that there were 659 unique permits across industries.[41] These facilities had a total of 14,998 violations over the entire six year period. Four hundred and eleven permits were for major facilities; our data consist of 214 unique major permits (52 percent of the majors). The numbers are similar by industry: our sample contains 59 percent of the major pulp and paper facilities; 55 percent of the major steel facilities; and 41 percent of the major oil facilities.

[41] In some cases facilities have multiple permits; therefore, the actual number of facilities may be slightly lower than the number of permits.

Combined, all of the major facilities in the EPA data had 11,477 violations over the six year period. Our sample has a total of 5,341 violations (47 percent of the violations for majors).[42] The plants that are in our sample are responsible for 49 percent of the pulp and paper violations; 56 percent for major steel facilities; and 36 percent for major oil facilities. Overall then, the sample for this study captures approximately half of the major facilities in each industry and half of the violations, with somewhat smaller numbers for the oil industry.

After the firm and facility data was created, it was time to tackle the NPDES data itself. The Clean Water Act prohibits the discharging of pollutants through point sources into waters of the United States without a NPDES permit. The NPDES permit program translates the general requirements of the Clean Water Act into specific requirements for each facility. The permit contains limitations on what and how much a facility can discharge as well as monitoring and reporting requirements. Facilities are required to take various measures of discharges into the water and submit reports (usually monthly) of both NPDES permitted levels and actual discharges to the EPA; these reports are called discharge monitoring reports (DMR).

Water samples (taken to measure pollution levels) must be taken at various locations in and around the facility. The data file is reduced by including only monitoring locations associated with effluent output. For instance, upstream and downstream monitoring was excluded and the focus was limited to the water the facility was directly discharging into the waterways (effluent gross value).

[42] These estimates have not been "cleaned" according to the rules below. They are total counts of the number of violations per EPA estimations.

The data file is also limited to discharge monitoring reports for which the facility had a numeric limit on pollution. If a facility was being monitored by the EPA but did not have a specific limit on pollution the case was excluded, as there is no real opportunity for violation.[43] Federal regulations specify five different kinds of limits/measurements that can be placed on pollution (i.e., quantity average, quantity maximum, concentration minimum, concentration average, concentration maximum).[44] However, all five limit types are not required for every pollutant; the regulations specify certain measurements/limits for each kind of pollutant. If every pollutant had a required numeric value for all five limit types, then our data file would have contained 1,982,395 opportunities for violation. However, the bulk of the limits required the facility to monitor and report pollution levels, but did not have enforceable limit values. Across limit types, our data file contains 382,902 opportunities for violation.

Of these enforceable limits, 285,480 (75%) had DMR reports of actual pollution levels. The data file contained an explanation for the missing data in 98.5 percent of these cases (95,966 out of 97,422); thus, less than two percent (1.5) of the required

[43] The limit fields specify a particular numeric value for the facility discharges; however, the fields may also specify monitoring/reporting requirements without a specific limit. For example, the limit field might say "ADDMON." This code indicates that the permit writer added an additional monitoring requirement over and above what is required in the regulations. Similarly, the limit field might say "DELMON," indicating that the facility is not required to report a limit that is required by regulation. In addition, the limit field might specify "OPTMON." In these cases, the facility monitoring is optional. The limit field is also often blank. If the limit has a unit code attached to it, the blank indicates that the facility is required to report its discharges (in the specified units) but it does not have to stay under or reach a particular limit. In all of these cases the facility does not have the opportunity to receive an effluent violation (although it can receive a reporting violation if the limit field says "ADDMON" or if a blank limit has a unit code); the EPA is monitoring the facility discharges without limiting them. If the limit field is blank and does not have a unit code, then federal regulations do not require the facility to monitor or report the limit. Again, the facility has no opportunity to receive an effluent violation. In constructing my violation data, I only use the DMR reports in which the facility had the opportunity to be cited for a violation. In a few instances the PCS system calculated a violation for a report that was supposed to simply be monitored (no specific limit was set); I do not include these violations in violation counts or rates because they are system errors. I discuss the number of required reports (with a particular limit) that are missing in the following section.

reports was missing without explanation. The data was most often missing because there was no discharge (61 percent). Additional explanations included "other" reasons (19 percent), conditional monitoring (the report was not required for that particular monitoring period, 11 percent), the pollutant was below the detectable limit (5 percent), and production based limits (the limit did not apply during this particular production period, 1 percent). Most of the remaining explanations were used less than one percent of the time and indicated that the facility was likely in compliance (e.g., not quantifiable, not tracked in PCS for this period, operations shutdown). However, a few (used less than one percent of the time) were somewhat ambiguous regarding compliance status. For example, in a few instances a facility reported conducting an invalid test, a lost sample, or that analysis was not conducted. While this may indicate malfeasance on the part of the facility, it may also result from an error by the lab responsible for testing samples.

With the remaining limit and DMR reports, a few additional problems were encountered. In some cases the DMR reports contain values that are clearly incorrect. For example, effluent net measurements may have negative values because the measure represents the difference in the pollution level at two points in the production process (ex: intake water versus discharges). Other end-of-pipe measures (i.e., effluent gross value) should never contain negative values as negative measurements are not possible, but facilities have reported some negative values. In other cases the DMR reports contain values that seem questionable, but are not as clear-cut. For example, one facility reports quantity discharges as high as 89 million kilograms per day. These values seem unlikely, given that the facility is permitted to pollute 561 kilograms per day. However, in other

[44] Quantities represent total loads; the EPA also requires measurements of the concentration or percent of the pollutant in the water.

cases such high values seem possible because the plant is permitted to discharge millions of gallons of water each day. Both the negative and the extremely high positive values make up a very small portion of the data. For example, only three-tenths of one percent of the quantity average DMR reports contains negative values when they are inappropriate (measurement is a gross value). Similarly, one tenth of one percent of the quantity maximum DMR reports has negative values when they are inappropriate. I will discuss the coding of these extreme values as I discuss each specific measure of pollution.

Data and Measures

The Clean Water Act (CWA) requires firms to self-report monthly water pollution levels to the Environmental Protection Agency (EPA). When pollution levels are higher than permitted amounts, the EPA has the authority to use sanctions (e.g., warning letters, administrative actions, civil and criminal cases). Facility-level data on both compliance and enforcement have been compiled and linked to the parent company for the years 1995 through 2000. Data on traditional predictors of firm misconduct such as firm size and finances have also been gathered from other sources. Added to these data are two corporate citizenship measures that allow an examination of the effect of corporate citizenship on compliance and returns to compliance. Descriptive statistics on all of these measures are provided in Table 1A. A description of each measure is provided in Table 1B.

INSERT TABLE 1A and TABLE 1B HERE

As Figure 2 shows, the final sample contains 67 companies as of 1995 and drops to 55 by 2000 (mainly due to mergers). The majority of the companies in the sample

operate in the pulp and paper industry (30 in 1995 and 24 in 2000). In 1995, 19 of the companies were operating in the oil industry and 18 were operating in steel; the number drops to 16 and 15 oil and steel companies (respectively) by the year 2000.

INSERT FIGURE 2 HERE

Figure 3 provides the number of companies in each industry over the entire sample period. Again, the majority of the companies operate in pulp and paper.

INSERT FIGURE 3 HERE

Figure 4 shows that these companies were operating 212 major water facilities. Like the parent companies, the number of facilities declines over time, mainly due to international mergers and sales. The majority of the facilities are pulp and paper facilities (124 in 1995 and 113 in 2000). The sample contains 48 oil facilities and 40 steel facilities in 1995 and drops to 45 oil and 35 steel facilities by 2000.

INSERT FIGURE 4 HERE

Over the entire sample period, Figure 5 shows that 58 percent of the facilities are in the pulp and paper industry.

INSERT FIGURE 5 HERE

Several previously used measures of compliance are calculated at the firm-level, including a dichotomous measure of compliance, the number of violations, and the compliance ratio. Cases with inappropriate negative DMR values were dropped before constructing each of the measures, resulting in a small fraction of lost cases (e.g., 1.3 percent of the quantity averages and 0.4 percent of the concentration averages). When constructing the dichotomous and count measures, DMR reports of extremely high discharges less problematic. Even though the large values may be greater than the actual

discharge, the facility is still likely to be in violation with such a large report. These were retained and coded as violations. Extreme values become more problematic for the compliance ratio because the exact value is used rather than a dummy code. For these measures the extreme values are censored after the compliance ratio is computed.[45] The *quantity* compliance ratios for BOD and conventional pollutants contained values that appeared to be outliers and these single values were dropped. For the monthly average *concentration* compliance ratio, BOD, TSS, and conventional pollutants had outliers, one value was dropped for each of these pollutants.

Dependent Variables

Previous studies of environmental behavior focus on one type of water pollution: biochemical oxygen demand (BOD). BOD provides information on the organic pollutant content of the water by measuring the amount of oxygen consumed in the biological processes that break down organic matter; the greater the BOD, the greater the degree of pollution. In this research measures for BOD are examined as well as several other pollutants that are common across the industries of interest (i.e., total suspended solids, conventional pollutants, toxic pollutants). Total suspended solids (TSS) is a standard measure of the particulate content of the water (Kagan et al., 2003). Both BOD and TSS are standard measures of water quality (Kagan et al., 2003). In addition to these specific pollutants, two general categories of pollutants are also examined: conventional and toxic pollutants. Conventional pollutants are common pollutants, such as organic waste, acid, bacteria, oil and grease, or heat that are well understood by scientists. These materials

[45] It is difficult to determine whether the value is unreasonable based on the DMR report alone because the facility may have a very high limit.

will naturally break down in the water. Toxic pollutants are materials that cause death, disease, or birth defects in organisms that ingest or absorb them (United States Environmental Protection Agency [U.S. EPA], 2006).

Figure 6 shows that together these pollutants constitute a significant portion of the violations in the sample. Although BOD is the most commonly examined pollutant, it accounts for only 8 percent of the total violations each year. TSS violations are somewhat more commonly, representing approximately 16 percent of the violations each year. Although these numbers seem small, there are a total of 69 different conventional pollutants (both of these pollutants are classified as conventional pollutants) in the data that account for approximately 50 percent of the violations each year (see below). Thus, two out of 69 pollutants (BOD and TSS) together make up twenty to thirty percent of the total violations each year.

INSERT FIGURE 6 HERE

Figure 7 provides the same information for conventional and toxic pollutants. The two groups of pollutants, conventional in particular, account for a most of the total violations each year. In 1995, 458 of the 961 total violations (48%) were conventional pollutant violations; 224 of the 961 (23%) were toxic pollutant violations. These patterns are fairly stable over time. Together these two groups of pollutants account for approximately 70 percent of the total violations each year.

INSERT FIGURE 7 HERE

Thus, in this study the specific pollutants are examined to compare to the prior literature. However, additional pollutant groups are added that contribute a substantial

portion to the total violations. This larger group of pollutants will provide a more complete picture of plant and firm environmental behavior.

As noted, the prior criminological literature on environmental crime generally uses court case data and factorial surveys to examine the phenomena. Because the data contain the actual self-reports of pollution, the measures are drawn from the plant-level studies. Researchers have constructed a variety of measures of pollution using NPDES data and have examined different units of time. The dependent variable has been constructed as a dichotomous measure equal to one if the plant is in noncompliance (Helland, 1998; Magat and Viscusi, 1990); as a pollution level (Kagan et al., 2003; Magat and Viscusi, 1990); as the total number of violations (Yeager, 1987); and as a monthly compliance ratio (percent of permitted level) (Bandyopadhyay and Horowitz, 2006). Researchers have examined these measures on a monthly (Bandyopadhyay and Horowitz, 2006) and quarterly basis (Helland, 1998; Magat and Viscusi, 1990). Because the firm-level predictors are yearly, the measures are ultimately constructed for each firm/year. However, quarterly measures are used to examine sanction questions because sanctions are delivered on a quarterly basis.

I have constructed a dichotomous measure, a violation count, and a compliance ratio for the first set of research questions and use the latter two to test the sanctions hypotheses.[46] The dichotomous and the count measures are used in the environmental literature and are consistent with the criminological distinction between participation in offending (entire population) and frequency of offending (offender population). The dichotomous measure does not have the exact same meaning as the participation measure

[46] Level of pollution is not created because it has similar flaws to the first two measures. Instead, I chose to focus on the compliance ratio because it accounts for differences in permitted levels and opportunity.

discussed in the developmental literature. Developmental researchers define "participation" as the fraction of a population that is criminally active (Blumstein, Cohen, Roth, and Visher, 1996). In this case the measure is constructed for a period of several years (portion of years in violation). However, the two measures are split in this research for a similar purpose. Partitioning criminal activity into different components (engaging in crime; frequency of crime) enables research to identify different factors that affect different dimensions of offending (Blumstein et al., 1986). This is particularly important in the corporate crime literature because there is less information (fewer studies) about how firm characteristics relate to these different elements of offending.

The dichotomous measure includes the full sample of firms that have a numeric limit on the pollutant. Firm/years that have no violations are coded as zero and firm/years with any violations are coded as one.[47] Thus, the average represents the portion of firm/years spent in violation. Firms have at least one violation of pollution standards for at least one pollutant in 91 percent of the yearly observations (see Table 1). The violation rate is highest for the largest group of pollutants (75 percent of the

[47] The EPA data contain the limit, the DMR report, and a calculation of the percent the facility is out of compliance. Using the limits and DMRs, I constructed a dummy measure to flag reports that were in violation. I first compared whether there were any discrepancies between EPA and my calculations in whether or not a violation occurred. Out of 283,173 computations, there were 214 discrepancies as to whether or not a violation occurred. These discrepancies went both ways; in some instances my calculations contained violations not in PCS and vice-versa. Closer examination of these discrepancies suggested that the limits must have been changed in the system in one point at time. The calculations I produced were correct, but the PCS calculations were clearly based on a limit different from the one currently in the data. There is currently a backlog in the NPDES system for permit renewal. When permits are renewed after the delay, the new limits are entered retrospectively up to the point where they should have taken effect. However, the violation calculations are not updated. This is likely the source of the discrepancies. If permits are updated in certain months, then systematic bias may be introduced into the yearly violation, compliance, or overcompliance rates by using the calculations in this study. However, the permit expiration (and thus renewal) dates are spread fairly evenly over all 12 months in these data. The percent of permits that expire in each month ranges from 6 to 12 percent.

observations for conventional pollutants are in violation). The violation rate is approximately 50 percent for BOD, TSS, and toxic pollutants.

The second count measure represents the number of violations during firm/years in which there is at least one violation. When this measure is used as the dependent variable the analysis includes only a subset of the total sample—the violators. During years in which a violation occurs, the average firm has 14 total violations. The average number of violations is highest for the largest group of pollutants (conventional pollutants—8) and smaller for toxic pollutants (6), BOD (3), and TSS (4).

The dichotomous and the count measures reflect compliance versus noncompliance and the extent of noncompliance (number of violations) when there are multiple levels of conformity (and degree of violations) in the data. Firms may have violations that are significantly greater than permitted levels or violations that are just over the limit. Similarly, firms that are in compliance may be just under the permitted level or they may consistently maintain pollution levels that are considerably lower than legally allowed (overcompliance). The compliance ratio captures these various aspects of pollution. It also makes the environmental record of firms of different size more comparable.

Creating measures that account for differences in opportunity is a common difficulty in the corporate crime literature (Simpson, Harris, and Mattson, 1993). Firms vary in size and larger firms generally are thought to have more opportunities to violate the law. Environmental compliance data are all the more complicated, as compliance is tracked at the facility-level. Firms own different number of facilities and thus have different levels of opportunity for violation to occur. The dichotomous measure would be

coded as a violation if one facility or all six of a single firm's facilities were in noncompliance. Similarly, the violation count may show that a firm has more violations but this may simply be because it owns more facilities. The compliance ratio sums together all of the monthly average pollution reports across facility for the same firm; thus, it provides a picture of the overall firm record in comparison to its own opportunities (total limits in every monthly report on pollution).

Thus, the compliance ratio is the sum of the monthly discharges over the sum of the monthly limits; it represents the "ratio of reported discharges to the permitted level" (Bandyopadhyay and Horowitz, 2006, p. 8). Compliance ratios that are greater than one indicate that the plant is in violation. Ratios that are closer to one indicate that the firm pollution level is close to the permitted level; ratios closer to zero indicate that the firm is polluting substantially less than legally allowed. Bandyopadhyay and Horowitz (2006) create this measure for concentration averages: I create it for both concentrations and quantities for each pollutant and pollutant group. There is no overall summary measure for this outcome. Pollutants that are neither conventional nor toxic pollutants have unique measurement properties that cannot be converted to a measurement unit that is consistent with the other types of pollution. Color, for example, is measured in "color units," which cannot be converted to pounds per day (quantity unit) or milliliters per liter (concentration unit).

Although this measure includes the full sample of firms, it excludes a significant portion of the pollution reports for each firm. The compliance ratio is limited to reports measured as monthly averages because it is unclear how one would include maximum and minimum pollution reports, particularly when measured daily or weekly. Three limit

types (quantity maximums, concentration minimums, and concentration maximums), which constitute nearly 50 percent of the DMR observations, are never measured as averages. Concentrated and quantity averages are always measured as averages. These limit types are usually measured monthly, but not always. The quantity average limits are calculated monthly in 70 percent of the (quantity average) observations. Over 80 percent of the concentration average limits are calculated monthly.

This measure is drawn directly from Bandyopadhyay and Horowitz (2006), but these data differ from theirs in a few ways. The authors examine the compliance ratio for municipal water facilities; there is much less variation in the level of permitted discharges for these types of facilities. Industrial facilities, on the other hand, all have unique permits that are specific to their operations; there is virtually no similarity. In addition, industrial facilities are sometimes required to measure the difference in samples taken at two points during production. Thus, if facilities reduce the amount of pollution in the water between point A and point B, the ratio can be negative (indicating even more overcompliance).

As the data in Table 1 demonstrates, firms generally overcomply with both quantity and concentration limits. The compliance ratio for BOD is at the high end and firms are still polluting only 33 percent of the legal limit. Many of the ratios are substantially smaller. For example, firms pollute only 9 percent of their toxic pollution limits on average.

Key Independent Variables

Prior Citizenship Measures

Researchers have used a variety of approaches to measure citizenship (usually called corporate social performance in this literature). Researchers began with perceptual measures and have since developed content analysis, social audits, and behavioral measures to capture corporate citizenship.

Perceptual Measures

Perceptual and reputation surveys are commonly used in the social performance literature. Perceptions are frequently drawn from populations that have little or no contact with the companies in question (MBA students; academics), although some researchers have surveyed executives about their own company (Aupperle, Hatfield, and Carroll, 1983; Aupperle, Carroll, and Hatfield, 1985). One commonly used measure—Fortune magazine's annual corporate reputation index—surveys executives from firms within the same industry. Researchers have acknowledged the major problems associated with these kinds of reputation measures including a lack of specific criteria and questionable expertise of the raters (Wokutch and McKinney, 1991).

Content Analysis

Content analysis of company annual reports has also been used to capture CSP. This method involves coding (counting) the quantity and measuring the quality of a firm's self-reported disclosures of socially responsible activities. The level of sophistication in these measures varies across studies (Wolfe, 1991). This approach has been criticized because firms may over- or under- report socially responsible behavior

and there is no way for researchers to determine the accuracy of the reports (Carroll, 1991; Wokutch and McKinney, 1991).

Social Audits

"Social audits" were proposed as a more systematic approach to CSP assessment. Advocates imagined something like a balance sheet that would summarize both the positive and negative impacts of the corporation. However, the social audits suffer from a lack of accepted methods (no standardized methodologies for collecting the information or measuring devices for quantifying the information), difficulty in gathering the information (executives are often wary of divulging information), and excessive cost (Wokutch and McKinney, 1991).

Behavioral Measures

Behavioral measures were designed to overcome the subjectivity of perceptual measures, as they examine the firms actual performance rather than its reputation. Examples of behavioral measures used in the research literature include corporate philanthropic donations (e.g., Galaskiewicz and Burt, 1991; Wang and Coffey, 1992), the commission of specific kinds of illegal acts (Wokutch and Spencer, 1987), and pollution control (e.g., Bowman and Haire, 1975; Chen and Metcalf, 1980). Using behavioral measures can also reduce, or at least make clear, the value-laden judgments that must be made in determining what programs are socially beneficial or how to prioritize multiple dimensions of social performance (Wokutch and McKinney, 1991).

Improving Measurement

Clearly there is no consensus regarding the appropriate measurement of firm citizenship. To some degree, this may be tied to the lack of consensus regarding what

citizenship means. In fact, few of the measures from prior literature are based on the conceptual models; the collection of conceptually based data has proven extremely difficult. Studies using survey (perceptual) measures based on the three part social performance models have suffered from extremely low response rates (Aupperle et al., 1983, 1985; Maignan and Ferrell, 2000). Other attempts to collect behavioral measures consistent with the social performance models have had little success distinguishing between the components and collecting data that was consistent with each (Clarkson, 1995).

Despite the limitations in attempting to measure citizenship, small improvements can still be made. First, measurement can be improved by separating potential outcomes from measures of CSP themselves. Many research questions require the creation of some demarcation between "good" and "bad" performance. Some researchers have used the presence or absence of crime to make this distinction. Although the literature provides little theoretical guidance on how to differentiate groups on the continuum of social performance, it is still unclear why a firm meeting its basic legal requirements would be considered a "good" social performer. Throughout the history of CSP research, some have included economic and legal considerations in the definition of social responsibility while others have not. But, regardless of whether definitions include legal and economic dimensions, all CSP definitions include something beyond these basic criteria, even within the legal domain. How that "something more" is defined varies greatly (appeasing other stakeholders besides shareholders versus acting on ethics), but the spirit of the original and current CSP definitions involves something above and beyond the call of

duty (see Carroll, 1999 for summary). Mere compliance with the law is not a sufficient indicator of "good" citizenship.

Second, measurement can also be improved by using multiple measures. A triangulation of data sources provides a better idea of the firms overall citizenship. As Bowie (1991) states:

> "The difficulty with most analyses of the moral obligations of the firm is that they focus only on one of the relationships—the obligations of managers to stockholders or the obligations of managers and employees to customers. A complete account of the firm as a moral community would need to consider the total set of stakeholder relationships" (p. 171).

Thus, in this study I will make small improvements in the measurement of citizenship by using behavioral measures that separate potential outcomes (crime) from the concept itself. In addition, I will rely on multiple measures of corporate citizenship. I will propose a new measure of citizenship (overcompliance programs) and I will use a set of measures commonly used in the business and society literature.[48] Specifically, citizenship is measured by actions taken by the firm that signal firm orientation toward citizenship. I acknowledge that firms may engage in some of these actions (i.e., voluntary overcompliance programs) to improve/maintain a good reputation (as "window dressing") without being truly committed to the ideals of citizenship. Therefore, I will discuss this limitation below.

[48] Although not improving measurement itself, using measures consistent with prior research (however flawed) can help to build knowledge regarding firm citizenship. Inconsistent measurement strategies in the business and society field have prevented any synthesis and conclusion regarding the relationship between citizenship and financial performance.

Current Citizenship Measures

Corporate Citizenship--Overcompliance Programs

In this study, I use firm participation in voluntary overcompliance programs as one measure of citizenship. Participation in voluntary programs is theoretically consistent with the citizenship/social performance concept, as firms are volunteering to go above and beyond legal requirements. As Clarkson (1995) notes, companies are free to decide the extent to which they will "acknowledge, recognize, or pursue obligations and responsibilities to their stakeholders" (p. 105). While there are legal requirements for obligations to some stakeholders (health and safety of employees), companies do not have legal obligations for some behaviors (employee career development). Any evidence of acknowledging some (non-legally obligated) stakeholders or evidence of going above and beyond the requirements for legally binding activities may be suggestive of a good citizen. The concept of citizenship is measured by firm participation in two voluntary programs: the EPA's TRI 33/50 Program and the Wastewise Program.

The EPA's Toxic Release Inventory (TRI) is an information disclosure program created in 1988. Although the pollutants reported in the program can be legally emitted (and thus, there are no sanctions associated with the emissions), the EPA requires toxic waste producers with more than 10 employees to file annual reports of emissions for approximately 300 toxins to the EPA. Reports are only required if the facility manufactures, processes, or otherwise uses listed chemicals in excess of the reporting thresholds over the course of a year (U.S. EPA, 1999).[49]

[49] From the list of toxins, "manufactured or processed" toxic chemicals in quantities exceeding 25,000 pounds must be reported. In addition, toxins from the list "otherwise used" must be reported if they exceed 10,000 pounds in the calendar year.

As a result of the information disclosed, the EPA developed a program called TRI 33/50. The 33/50 program targeted 17 chemicals to be reduced by 33 percent by 1992 and 50 percent by 1995. Although the recruiting effort occurred in stages, the EPA invited all companies that previously reported discharging the targeted chemicals to participate in the 33/50 program. All companies in this sample meet the criteria and, thus, would have been invited.[50] The EPA reports that 13 percent of the companies contacted committed to the 33/50 Program. The program met is overall goal (50 percent reduction in pollution transfers) by 1994, one year early (U.S. EPA, 1999). Approximately 50 percent of the companies in the current sample participated in the 33/50 program.

The second program used as a measure of citizenship is Wastewise. Wastewise is a voluntary partnership program which strives to reduce solid waste through waste prevention (i.e., using fewer materials to do the job) and recycling. It began with 281 partners and by 2004 had 1500 members (U.S. EPA, 2004). The EPA launched its Wastewise program in 1994 but companies could join anytime thereafter. Although a list of member companies is available, the year of membership is not; thus, Wastewise participation is also a static measure of CSP. Approximately 20 percent of the companies in the current sample participated in Wastewise at some time during the six year window that companies are followed.

[50] The EPA engaged in a heavy recruiting effort, beginning in 1991, to encourage firms to join the TRI 33/50 program. The EPA invited firms to participate in three stages with a total of approximately 8,000 invitations. Although the EPA has not retained a list of invitees, all companies in our sample were invited to participate. Two sources were used to verify the invitation. First, firms that discharged any one of the seventeen chemicals of interest were invited. Thus, TRI facility reports from 1988 and 1992 were used as verification. Second, Vidovic and Khanna (2005) provided their EPA database which contained facility reports of TRI 33/50 chemicals and the parent company participation status (participated, refused, never replied, etc).

These measures of citizenship are not ideal; they are not measuring firm culture, but rather actions or signals that seem to indicate good citizenship. I accept these measures at face value, which may be problematic. If, for example, firms volunteer for overcompliance programs because they have poor records and want to appear "green", then participation in these programs is not really capturing citizenship. On the other hand, there is no apriori reason not to accept these measures as reasonable proxies for citizenship.

First, the only benefits for participation in the TRI 33/50 program are public recognition and special awards from the EPA. Firms do not receive reductions in the enforcement of other EPA requirements.[51] Second, the literature on emissions and TRI 33/50 participation does not suggest that firms merely use the program for appearances.[52] Firms with higher releases of 33/50 chemicals tend to participate (Arora and Cason, 1995) and firms with higher releases of *non*-33/50 toxic chemicals (Arora and Cason, 1996) are more likely to join. Overall it seems that firms with higher levels of emissions may have been more likely to participate. Arora and Cason interpret this association in terms of negative motivation; firms want to want to reduce emissions and the associated stigma. However, it may also mean that firms recognized a problem for the first time (new mandatory reporting requirements) and took an opportunity to make a change.

[51] It is unlikely that firms received enforcement reductions in one regulated area for voluntary reductions in another. First, the EPA structure keeps program offices relatively separate. Instead of integrating new legislative requirements into an agency wide strategy, the EPA creates new, separate program offices when additional regulations are passed. EPA enforcement has only recently become more centralized. In addition, much of the enforcement takes place at the state-level and the TRI 33/50 program is a federal program (Arora and Cason, 1995). Finally, Arora and Cason (1995) reviewed enforcement decisions and penalties under the Toxic Substances Control Act (a program separate from the TRI program) and find little evidence of enforcement reductions for participants. Thirty-five percent of the companies fined were 33/50 participants. The largest fine was also imposed on a 33/50 participant.

[52] Although there is a growing body of literature examining the antecedents and effectiveness of the TRI 33/50 program, a similar body of literature has not developed on the Wastewise program.

Third, the evidence does not support the "free rider" argument. Firms that were already reducing emissions prior to the program inception were no more likely to participate (Arora and Cason, 1995, 1996). However, these firms were still eligible to participate.[53] Finally, the TRI 33/50 chemicals are *legal* pollutants; if firms that joined the program had poor records in discharging *illegal* chemicals it might still suggest that they entered the program for appearances. However, Arora and Cason (1996) do not find an association between a firm's TRI 33/50 participation and air violations.

These problems are less of an issue with the second set of measures—the KLD social ratings data. These measures are more objective; the firms are actually engaging in the socially responsible activities, not merely signing up for them. However, the social ratings data do not ensure that firms take the socially responsible actions out of moral or altruistic concerns.

Corporate Citizenship--Kinder, Lyndenberg, Domini & Co. Index[54]

In addition to the above citizenship indicators, I also use measures common in the corporate social performance literature. Kinder, Lyndenberg, Domini & Co., Inc (KLD) compiles and provides investors with information on corporate social activities derived from annual surveys, annual reports, proxy statements, quarterly reports, and articles in the general business press. Although the specific categories and the method of presenting the data have changed over time, KLD has assessed companies on a total of thirteen dimensions. KLD divides the dimensions into two sets (qualitative screens and exclusionary screens), each with different rating methods. The qualitative screens are a

[53] In fact, the TRI reports from 1988 are used as the program baseline to avoid excluding any decreases in emissions made by firms prior to the program inception in 1991 (Arora and Cason, 1996).
[54] The descriptive statistics for the KLD measure are presented in Table 5, which contains the sample averages for the subsample of firms in the KLD ratings.

set of dimensions (community; employee; environment; product; treatment of women and minorities; human rights; and corporate governance) that contain sub-categories on which the company might be rated a "strength" or a "concern." For example, under "Community" KLD rates companies on the following strengths: generous giving, innovative giving, non-U.S. charitable giving, support for housing, support for education, and other strengths. Companies that reach the criteria for "strength" are coded as a one and those that do not are coded zero. The "Community" dimension also contains a list of concerns on which companies may be rated a zero or one, including investment controversies, negative economic impacts, and other concerns.[55] The collected data are largely objective; for example, only companies that consistently give over 1.5% of trailing three-year net earnings before taxes to charity are rated as "generous givers" under the philanthropy sub-category. However, KLD must set sometimes subjective "cut points" to rate the sub-topics as a strength or a weakness. For instance, KLD determines whether a company is a "prominent participant" in partnerships that support housing (rather than simply using participation). Again, these data provide information on firm activities that signal corporate citizenship rather than directly measuring firm culture. However, these measures rate firms on a variety of activities across different domains. Thus, they provide a more comprehensive view of firm performance than just environmental activities. In addition, these measures are compiled on a yearly basis and allow for the examination of changes in citizenship and compliance over time.

[55] KLD originally provided a single score for each of these dimensions. The score ranged from major concern (-2) to major strength (+2); the sub-categories were listed as the reasons for the rating. Thus, companies that had three or more reasons for concern were given the same score on the dimension as companies with only two concerns (-2). Some researchers used this truncated score and others coded each reason code (assigning each a zero or one) and summed them to capture the full variation across company. The second method is used in this study.

These measures have been used extensively in the prior literature on citizenship. Some researchers have organized these dimensions to reflect stakeholder groups. Hillman and Keim (2001) combine the subcategories to reflect employee, customer, community, and supplier stakeholders. Dawkins (2002) collapses the stakeholder groups into "people" and "product" dimensions. Within each stakeholder group, strengths are subtracted from concerns arrive at a "net concerns" measure. Although combining them in different ways, each of these studies has used only five of the available categories of data: employees; women and minorities; products; community; and environment.

The KLD data contains an additional set of items called "exclusionary screens." These items are assigned a score only if the item is a concern for the company; these currently include whether the company derives substantial revenues from alcohol, gambling, weapons contracting, nuclear power, or production of tobacco products. In addition to the stakeholder group measures, one study used some of these additional categories (alcohol, military, nuclear contracting, non-US concerns over investment) as a "social issues" dimension (Dawkins, 2002).[56]

Although some advocate examining each dimension of CSP separately as some researchers have done (Johnson and Greening, 1999), the literature appears to suggest that firms can be assigned a single CSP score.[57] This approach was adopted by other scholars. Griffin and Mahon (1997) assigned both the qualitative items and the exclusionary screens equal weight and created a global CSP measure of all strengths

[56] KLD has also reorganized the data over time. For instance, South Africa involvement was previously included in the exclusionary screens (rated only if a concern). However, KLD have created a new category in the qualitative screens to reflect human rights. Positive South Africa involvement was then rated as a strength while South African controversies (and Northern Ireland, Burma, Mexico controversies) are rated as concerns.

[57] There is little guidance in the literature as to how one might aggregate these dimensions into a single CSP rating. Thus, a variety of approaches are used even with this single data source.

minus all concerns. Scharfman (1996) cites two conference papers that use researcher-developed weights to allow some items more importance in the global (weighted) measure of all strengths minus all concerns (Graves and Waddock, 1993; Ruf, Muralidhar, and Paul, 1993). This study is the first to examine the implications of citizenship for corporate crime; thus, it is logical to begin with the global concept of social performance.

Although the previous literature is followed as much as possible, the current social performance measure differs in several ways: the exclusionary screens, the product dimension, and the sub-categories that reflect criminal activity in all dimensions are excluded. Like previous studies the global measure includes the community, diversity, employee, environment, and corporate governance dimensions and does not include the human rights dimension.[58] None of the previous studies contained the human rights dimension in its current form (although some did indicate whether the company had significant involvement in South Africa; see footnote 56). Even in its current form, most of the sub-categories in the dimension were not collected during the time period of the current study (1995-2000). Most were assessed up to or only in 1994 or 1995 and others were added in 2000 or 2002. Sub-categories in the dimensions to be used (community, diversity, employee, environment, corporate governance) were all collected throughout the time period of interest; thus, the measure will be consistent over time.

Although previous global measures have included the exclusionary screen concerns (company derives substantial revenues from alcohol, gambling, weapons

[58] It is actually unclear whether studies using a single global CSP measure included the corporate governance dimension. Several studies mention the category (previously named "other") but do not discuss in any detail whether it was included in the summated measure. I see no reason to exclude it.

contracting, nuclear power, or production of tobacco products), there is less of a consensus these items; they are consistently rated as less important; and they are irrelevant for the industries in this study. Although there is little agreement on the meaning and appropriate measurement of social performance, there is more consensus that some of the dimensions reflect social (ir) responsibility more than others. For example, although individuals may not agree that firms have an obligation to provide retirement benefits and stock options to employees (employee relations dimension), they would not see it as irresponsible to do so. Some items in the exclusionary screens, however, are not as straightforward. For instance, societal views on mala prohibita kinds of behaviors (alcohol and gambling) have changed over time. Thus, while some may view alcohol or gambling revenue as reflecting irresponsibility, others would not. In fact, Scharfman (1996) finds that the global KLD score has a higher correlation with other social performance measures when the nuclear power, military contracting, and South African involvement are excluded. In addition, the exclusionary screens are rated as less important by independent assessors and socially responsible investors. In constructing weights for the KLD dimensions, both Waddock and Graves (1993) and Ruf et al. (1993) find that military contracting, nuclear power, and South African involvement are rated as less important than community relations, employee relations, product, and diversity by different sets of assessors (as cited by Scharfman, 1996). In addition, socially responsible investors report being mainly concerned with environment and labor relations. Although fewer in number, the investors were also concerned with individual rights (hiring women and minorities). Although mentioned the least, the respondents also reported concerns

with socially useful products and military contracts, particularly contracts that involved nuclear weapons (Rosen, Sandler, and Shani, 1991).

Finally, these items are virtually irrelevant for the industries examined in this study. No company had a concern rating for deriving revenue from alcohol, gambling, or production of tobacco products or for involvement with nuclear power. Only one item appeared as a concern for any company in the sample—receiving more than $50 million for fuel or other supplies related to weapons from the Department of Defense. However, this item is not included in the global measure. First, while other dimensions are applicable to all of the industries under study, this measure is only relevant for the oil industry. In addition, although investors reported a concern with military contracts that involved nuclear weapons, they did not report such a concern with selling oil. Finally, I would argue that this item is still subjective; many may see it as the patriotic duty of a corporation to assist the military rather than a social concern.

Although previous studies have used the product dimension, it is excluded from the global measure because almost every "concern" within the product dimension is related to crime (e.g., paying fines or penalties for regulatory actions relating to product safety). As discussed below, any crime related sub-categories is excluded from every dimension under study. In addition, the "strength" sub-categories do not seem to distinguish among the companies in these industries. Only one company is rated as a strength in the product dimensions at any time during the sample period. While this may suggest something about these industries (the industry products do not go directly into consumers hands) or the companies (they are not product leaders), it does nothing to distinguish among the companies.

Finally, the present measure differs from previous studies in that any crime related sub-category is excluded from the total concerns for each dimension. As stated, criminologists would conceive of crime as an outcome of corporate citizenship rather than a measure of it. Thus, any items related to fines or civil penalties are excluded whether they refer to discrimination, pollution, antitrust, or product safety issues.

With these modifications, I have followed the approach of previous studies and created a single score to represent social performance/citizenship by subtracting total concerns from total strengths. In some cases substitutions have been made when data are unavailable for subsidiaries and joint ventures in the sample (i.e., parent company social ratings are used for the subsidiary; both parent company social ratings are used for the joint venture). These substitutions were made for 18 company/years. With these substitutions, the data range from -3 to positive 8, with a mean of 1 and a standard deviation of 2. Without these substitutions, the descriptive statistics are virtually identical. The analyses are run both with and without the replacements.

Sanctions

The EPA also conducts enforcement activities at the facility-level, although the parent company may be a defendant in court cases. These official EPA reactions are also aggregated to firm-level counts of enforcement actions. For this study, I will examine the enforcement actions that resulted from a pollution violation (i.e., excluding enforcement actions for reporting violations, etc). However, the data does not contain links between enforcement actions and specific violations. Thus, although the outcome of interest may be limited to a specific type of pollutant (e.g., BOD), the enforcement action may have

been given for any type of pollution (e.g., combining violations for BOD, TSS, and nitrogen).

Two sources of information are used to construct measures of sanctions; one is the PCS system itself. The EPA data contains information on actions taken by EPA (national and state). EPA enforcement actions in this study have been categorized using a severity scale created by Hunter and Waterman (1996). The scale ranges from 0 to 7, with more informal actions falling at the bottom of the scale. Table 2 provides the distribution of sanctions across the 7 severity categories; the distribution is cut at 2 (categories 0, 1, and 2 are considered informal).

INSERT TABLE 2 HERE

Table 3 provides the distribution for informal and formal sanctions. Level three contains administrative action items, moving into the realm of a formal response. Although in their study Hunter and Waterman (1996) find that the bulk of enforcement actions fall into the informal categories, the distribution of formal and informal enforcement actions in these data is more balanced. Shifts in EPA and political administration over time may account for this difference. In addition, Hunter and Waterman (1996) combine enforcement actions administered for different kind of violations (some more serious than others) and to different kinds of violators (municipalities and industry). The data presented here measure enforcement actions for industrial polluters (a more serious violation). Thus, the equal use of formal and informal actions may represent a more punitive stance toward the more serious violations.[59] As

[59] This difference may also be due to one category of sanctions that is excluded—other. The "other" category is not included in the Hunter and Waterman (1996) scale (nor is it mentioned as a problem). It is unclear what kinds of actions might be included and whether they would be informal, formal, or a mix.

shown in Table 1, on average firms receive very few sanctions each year. Although some firms received as many as 41, on average each firm/year contains only 2 sanctions: one formal and one informal.

INSERT TABLE 3 HERE

The EPA has several options for pursuing violators through the court system. The EPA may handle the case administratively (internally); these are administrative (civil) cases. The EPA may also refer cases to the Department of Justice (DOJ) for external civil ("civil judicial") or criminal prosecution. These sources provide an additional indicator of sanctions in this study. However, there are several issues that require caution when the using these data. First, it is likely that information on administrative cases in this source (EPA Docket) overlaps with information on administrative orders and penalties in the PCS data, but it is impossible to determine the degree of overlap. Second, the administrative, civil, and criminal cases coded as the more formal actions in the scale currently reflect all cases brought against these companies under the Clean Water Act; thus, the cases may have been brought as a result of other kinds of violations (reporting or compliance schedule violations rather than pollution violations). However, because the EPA targets the most serious violators and the most serious violations (i.e., pollution) for formal enforcement actions it is likely that most of the cases were brought for either repeated pollution violations or repeated violations of many types (e.g., pollution, compliance schedule, and single event violations).

As Table 4 demonstrates, when formal cases are brought the EPA most often files the least serious type of case—administrative. Administrative cases constitute 72 percent

of the total cases and civil cases make up 25 percent; thus, criminal cases are extremely infrequent (3 percent).

INSERT TABLE 4 HERE

Control Variables

Firm Financial Performance

Profitability

A common measure of profitability (total firm profit) is total stockholders equity (TSE) (Simpson, 1986; Jamieson, 1994). TSE is the common and preferred shareholders' interest in the company; essentially it is total assets minus total liabilities and represents the amount stockholders might obtain if a corporation were liquidated. The mean TSE is approximately 3 billion with a standard deviation of 8 billion. Higher values indicate that the firm is more profitable.

Return on Assets

Return on assets (ROA) is a common measure of firm financial performance. ROA is commonly calculated as net income divided by total assets and captures how effectively managers utilize firm assets (Clinard and Yeager, 1980; Deephouse and Carter, 2005; Kieso and Weygandt, 1974). Profitability in relation to assets or investment reflects how efficiently the firm utilizes its resources (Keane, 1993). The mean is 0.03 with a standard deviation of 0.06. Higher values indicate that the firm is more efficient.

Return on Sales

Return on Sales (ROS), measured as total sales divided by total assets, is also used to measure of firm performance (Altman, 1968). ROS indicates the sales generating

ability of firm assets (Clinard and Yeager, 1980). Altman (1968) refers to it as a measure of management's capability in dealing with competitive conditions. The mean for this variable is 1.20 with a standard deviation of 0.66. Higher values indicate that the firm is more efficient.

Liquidity

Liquidity is defined the difference between a firm's current assets and current liabilities divided by the total corporate assets. It is meant to capture a firm's working capital (Clinard and Yeager, 1980). The mean for this measure is 0.09 with a standard deviation of 0.12. Higher values indicate that the firm is generating more working capital.

Firm Structure

Complexity

In this study, firm complexity is measured as the number of facilities owned by the firm that are operating in the same industry. This provides a proxy for complexity in that it captures the degree of horizontal spread in the company's structure. The mean number of facilities owned is 3 with a standard deviation of 3.

Firm Size

Size is measured as the number of employees. The mean number of employees is approximately 15,000 and the standard deviation is 20,000.

Additional Controls

Industry

Corporate wrongdoing may be a reflection of the culture or structure of the industry in which the firm operates (Clinard and Yeager, 1980). Thus, it is important to

control for industry effects, particularly because studies have found them to be more powerful predictors of compliance than firm-level constructs (Clinard and Yeager, 1980; Simpson, 1986; Simpson, 2002). In the descriptive section differences in environmental record across industry are explored. Dummy controls for the primary industry of each company (steel; pulp and paper; and oil refining) are also included when the questions of interest are explored. Controlling for industry effects in this manner is consistent with previous studies (Simpson and Koper, 1992).

Variability

As stated, plants often have variability in discharges from seasonal changes, random fluctuations, differences in intake water content, and plant maintenance. Bandyopadhyay and Horowitz (2006) find that variability significantly predicts the degree of overcompliance: water treatment plants with higher variability were more likely to overcomply to maintain an overall low pollution level. Water/sewage treatment plants (publicly owned treatment works) are also required to obtain NPDES water permits to discharge water into waterways. These entities are different from industrial discharges: they are publicly owned and therefore have no corporate structure. Most importantly, many manufacturing plants send some water discharge to sewage treatment plants and the sewage treatment plant is ultimately responsible for treating and discharging wastewater. Because the water treatment plants have less control over the receiving water, they likely experience more problems with variability. However, variability is still likely to be a problem for industrial plants as well. Thus, the same measure used by the authors (the firm-specific standard deviation of the logged monthly

compliance ratio) is created and used here when the compliance ratio is the dependent variable.

Data and Sample Issues

Table 5 provides the descriptive statistics for the subset of firms that are ranked in the KLD social ratings data. The KLD firms have better financial performance and are larger on average; thus, the firms that are less profitable and smaller tend to be excluded from these rankings. For example, the average stockholders equity is approximately 3 billion in the full sample and 5.5 billion in the KLD sample; this is due to the loss of firms on the lower end of financial performance. Although the average levels are much more similar for return on assets, return on sales, and liquidity, the firms at the bottom of the distribution are again excluded from the KLD ratings and the KLD firms have slightly higher returns and liquidity. Similarly, the companies contained in the KLD data are larger. They own 1.4 more facilities and have approximately 12,000 more employees than the average firm in the full sample.

The KLD sample also differs in terms of sanctions and compliance record, but the differences are minimal. The KLD sub-sample received slightly more sanctions on average each year and has a slightly higher average number of administrative cases. However, the largest difference in means is still small: the full sample received 1.75 sanctions (of any kind) on average each year and the KLD sample received 2.09 per year.

On average the KLD firms were in violation during a slightly higher percent of the yearly observations for nearly all of the pollution types, although the mean difference ranges from only 0.03 to 0.08. The KLD subsample was in compliance with toxic pollution standards slightly more often. The KLD subsample also has slightly more

violations on average than the full sample (with the exception of violations for TSS and for toxic pollution), but the differences are again small. The biggest difference is in total violations. Among the violators in the full sample, the firms had 13.55 violations on average per year while the KLD violators had 14.10 yearly violations on average. The difference between the two samples in the compliance ratio (portion of limit that is discharged) varies by the measure; however, the median compliance ratios are quite similar across the two samples. Table 6 provides this information for the KLD sample without the substitutions. The means and medians change very little from the KLD sample with replacements.

INSERT TABLES 5 AND 6 HERE

Regardless of the sample, the data are challenging to use. Ideally, panel models with fixed effects would used to test both sets of hypotheses. Controlling for unobserved differences in firms that might explain citizenship, sanctions, and environmental behavior would strengthen any associations that are uncovered. However, this type of analysis is not feasible for several reasons.

Two issues emerge from examining these descriptive statistic tables. First, the data are clearly skewed; in fact, the standard deviations are often larger than the means. In addition, the medians are often quite different from the means. The second related problem is low variability. For example, the range of violations each year is large but the median for each type of pollutant is between two and four for each pollutant group and only eight for overall pollution.

Several other difficulties emerge due to the complexity of the data. First, the variables of interest are measured in different time units. Although pollution levels are

usually reported monthly, sanctions are distributed quarterly and firm characteristics (size and financial performance) are only available yearly. Thus, the data must be aggregated to firm/year to examine the effect of citizenship on environmental behavior. If a monthly or quarterly analysis was conducted the coefficient would still be based on any yearly changes in citizenship. In addition to a small sample size (73 firms total), this reduces the number of observations over time. When the sanctions questions are examined the models are run quarterly and the firm characteristics for each year are applied to every quarter in the year.

To further complicate matters, some measures are available for a limited number of firms. As noted, the KLD social ratings are available for only half of the sample. In addition, the compliance ratios can only be calculated for monthly averages, but pollution levels are not always measured and submitted in this unit.

Finally, many of the independent variables of interest are correlated (see Table 7). For example, consistent with previous studies (Arora and Cason, 1995, 1996; Decanio and Watkins, 1998), larger firms are more likely to participate in voluntary programs. Firms with more employees also score higher on the KLD rankings. Correlations among the independent variables make it more difficult to sort out competing explanations. However, diagnostic tests of the regression models indicate that the correlations do not create substantial multicollinearity (discussed in the results section).

These problems make these data difficult to analyze, but not impossible. A variety of methods are used to understand the association between environmental behavior and citizenship. When the outcome is continuous mean differences and/or correlations are presented for the full sample. Because these tests do not correct for the

dependence of multiple observations of the same firms, pooled regression models that correct the standard errors (using the STATA cluster command) are used to determine statistical significance. However, STATA documentation urges caution in using the cluster command with binary dependent variables. In addition, it is unclear whether it is appropriate to use the cluster command with binary independent variables. In these cases, all of the data for each firm is combined into one observation (circumventing the problem of dependent observations over time) and then mean differences and correlations are calculated. The bivariate tests do contain some statistically significant results.[60] When the outcome is continuous, multivariate pooled regression (with a correction for clustering) is conducted to test citizenship against competing explanations of firm behavior. When the cluster command is inappropriate, partial correlations are used to examine whether citizenship remains significant when covariates are included.

The sanction hypotheses are especially tricky to test with these data. Again, survival or panel analysis with fixed effects would be ideal to sort out the impact of sanctions on compliance. However, in addition to the outcome, the data also lack variability in sanctions. The median number of sanctions received each year is zero and 75 percent or more of the firm/quarters have zero sanctions. Although survival analysis might be useful to identify the effect of sanctions even when rare, fixed effects cannot be included in the survival models to ensure the effect of sanctions on recidivism is captured rather than the reverse (poor environmental behavior results in sanctions) because of low

[60] Because of the data limitations, statistical power in this study is low. There is an increased chance of making a Type I error (failure to detect true significant differences). Thus, a lower significance criteria (p=0.10) is used.

variability in the outcome.[61] In addition, time to failure models would not capture the effect of sanctions on the frequency of violation or overcompliance. Despite these problems, I am still able to address the sanctions questions in an exploratory manner. Using the violation count and overcompliance measures, I examine the effect of sanctions on future behavior within each citizenship group while including the firm characteristics that are related to environmental performance in the model. I also include prior violations/overcompliance in the model as a proxy for "sanction risk." In a limited way, the lagged dependent variable "controls for" the fact that chronic offenders receive more sanctions.

Given that the concept of citizenship and data on the actual pollution levels at the firm-level are new additions to the corporate and environmental crime literature, it is reasonable to begin addressing these research questions with this more descriptive approach. In addition, compiling this type of data at the firm-level is a new approach and it is necessary to first understand some of the broader patterns in the data. Thus, I begin the results section with a description of the production of water pollution in each of the industries of interest before describing the patterns of environmental behavior (with each of the measures) for each industry over time. Next, the environmental record of the plants and firms in the sample are described overall and within each industry. This section provides some sense of how the picture of pollution changes as one moves to a higher unit of analysis. Finally, descriptive analysis of the relationship between sanctions, citizenship, and environmental record are presented at the firm-level.

[61] In preliminary analysis I found that fixed effects explained 75 to 90 percent of the variation in firm violation rate.

CHAPTER 4: DESCRIPTIVE ANALYSIS AND RESULTS

Industry Descriptions[62]

Pulp and Paper

The pulp and paper industries are intertwined to produce paper. The pulping process involves breaking down raw wood into wood fiber that will be used to make paper (papermaking). Specifically, pulp mills break down and separate the fibers of wood from one another and from other impurities (e.g., rags, straw, etc) using chemical, semi-chemical, or mechanical (grinders) methods. Wood is the most common pulping material. In this pulping process, chemicals are used to break down the bonds that bind wood fibers together. Once the wood fibers are separated they are usually bleached, combined with other additives, and mixed with water to create "slurry." Paper mills "dewater" the mixture, leaving the fibers spread on a wire conveyor that presses and heats the mixture into the final paper product. Integrated mills engage in both pulping and papermaking; other paper mills purchase pulp or recycle wastepaper to make paper.

Both the pulp and the paper production processes use water; in fact, the pulp and paper industry is the largest industrial process water user in the U.S. The resulting wastewater can reduce water quality and/or (depending on the process) introduce toxic pollutants into the waterway. The pulping process has a greater pollution potential than papermaking, mainly in the pulping and the bleaching stages (U.S EPA, 2002).

[62] The EPA produced industry sector reports in 1995 and updated them in 2002. The sector reports for pulp and paper, steel, and oil and gas are used to describe the production of pollution in each of the industries of interest.

Steel

Steel production contains several steps that vary by the type of technology used in the mill. When the basic oxygen furnace (BOF) is used, cokemaking and ironmaking precede steelmaking. Coal is converted into "coke" in large oven batteries; the coke is burned to reduce iron; and the molten iron is melted and refined into steel in the BOF. When the electric arc furnace (EAF) is used, the primary input material is scrap steel and the coking process is not necessary. The scrap metal is melted and refined. The later parts of the process are similar regardless of the technology initially used. The molten steel from either furnace type is formed into slabs that are rolled into finished products. During the rolling process, the steel may be reheated, cleaned, and/or coated. Fully-integrated mills (i.e., those using BOF) create coke, produce steel, and roll and finish it. Non-integrated mills do not have the necessary equipment to produce steel from coal, iron ore, or scrap metal; these mills purchase raw materials in processed form. The current sample contains both types of mills.

The type of environmental threat varies according to the type of mill. Water is used in both the coking process and the steel finishing process, but the largest pollution threat is associated with the coking process. This wastewater is most likely to contain contaminants (U.S. EPA, 1995a).

Oil

Petroleum refining refers to the physical, thermal, and chemical separation of crude oil into distillation fractions which are then further processed into finished petroleum products. Petroleum refineries contain multiple complex operating systems. The specific operations depend on the properties of the crude oil to be refined (the composition of crude oil can vary significantly by source) and the desired products; thus,

no two refineries are identical. Large volumes of water are used in the refining process and four types of wastewater are produced: surface water runoff, cooling water, process water, and sanitary wastewater. Water used for cooling and water used in processing operations account for significant portions of the total wastewater. Process water often comes into direct contact with oil and is usually highly contaminated; cooling water typically does not come into direct contact with oil and contains fewer contaminants. Surface water runoff can contain pollutants from spills to the surface, leaks in equipment, or any materials that may have collected in drains. After primary treatment, the wastewater can be discharged to a publicly owned treatment works or undergo secondary treatment before being discharged directly to surface waters. The wastewater discharged directly to surface water is regulated under the National Pollution Discharge Elimination System (U.S. EPA, 1995b).

With this background information about the industries of interest, the yearly trends in the environmental record of the pulp and paper, steel, and oil plants in these data are discussed. Other environmental research has shown a growth in compliance over time (e.g., Thornton et al., 2003). The trend toward more compliance is even visible in this study with only six years of data. Overall in 1995 thirty-five percent of the plants reported zero violations; by the year 2000 this number increased to 46 percent. Although not always perfectly linear, as Figure 8 shows compliance increases in both the pulp and paper and the oil industry over time. Although the steel industry also increases in compliance between point A (1995) and point B (2000), its course is much more sporadic. In fact, the steel industry declines in compliance between 1998 and 2000.

INSERT FIGURE 8 HERE

Figure 9 contains the yearly compliance rate for each pollutant. Although somewhat more stable for toxic pollution, the upward trend exists for all of the pollutant types.

INSERT FIGURE 9 HERE

A similar pattern is revealed in the violation data. There are 4,608 violations over the six year period. As figure 10 shows, the number of total violations declines each year, from nearly 1000 violations in 1995 to 600 in 2000. This decline occurs in each industry and for every pollutant type (Figure 11).

INSERT FIGURES 10 & 11 HERE

Unable to create a summary measure of total compliance ratio, instead the industry patterns are presented over time for both conventional and toxic pollutants. As shown in Figure 12, all three industries show a decrease in the portion of the conventional pollutant quantity permit that is discharged (increases in overcompliance). However, the path is not as smooth for the steel industry. In fact, the portion of the conventional pollutant quantity limit discharged increases for several years before declining. As Figure 13 shows, the pattern is the same for toxic pollution quantities with the exception of the steel industry. The steel industry increases the portion of the quantity permitted level that is discharged over time. In other words, the steel industry overcomplies less over time. When summed across industry, the fraction of limits discharged decreases (overcompliance increases) across all pollutant types over time (Figure 14).

INSERT FIGURES 12, 13, AND 14 HERE

Turning to concentration measures, the pattern is somewhat different for conventional pollutant concentrations (Figure 15). The steel industry pollutes less of its

legal concentration limits over time but is fairly stable. Both the pulp and paper and the oil industries pollute more of their legal limits over time. The increase is much more dramatic for the pulp and paper industry. Although the oil industry has a spike in 1998, overcompliance with toxic pollution concentration limits generally increases or remains fairly stable over time across industry (Figure 16). When summed across industry, the fraction of limits discharged increases (overcompliance decreases) over time or is stable over time. However, the level of overcompliance does consistently increase over time for toxic pollution concentrations (Figure 17).

INSERT FIGURES 15, 16, AND 17 HERE

Overall, all of the measures of environmental behavior show continued improvement over time. The firms are in compliance more often, violate less, and overcomply more over time. Although the findings are more varied for the compliance ratios, it is important to note that the increases in the portion of the legal limit being discharged were small. The median monthly compliance ratios still reflect a substantial degree of overcompliance, even with the increases.

Given that the level of compliance was already high in 1995, the demonstrated improvements through the year 2000 are very noteworthy. The increases in compliance are consistent with previous work (Vandenbergh, 2004) and clearly suggest that firms have some commitment to improved environmental performance. However, the trend toward compliance is not as smooth among firms in the steel industry. The context of the steel industry may account for this difference. Declining prices, inefficient mills, and the influx of foreign steel forced a string of bankruptcies in the U.S. steel industry in the mid-1990s. The older, less efficient mills (with worse environmental records) may have

closed during this period. As the industry became dominated by newer mini-mills, the environmental performance of the industry as a whole likely improved.

Moving on from the changes over time, in the following section the data are pooled to present the plant-level record overall and by industry.

Plant-Level Environmental Record

I begin by describing the general patterns of environmental behavior in the data using the simpler measures from the prior literature (i.e., dichotomous, counts). In order to compare to this prior work, these patterns are examined at the plant/month and plant/quarter. The data are also aggregated to the plant/year because the analysis for this paper will ultimately be conducted on a yearly basis. Finally, plant behavior is described using the monthly compliance ratio, which controls for differences in the permitted levels.

Full Sample: Dichotomous Violation Measure

Most of the existing studies of water pollution examine BOD and TSS outcomes. Using data from the mid-1980s, Magat and Viscusi (1990) find that pulp and paper mills in the southeastern states were in compliance with BOD limits during 75 percent of the quarters over a three year period. Using data from the late 1990s, Kagan et al. (2003) find even higher compliance with BOD and TSS monthly standards; the sample of 14 pulp and paper mills in Australia, New Zealand, British Columbia, and the states of Washington and Georgia in the United States were almost always in compliance. Table 8 shows similar high levels of compliance for BOD and TSS in these data. Plants were in violation of BOD limits only 7 percent of the quarters and 3 percent of the months. Similarly, plants were in violation of TSS limits only 9 percent of the quarters and 4

percent of the months. When aggregating to the year the compliance rates are somewhat lower for BOD and TSS (81 and 80 percent respectively), but still show high levels of compliance. In addition, the number of violations for those plant/years that are out of compliance is often quite small (e.g., one or two for the entire year).

Although still exhibiting a high degree of compliance, the percent of observations in compliance is somewhat smaller when examining groups of pollutants. At the monthly level, plants are in compliance with conventional pollutant standards 91 percent of the time; at the quarterly level this drops to 81 percent. Similarly, the percent of observations in compliance is lower for the group of toxic pollutants: 92 percent of the monthly observations and 85 percent quarterly observations are in compliance. The plants were in compliance during 61 percent and 71 percent (respectively) of the yearly observations of conventional and toxic pollutants.

Compliance levels are the lowest when examining the plants' overall pollution record. For all pollutants, plants were in compliance in 83 percent of the monthly observations; 68 percent of the quarterly observations; and 41 percent of the yearly observations. While still reflecting a substantial degree of compliance, these numbers are substantially lower than the compliance rates that are often presented in studies of single pollutants.

INSERT TABLE 8 HERE

Prior research has primarily examined water pollution in the pulp and paper industry. In this study pulp and paper is included as well as steel and oil and there are differences in the level of compliance across industry. As Table 9 shows, the pulp and paper industries level of compliance closely resembles the findings in other work. As

Kagan et al. (2003) find, the industry is nearly always in compliance with BOD and TSS standards (98 percent for each at the monthly level). In fact, pulp and paper has the highest rate of compliance of all the industries for each pollutant and pollutant group. Although the percent of observations in compliance decreases as the number of time periods increases (i.e., moving from monthly to quarterly), the industry has fairly high compliance rates (e.g., 89 and 92 percent for conventional and toxic pollutants at the quarterly level; 73 and 83 percent at the yearly level). In fact, the rate of compliance for pulp and paper is actually higher than the sample average even at the quarterly and yearly level of analysis. The steel and oil industries, however, are not quite as conforming.

INSERT TABLE 9 HERE

As Table 10 demonstrates, the steel industries' BOD and TSS monthly compliance levels are comparable to the sample average. Ninety-four percent of the BOD observations and 93 percent of the TSS observations reflect compliance in the steel industry, compared to 97 and 96 percent respectively in the entire sample. However, it is important to note that although the compliance levels are similar, very few plants in the steel industry are required to report BOD levels (especially compared to pulp and paper). Unlike BOD and TSS, the industries' overall compliance and compliance with conventional and toxic pollutant standards is lower than the sample average at the monthly level. A similar picture emerges when the data is aggregated to the quarter. In the steel industry 71 percent of the quarterly observations for conventional pollutants; 73 percent of the observations for toxic pollutants; and 55 percent of the total observations show compliance. The quarterly compliance percentages for the sample as a whole are approximately 12 percent higher than steel for each group of pollutants. The compliance

levels in the steel industry are lower than the sample average for all pollutants and pollutant groups when the time unit increases to the yearly level, although the difference is largest (approximately 20 percent lower) for conventional and toxic pollutants.

INSERT TABLE 10 HERE

Like the steel industry, Table 11 shows that the oil industries' BOD and TSS monthly compliance levels are comparable to the sample average (95 and 93 percent respectively). The oil industry also has lower than average monthly compliance levels for conventional pollutants and overall pollution. However, unlike the steel industry the oil industry differs very little from the monthly sample average for toxic pollutants (95 and 92 percent respectively). At the quarterly unit of analysis the oil industry exhibits less compliance than the sample for all pollutants and pollutant groups with the notable exception of toxic pollutants, which is actually three percentage points higher than the average. Like steel, the differences are smaller for BOD and TSS than for conventional and overall pollution (oil is approximately 5 percentage points lower). In the oil industry the percent of quarters in compliance is 57 percent overall and 69 percent for conventional pollutants; the sample average is approximately 11 points higher for each. This trend continues when the data are aggregated to the year. The oil industries' yearly compliance rate is comparable to the sample average for BOD and TSS and is actually a few percentage points higher for toxic pollutants, but compliance is approximately 20 percent points lower than average for conventional pollutants and total pollution.

INSERT TABLE 11 HERE

Overall, the steel and oil industries have smaller percentages of compliant observations than the pulp and paper industry. The industries differ most in terms of the

pollutant groups (conventional, toxic, and total) rather than the specific pollutants (BOD and TSS). These differences are depicted graphically in Figure 18. While the observations for most pollutants and time units reflect compliance the majority of the time in all industries, reports of nearly 100 percent compliance rates in the pulp and paper industry do not apply to steel and oil; plants in these two industries are in violation more often. In addition, the steel industry has the lowest compliance rate for the worst type of pollution: toxic discharges. This toxic pollution problem has not been captured in studies that look exclusively at BOD pollution in the pulp and paper industry.

INSERT FIGURE 18 HERE

Violators: Number of Violations

Moving to the number of violations outcome, Tables 12 through 14 show similar industry patterns among the violators. Among the violators, those in the pulp and paper industry tend to have fewer violations on average, less than the sample average. Violating firms in the steel and oil industries tend to have more violations than the sample as a whole. The steel industry violators are actually the "worst" violators. On a yearly basis the plants in the steel industry have the highest number of violations on average. For example, the average violator has 3.39 total violations per year in the pulp and paper industry; 11.37 violations per year in the steel industry; and 6.72 violations in the oil industry.

INSERT TABLES 12 – 14 HERE

In terms of total violations over the six year period, the steel industry again often leads the way (as shown in Figure 19). The steel industry is responsible for the highest percent (41 percent) of total pollution and the majority of toxic pollution violations (63

percent). The oil industry accounts for 32 percent and pulp and paper accounts 27 percent of the total violations. The distribution for TSS and conventional pollutants is more evenly split between oil and steel (each between 35 to 40 percent) with pulp and paper following. The one exception to this pattern of high violations in the steel industry is for BOD. The pulp and paper industry is responsible for 45 percent of the BOD violations and the oil industry is responsible for 49 percent. However, most of the steel plants were not required to maintain specific limits on BOD.

INSERT FIGURE 19 HERE

In addition to industry level differences, differences in environmental record also exist across plants. For example, Bandyopadhyay and Horowitz (2006) find that a small group of water treatment plants have continually poor compliance records over time. Similarly, Magat and Viscusi (1990) find that four of the fifty-six pulp and paper mills in their sample were responsible for most of the cases of significant noncompliance. Although not as dramatic, there are similar patterns in these data shown in Table 15.

With a total of 434 violations of BOD standards in the 6 year period, the average number of BOD violations (among the violators) is only 2.42 per year. However, some plants violated BOD standards as many as 8 times in a quarter and 26 times in a year. Over the entire sample period, one plant was cited 56 times for polluting above the permitted BOD levels. Three facilities were more than two standard deviations above the sample mean for the six years; these three facilities accounted for 24 percent of the total BOD violations. In fact, these same three facilities were responsible for 30 percent of the significant violations (more than 40 percent over permitted levels) of BOD regulations.

Over the six sample years there are 746 violations of TSS standards. Although the average number of violations (among the violators) is only 2.27 violations per year, some facilities have as many as 20 violations in a quarter and 33 in a year. One facility accumulated 119 TSS violations (16 percent of the total) as well as 17 percent (71 of the 411) of the significant violations over the six years. Two facilities were more than two standard deviations above the sample mean, accounting for approximately 21 percent of the total and significant TSS violations.

Over the sample period, plants received the most violations for conventional pollutant discharges. On average the violating plants received 4.81 violations per year; however, some facilities have as many as 40 violations in a single quarter and 73 in a year. One facility accumulated 264 conventional pollutant violations (11 percent of the total) and 10 percent of the significant violations. Four facilities were more than two standard deviations above the sample mean, accounting for approximately 26 percent of the conventional pollutant violations and 27 percent of the significant violations.

Among the violators, the average number of toxic pollutant violations is 4.53 per year. Yet, some facilities receive as many as 20 violations in a quarter and 48 in a year. One facility was responsible for 17 percent of the toxic pollutant and significant toxic pollutant violations over the six year period. Three facilities were more than two standard deviations above the sample mean, accounting for approximately 32 percent of both the total and significant toxic violations.

INSERT TABLE 15 HERE

The two pieces of information examined thus far (the number of violations and the percent of observations in compliance) provide consistent pictures of the

environmental record across industry for conventional and toxic pollutants. Both measures suggest that the steel industry is the leading polluter of toxic chemicals. The percent of compliant observations in the steel industry is 15 to 19 percentage points lower than oil and pulp and paper quarterly and 24 to 33 percent lower yearly. In addition, the steel industry is responsible for 64 percent of the toxic pollution violations and the average violator has more violations per year.

Both pieces of information also show that the steel and oil industries are responsible for the bulk of the conventional pollution problem. The two industries are in compliance for 18 to 20 percent fewer of the quarterly observations and 28 to 34 percent fewer of the year observations than the pulp and paper industry. Similarly, the two industries are responsible for approximately 40 percent of the conventional pollutant violations over the sample period and on average have a higher number of violations. Both measures suggest that the steel and oil industries are also problematic in terms of TSS. These two industries account for 40 and 35 percent of the total violations respectively and are in compliance for a smaller portion of the observations. Steel and oil are in compliance for 10 percent fewer observations quarterly and approximately 18 percent fewer yearly than pulp and paper.

Both measures also suggest that the pulp and paper industry overall accounts for the smallest percent of the total violations (27 percent) and the plants are in compliance more often than the other two industries at both the quarterly and yearly unit of analysis. Together the steel and oil industries account for the majority of the total violations (73 percent), are in compliance less often, and have more violations on average than the pulp and paper industry.

The distribution by industry differs between the two measures only for BOD. Pulp and paper and oil are responsible for the bulk of the BOD violations (50 and 45 percent) across the six year period, while steel is responsible for only 6 percent. However, the pulp and paper and plants are actually in compliance during a slightly higher portion of the observations than the steel or oil industries; pulp and paper is in compliance for 5 to 7 percent more quarterly observations and 12 to 14 percent more yearly observations. In addition, the pulp and paper industry violators have slightly fewer violations on average than steel or oil. The difference seems to be an issue of sample size. There are 680 observations for the pulp and paper plants and only 28 for the steel plants. While the pulp and paper industry is more often in compliance and has fewer violations on average, the additional observations make it look as though it is more problematic then steel.

These data show some industries to be more problematic for specific kinds of pollution. However, although not as high as prior studies of BOD in the pulp and paper industry would suggest, the percent of observations in compliance is still rather high for each pollutant and each unit of analysis even when examining the plants' overall record. In fact, only when examining total pollution compliance rates at the yearly level does the percent of observations in compliance fall below 50 percent and even in these cases the number of violations is rather small. However, this is not to suggest that plants never pollute over the permitted levels. In fact, some plants have high numbers of violations. Consistent with the prior literature, these outliers are quite different from the sample averages. In addition to the violators, the sample also contains a high degree of overcompliance.

Full Sample: Compliance Ratio

The results for the median compliance ratio are comparable to the prior literature. Bandyopadhyay and Horowitz (2006) look specifically at monthly average BOD concentrations and find them to be far below permitted levels. Across plants, the median monthly compliance ratio for BOD concentrations is 0.32. The data in this study contain even higher levels of overcompliance, as shown in Table 16. For monthly average *concentrations*, the median sample compliance ratio is 0.23 for BOD; 0.20 for TSS; 0.22 for conventional pollutants; and 0.10 for toxic pollutants. Thus, the water treatment plants in the Bandyopadhyay and Horowitz (2006) sample polluted only 32 percent of their permit while the industrial plants in the current sample pollute only 23 percent of their BOD legal levels. The estimates for the pulp and paper industry are even closer to those of Bandyopadhyay and Horowitz (2006); on average the pulp and paper plants pollute just 27 percent of BOD concentration limits and 29 percent of BOD quantity limits (see below for industry comparison). For monthly average *quantities*, the median compliance ratio is 0.27 for BOD; 0.20 for TSS; 0.22 for conventional pollutants; and 0.08 for toxic pollutants. While all of these compliance ratios show a substantial amount of overcompliance, plants overcomply the most (pollute the smallest portion of their legal limit) with *toxic* pollution requirements.

Based on the previous descriptions, one might expect plants in the pulp and paper industry to lead in overcompliance. However, this is not the case. With the exception of toxic pollutants, steel and oil actually overcomply more (to some degree) than pulp and paper for all pollution types. The industry that pollutes the least of its permitted levels (on average) varies with pollutant and measure (quantity versus concentration), but the general pattern is the same for all pollutants except toxic pollutants. Thus, while the steel

and oil industries are generally in compliance less often and have more violations on average, they also overcomply more than the pulp and paper industry in most cases. These industry differences are consistent with the variability argument (Bandopadhyay and Horowitz, 2006). Firms in the steel and oil industries have higher variability and firms in the pulp and paper industries have lower variability. Firms with higher variability are likely to have more total violations because the violation count includes violations of daily pollution measurements that are more subject to random fluctuations than monthly averages. But, firms with higher variability will also overcomply more in order to maintain a good overall record. Conversely, firms with lower variability (pulp and paper) may have fewer violations but overcomply on a smaller scale.

However, there is one exception to the overall patterns. The steel industry overcomplies the least with toxic pollution requirements. In this case, variability does not differ by industry. Thus, some other factor unique to the steel industry must account for this difference. The production process in the steel industry may simply create more toxic pollution.

As these differences in overcompliance are described, it is important to note that they are actually very small. Across industry the firms are engaging in substantial overcompliance. The differences in environmental behavior across industry are summarized in Figures 20 and 21.

INSERT FIGURES 20 AND 21 HERE

Firm-Level Environmental Record

The firm-level patterns are described in the following section, beginning with the dichotomous violation measure. After illustrating the firm patterns in the additional

outcome measures (counts, compliance ratio), a summary of every outcome is presented. Comparisons to the plant-level results are made throughout the discussion.

Full Sample: Dichotomous Violation Measure

At the firm-level the dichotomous measure shows that overall the firms are in violation of EPA standards during a larger portion of the yearly observations than at the plant-level. This is not surprising given the change in the unit of analysis. When the data are aggregated, if any plant is in noncompliance then the entire firm is coded as noncompliant. Although most of the industry differences remain the same at the firm-level, the magnitude of the differences is much smaller.

Table 17A provides a summary of the dichotomous measure of compliance across industry at the firm-level. In the plant-level description, steel and oil were in compliance less often than pulp and paper. The differences at the plant level were quite large: the pulp and paper industry was in compliance in 52 percent of the total observations compared to 29 percent in the steel industry and 23 percent in the oil industry. At the firm/year, the oil industry continues to be in compliance during the smallest portion of observations (4 percent). However, the difference between pulp and paper and steel is very small and steel is actually in compliance for a higher portion of observations (15 percent versus 10 percent). Aggregation to the firm-level likely explains this shift. For all of the dichotomous measures of pollution, there is more variability between firms than within firms: facilities owned by the same firm tend to have similar records (Table 17B). However, this does not mean that all facilities owned by a firm will be in compliance or vice-versa. Even though plant records tend to be similar within firm, there is some variation. When the data are aggregated, if any plant is in noncompliance then the entire

firm is coded as noncompliant. The firms in the pulp and paper industry own more plants on average and have a higher chance of at least one of those plants having a violation.

Patterns of compliance with BOD standards also shift when the data are aggregated to the firm-level. Rather than pulp and paper, at the firm-level the steel industry is compliant most often (65 percent of the observations). There are very few BOD observations for the steel plants and firms. When the data are aggregated, the denominator for used to create the mean changes very little for the steel industry. However, it drops drastically for the pulp and paper industry. The pulp and paper industry is compliant for 52 percent of the observations and the oil industry during 43 percent.

The patterns for the remaining pollutants remain consistent with the plant-level description. The oil industry is in compliance with TSS standards during the smallest portion of observations (46 percent) followed by steel (52 percent) and pulp and paper (55 percent). However, the difference between the average for steel and pulp and paper is not very large at the firm-level (only 3 percentage points). Once again, the oil and steel industries are in compliance with conventional pollutant standards less often than pulp and paper (15, 27, and 31 percent respectively). And finally, the steel industry has the lowest percent of toxic pollutant observations in compliance (35 percent) followed by oil (46 percent) and pulp and paper (64 percent). Figure 22 summarizes these industry differences. The patterns are similar in the smaller sample of violators.

INSERT TABLE 17A, TABLE 17B, AND FIGURE 22

Violators: Number of Violations

As Table 18A shows, among the violators those in the pulp and paper industry once again tend to have fewer violations on average, less than the sample average. Violating firms in the steel and oil industries tend to have more violations than the sample as a whole. The steel industry violators are actually the "worst" violators; on a yearly basis the plants in the steel industry have the highest number of violations on average. For example, the average violator has 8.28 total violations per year in the pulp and paper industry; 21.82 violations per year in the steel industry; and 14.32 violations in the oil industry. Although these averages are quite low, like the plants some firms have many violations each year. For example, some firms have as many as 106 total violations; 27 BOD violations; 33 TSS violations; 73 conventional pollutant violations and 48 toxic pollutant violations in a single year. Once again, a one-way ANOVA shows more variability between firms than within firm: plants owned by the same firm tend to have a similar average number of violations when they violate (Table 18B).

INSERT TABLES 18A AND 18B HERE

In fact, there are a few firms that are responsible for a disproportionate percent of the violations.[63] Nine companies (13 percent) are more than one standard deviation above the sample average and are responsible for 45 percent of the total violations during the sample period. Similarly, five companies (seven percent) are responsible for 40 percent of the BOD violations. With TSS, eight companies (11 percent) are responsible for 54 percent of the violations. Similar patterns emerge with conventional and toxic

[63] Although in any year there are fewer companies in the sample, 73 different entities are observed during the six year period. Although some of these are mergers from two original sample companies, I count them as separate entities in calculating the percent of the sample. I also combine the two parent companies violation data with the violation data of their joint ventures (and reduce the denominator accordingly). The numbers are very similar when I do not combine the joint ventures.

pollutants. Nine companies (13 percent) are responsible for 53 percent of the conventional pollutant violations and six companies (eight percent) are responsible for 56 percent of the toxic pollution violations. In fact, three companies fall into these high violation groups for total violations, conventional pollutant violations, and toxic pollutant violations. Six other companies fall into two groups: either total and toxic or total and conventional pollutants. However, the companies are not all observed for the same length of time for various reasons (e.g., mergers, closings, etc). Thus, it is possible that certain companies make up a disproportionate amount of the violations simply because they are observed for a longer period of time. Yet, on a fairly consistent yearly basis, the same companies have significantly higher than average numbers of violations. The company with the highest number of violations is higher than average every year. Other companies also consistently rank highly in violation counts for 3 to 4 of the sample years; while others are less consistent (1 to 2 years).

This study is the first to demonstrate that a few companies are responsible for a disproportionate number of the total violations. This concentration of violations among certain companies is quite relevant to the larger field of criminology because it is consistent with the patterns of offending for street offenders (Wolfgang, Figlio, and Sellin, 1972) and white-collar offenders (Weisburd et al., 2001). Yet, the data also contain a substantial degree of overcompliance. Returning to the full sample, overall the patterns for the median compliance ratio at the firm-level are nearly identical to those at the plant-level.

Full Sample: Compliance Ratio

As shown in Table 19A, the sample median of the concentration compliance ratio is 0.25 for BOD; 0.25 for TSS; 0.25 for conventional pollutants; and 0.11 for toxic pollutants. For pulp and paper specifically, the median concentration level is 0.27. For monthly average quantities, the median compliance ratio is 0.32 for BOD; 0.23 for TSS; 0.26 for conventional pollutants; and 0.09 for toxic pollutants.

Thus, the firm-level averages also demonstrate a substantial degree of overcompliance with legal limits. Overall, the steel and oil industries pollute less of their permitted levels than pulp and paper: the industry that overcomplies the most depends on the pollutant and on the measurement (quantity versus concentration). For example, the oil industry overcomplies the most with BOD quantity standards, but the steel industry overcomplies the most with BOD concentration standards. Toxic pollutants are one exception to this pattern. The steel industry overcomplies the least with toxic pollution quantity and concentration standards. Again, for the most part these differences by industry are small.

INSERT TABLE 19A HERE

Tables 19B and 19C provide the ANOVA test for the compliance ratios. Consistent with the other outcomes, plants owned by the same firm tend to have similar average compliance ratios.

INSERT TABLES 19B AND 19C HERE

Overall the data show that the firm-level approach is relevant. For each outcome measure the ANOVA tests indicate that there is more variability between firms than within firm (i.e., multiple plants owned by the same firm). In addition, moving to the firm-level does not distort the overall and industry specific patterns found at the plant-

level. The changes that do occur are expected because the unit of analysis is larger (e.g., the firms are in violation more often than the plants). The remainder of the analysis is conducted at the firm-level.

In the following section, the association between firm citizenship and environmental record is examined beginning with the bivariate association between citizenship and each measure of environmental behavior. When the citizenship measure is binary, the average time spent in violation, number of violations, or compliance ratio is presented for the "good" and "bad" citizen. When the citizenship measure is continuous, Pearson's correlation coefficient is provided. The mean difference and correlation tables are presented, but regression models are used to determine significance levels after adjusting the standard errors for the dependence of observations over time using the STATA clustering command. An overview of the bivariate relationship between environmental behavior and the other variables of interest is provided before moving into multivariate analysis.[64]

Citizenship and Environmental Behavior: Bivariate Analysis

Full Sample: Dichotomous Violation Measure

The bivariate relationship between citizenship and environmental performance is first examined using a dichotomous measure of violation. Violation is coded as one; thus, a higher value indicates that a higher portion of firm/years in violation. Table 20 provides the firm-level (one observation for each firm) means for each group ("bad" and "good" citizens) by pollutant type with a two-tailed test for significance. Because using

[64] With the exception of the program participation measures, firm characteristics are lagged by one year in all of these models. Models were also run without lags on citizenship and one only result substantively changed. This difference is discussed in the text.

the STATA clustering command with a dichotomous outcome is a potential problem, I provide firm-level findings (aggregating the data to one observation per firm) in addition to the regression results. Aggregating multiple observations (over time) to a single firm observation eliminates the need to adjust the standard errors because each observation is independent. Because of the reduction in sample size, the firm-level analysis is a more conservative estimate of significance levels.

Counter to the research hypotheses, when significant the mean differences in Table 20 and the regression results in Table 21 actually show that program participants are in violation of pollution standards more often than non-participants.[65] TRI 33/50 participants tend to be in violation of BOD, TSS, and conventional pollutant standards for a higher proportion of years than non-participants. For example, the program participants are in violation of TSS standards during 55 percent of the firm/years on average; the nonparticipants are in violation during 37 percent of the firm/years. Since BOD and TSS are conventional pollutants, it seems that in general TRI participants have a problem with violating conventional pollutant standards.

The pattern is similar for Wastewise participants who tend to be in violation of some pollution standard (the overall measure) more frequently than non-participants (96 versus 90 percent of the years, respectively). These results are consistent in both the mean difference and regression findings in Tables 20 and 21.

[65] Although the findings are in the same direction for both the firm-level mean differences and the regression results, the two pieces of information differ in terms of significance. In the firm-level mean difference tests, the TRI 33/50 program participants do not differ significantly from the non-participants in the proportion of years in violation of BOD or conventional pollutant standards. However, the regression models show small significant differences (p=0.10) between the two groups for these two pollutants. The firm-level analysis provides the most conservative test of the hypothesis; in reality the correct standard errors are probably somewhere between these two approaches. Thus, while there may be a small difference in the proportion of years in violation for BOD and conventional pollutants, the differences between the two groups is clearly more robust for TSS.

INSERT TABLE 20 AND 21 HERE

The KLD citizenship measures, however, are not significantly related to the portion of firm/years in violation in the correlations or regression results (Tables 22 and 23).[66] Good and bad citizens differ somewhat in the amount of time they are in violation of toxic pollution standards. When KLD citizenship is converted to a dichotomous variable, KLD good citizens are in violation during 42 percent of the firm/years while the "bad citizens" are in violation during 52 percent of the firm/years. Similarly, the correlation analysis shows that increases in citizenship are associated with a decrease in the fraction of time spent in violation of toxic pollution standards. However, these differences are not statistically significant.

INSERT TABLE 22 AND 23 HERE

Thus far, there is little support for the hypothesis that citizenship will decrease the amount of time spent in violation. If anything, firms that participate in voluntary compliance programs are in violation more frequently. However, results may differ when a different measure of violation is utilized.

Violators: Number of Violations

As shown in Table 24, the bivariate relationship between citizenship and the average number of violations is generally counter to hypotheses, but findings again vary by pollution type and the citizenship measure.

Table 24 contains the average number of violations for program participants and non-participants using the full sample (multiple observations for each firm). Because the

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[66] Recall that in some cases substitutions have been made. If the data were data unavailable for subsidiaries and joint ventures in the sample then parent company social ratings are used. The results are presented with the replacement data and without.

standard deviations are not corrected for the dependence of observations, regression results in Table 25 are used to determine the statistical significance.[67] In addition to spending fewer years in compliance, Table 24 shows that TRI 33/50 participants have a significantly higher number of total, BOD, and toxic pollution violations on average. For example, the participants on average have approximately 6 more total violations and 5 more toxic violations than the non-participants. Although TRI 33/50 participants are in violation of toxic standards the same amount of time as than non-participants, when the participants violate toxic pollution standards they have more violations on average. The findings are similar for Wastewise volunteers. When Wastewise participants violate pollution standards they tend to have more violations on average across pollutant type (except BOD). For example, Wastewise violators have approximately 16 violations on average each year compared to 13 among non-participants. However, these differences are small and are not statistically significant.

INSERT TABLES 24 AND 25 HERE

The findings for the KLD social ratings measures vary by pollutant type. Table 26 shows that although not significant, higher levels of citizenship (as ranked in the KLD data) are associated with more BOD and TSS violations. However, KLD citizenship is negatively associated with toxic pollutant violations: those ranked higher in the KLD data tend to have fewer toxic pollution violations on average. As shown in the bivariate regression model in Table 27, the negative association between citizenship and toxic pollutants is significant at the 0.10 level.

INSERT TABLES 26 AND 27 HERE

[67] Although OLS is technically inappropriate when the dependent variable is a count, I use it for ease of presentation and interpretation. All results were confirmed with a Poisson model as well.

Next, the total number of violations across the six year period is examined by citizenship. Table 28 confirms the positive relationship between TRI 33/50 participation and violations. TRI 33/50 participants are responsible for 66 to 79 percent of the violations across pollutant type. Wastewise participants are actually responsible for a smaller percent of the violations—only 20 to 30 percent for each category of pollutants. While this result may seem counter to earlier findings that Wastewise participants have more violations on average, it is an issue of sample size. Data on Wastewise participants is limited to 77 company/year compared to 308 for the nonparticipants. Thus, the Wastewise participants tend to be in violation more often and to have more violations on average, but are responsible for fewer total violations because there are fewer observations.

INSERT TABLE 28 HERE

As shown in Table 29, the KLD good citizens are responsible for forty percent of the violations or less in all pollution categories with the exception of BOD. Overall, the firm/years with higher KLD ratings are responsible for a smaller percent of the total, TSS, conventional, and toxic pollution violations. Consistent with the previous results, the difference is most noticeable for the most worrisome measure—toxic pollutants. When using the number of violations attributable to firms ranked in the KLD data as the denominator, the bad citizens account for almost 80 percent of toxic violations (data not shown). When examining the percent of violations for the good and bad KLD citizens using the total sample violations as the denominator, the differences in toxic pollution between the groups are much smaller but still notable. KLD bad citizens (with and

without replacement data) account for approximately 30 percent of the toxic pollution violations compared to only 9 percent for the good citizens.

INSERT TABLE 29 HERE

Turning back to the full sample, the relationship between citizenship and overcompliance is again opposite of hypothesis when the program participation measures are used. However, the relationships differ when using the KLD citizenship measures.

Full Sample: Compliance Ratio

The final environmental measure that examined is the compliance ratio—the amount of the permit that is discharged. Ratios that are closer to one indicate that the firms pollution levels are close to the permitted level; ratios closer to zero indicate that the firm is polluting substantially less than legally allowed. Because the compliance ratio is logged prior to taking the median, the actual numbers are difficult to interpret. Larger negative values indicate a higher level of overcompliance.[68] Thus, while the other measures focused on compliance versus noncompliance, this measure includes the entire range of conformity and violation.

Consistent with earlier results the findings differ by citizenship measure. They also vary by limit type (quantity versus concentration). Table 30 contains the median compliance ratio by program participation for the full sample. Because the standard errors are not corrected in this table of means, significance is discussed using the regression results that control for clustering (Table 31). None of the comparisons are significantly different (statistically) from one another. Yet, there is a substantive pattern

[68] Previous literature finds that pollution levels are quire variable and the error does not follow the normal distribution. Per the Bandyopadhyay and Horowitz (2006) approach, the compliance ratios were logged before taking the median (and standard deviation as the measure of variability).

in the direction of findings; the results are *generally* counter to hypotheses. Although any observed differences are small, program participants overcomply with quantity limits *less* than nonparticipants. Tables 30 and 31 show that TRI participants on average discharge a larger portion of permitted BOD, TSS, conventional, and toxic pollution quantities as well as toxic pollution concentrations (Tables 32 and 33). However, TRI 33/50 participants do overcomply with BOD, TSS, and conventional pollutant *concentration* standards more than nonparticipants (Tables 32 and 33). Again, although some differences are more substantial than others, none reach statistical significance.

Wastewise participants also overcomply with quantity standards less than nonparticipants. With the exception of toxic pollution, Wastewise participants discharge a higher portion of the permitted quantity on average. Based on the regression results (with corrected standard errors), this difference is only significant for BOD ($p=0.07$). The differences in the average compliance ratio for concentration measures show a similar pattern. The difference between groups is largest for BOD and toxic pollution: Wastewise participants overcomply less with BOD and toxic pollution concentration standards. However, these differences are not statistically significant.

INSERT TABLES 30-33

Once again, research results are more consistent with hypotheses when citizenship is measured using the KLD social ratings. KLD citizenship is associated with higher levels of overcompliance with BOD, TSS, conventional pollutant and toxic pollutant quantity limits; good citizens tend to pollute less of their permitted limits (see Table 34). The pattern is generally consistent for concentration limits as well. Good citizenship is associated with overcompliance with BOD, conventional, and toxic pollution standards

(see Table 36). However, the majority of the associations are not significant (Tables 35 and 37). Two associations remain marginally significant in the regression models, but depend on the specification of citizenship. The association between good citizenship and overcompliance with conventional pollutant quantity standards is significant only with the KLD measures without substitutions. In addition, good citizens overcomply with toxic pollution quantity standards significantly more than "bad citizens," but only when parent company data is substituted for subsidiary data. This association is only significant when citizenship is measured contemporaneously (see footnote 64).

Summary: Citizenship and Environmental Behavior Bivariate Results

Overall the results indicate that TRI 33/50 and/or Wastewise participants tend to have environmental records that are either indistinguishable or worse than nonparticipants. The findings for TRI 33/50 participation are fairly consistent across different measures of the outcome, although the significance of the findings varies by pollutant type. TRI 33/50 participants are more likely to be in violation; have more violations on average; have more total violations over the sample period; and are less likely to overcomply with quantity and concentration standards.

The differences in environmental behavior between Wastewise participants and non-participants are also fairly consistent across different measures of environmental behavior, but are only sporadically significant. Wastewise participants tend to be in violation of a pollution standard more often (the differences are insignificant); have more violations on average than nonparticipants (no significant differences); and overcomply with quantity and concentration standards less than non-participants (only one of these comparisons is statistically significant).

The association between citizenship and environmental behavior does vary by outcome type using the KLD social ratings data. Good citizens do not differ in the amount of time spent in violation or in the number of violation, but the direction of the correlation between (and regression coefficients for) citizenship and violation counts is mixed according to pollution type. KLD good citizens have slightly more conventional pollutant violations on average (including BOD and TSS specifically), but fewer total and toxic pollution violations. The correlation between citizenship and the number of toxic pollution violations is larger than the correlation with the other pollutants even though none of the associations are statistically significant. The relationship between KLD citizenship and overcompliance is more consistent across pollutant type and is in the hypothesized direction, but only two are statistically significant. Firms higher in KLD citizenship overcomply with conventional and toxic quantity standards significantly more than firms low in citizenship. These two findings are important, especially when coupled with the consistent association between citizenship and overcompliance in the other pollution measures (even though not significant). Out of all the pollution measures, one would expect the relationship between citizenship and overcompliance to be the strongest.

In sum, these results are generally counter to research hypotheses, especially those that measure citizenship using TRI and Wastewise participation. Firms that are distinguished as "good citizens" have equivalent or worse environmental records than those distinguished as "bad citizens." The next step is to determine whether the findings are spurious. Based on the corporate crime literature, one would expect that other firm characteristics will be associated with environmental behavior.

Firm Characteristics and Environmental Behavior: Bivariate Results

Analyses reported in Tables 38-41 show that other firm characteristics are correlated with the various environmental outcomes and the citizenship measures. Beginning with the full sample dichotomous measure, firms with higher liquidity spend significantly fewer years in violation of total, BOD, TSS, and conventional pollutant standards. However, the effect is opposite for toxic pollution. Firms with higher liquidity spend more years in violation of toxic pollution standards. Other economic indicators have no effect. Both the number of employees and the number of facilities owned are positively (and usually significantly) related to spending a higher fraction of time in violation, but once again, the findings are different for toxic pollution. Firm size is in the opposite direction, but unrelated to the portion of time that firms violate toxic pollution standards. Firm characteristics are also relevant among the violator sample.

INSERT TABLE 38 HERE

Moving next to the relationship between economic standing and average number of violations (among violators), we see that companies with a higher return on sales have significantly more BOD, TSS, and conventional pollutant violations on average. Once again, the effect is different for toxic pollution. Firms with a higher return on sales have significantly fewer toxic pollution violations (on average) when they violate. The association between firm size and average violations, while generally in the negative direction, is rarely significant.

INSERT TABLE 39 HERE

Returning to the full sample, the association between firm economic standing and overcompliance is highly variable. Companies with a higher return on sales pollute

significantly *less* of their BOD and toxic quantity permits. Firms with more employees or more facilities pollute significantly *more* of their permitted quantity levels, but company size is unrelated to toxic pollution overcompliance. None of the firm characteristics are significantly associated with overcompliance with concentration limits.

INSERT TABLES 40 AND 41 HERE

Thus, the existing literature and the current results indicate that firm characteristics are relevant to each of the dependent variables. Plant variability is also important to examine because prior literature indicates that higher variability is linked to overcompliance. Using the standard deviation of the log of the monthly compliance ratios as a measure of discharge variability, Bandyopadhyay and Horowitz (2006) find that variability in discharges explains some variation in overcompliance. Using the same measure, the correlation matrix in Tables 40 and 41 shows that discharge variability is significantly (negatively) correlated with median compliance levels. Firms with more variability in pollution discharges pollute significantly less of their permitted quantity values for all pollution types (although the effect is only marginally significant for toxic pollution). In fact, variability is the only measure significantly associated with the concentration compliance ratio. Firms with more variability in pollution discharges pollute significantly less of their permitted quantity values for BOD, TSS, and conventional pollutants. Variability is also significantly associated with toxic pollution, but in the opposite direction. Firms with higher variability pollute significantly more of their legal levels for toxic concentration.

Given these other firm-level associations, it is possible that the relationship between citizenship and overcompliance is spurious. In the next set of analyses, the

relationship between citizenship and environmental behavior is examined using a fully specified model including a measure of firm financial performance, firm size, and industry controls.

Citizenship, Firm Characteristics, and Environmental Behavior: Multivariate Results

It is important to test the citizenship results against the other relevant covariates. However, each of the independent variables is correlated. Therefore, the tolerance/variance inflation factor for the independent variables in each of the models is examined to determine whether multicollinearity is a significant problem. The tolerance for each independent variable is never lower than 0.35. Generally the tolerance is at least 0.4 or 0.5, but usually greater. Thus, multicollinearity does not seem to be a significant problem in these models. The presentation of results begins with the full sample dichotomous measure.

Full Sample: Dichotomous Violation Measure

Mean differences tests are more appropriate than correlations when both the independent variable and the outcome are dichotomous. However, because these data are aggregated to the firm-level (one observation per firm), the sample size is too small to present two-by-two tables of the average time spent in violation by citizenship and other relevant firm characteristics. Thus, partial correlations are presented in Tables 42 and 43.

INSERT TABLES 42 AND 43 HERE

Although still positively correlated, TRI 33/50 participation is no longer significantly associated with being in violation once firm characteristics are controlled. Similarly, Wastewise participation is no longer significantly associated with being in violation of any pollutant once firm characteristics are included.

Turning to the violators in the sample, the bivariate analysis revealed that participation in TRI 33/50 was associated with more total, BOD, and toxic violations on average. However, most of these results also become insignificant as well.

Violators: Number of Violations

As shown in Table 44, the effects for total and BOD violations are no longer significant in the fully specified model. Only the effect for toxic pollution remains, controlling for firm return on sales, number of employees, and industry. TRI participants who violate pollution standards have significantly more toxic violations on average than non-participants. Recall that in the bivariate analysis, KLD citizenship significantly ($p<0.10$) decreased the average number of toxic violations. However, this effect too is eliminated in the full model shown in Table 45. A few of the results are also rendered insignificant in the full sample compliance ratio models.

INSERT TABLES 44 and 45 HERE

Full Sample: Compliance Ratio

Bivariate results showed Wastewise participants were less likely to overcompy with BOD quantity standards. Once again, this effect disappears in the full model (Table 46) once controls for firm profits, size, and industry are added.

INSERT TABLE 46 HERE

KLD citizenship, on the other hand, remains marginally significant in the conventional pollutant model. Results in Table 47 indicate that good citizens pollute slightly less of their conventional pollutant quantity limits than bad citizens; yet other firm characteristics (size, industry) have a stronger association with the compliance ratio. In fact, once the other firm characteristics are included, variability is no longer

significant. However, the previously observed relationship between KLD citizenship and overcompliance with toxic pollution standards no longer holds when the other covariates are added. In fact, none of the firm or citizenship measures are significantly related to toxic pollution.

INSERT TABLE 47 HERE

Given the small sample size and low variability, there is potential for instability in the regression coefficients. As one last check, the full model was run for all of the citizenship/environmental behavior combinations to determine whether results changed. In nearly every model citizenship remained insignificant (consistent with the bivariate models). The substantive results changed in only one case. Although it was not significant in the bivariate model, in the multivariate model KLD citizenship became a significant predictor of the toxic concentration compliance ratio. Firms higher in the citizenship rankings appear to overcomply more than firms that rank lower.

Summary: Multivariate Results

Very few of the citizenship/environmental behavior associations remain significant after controlling for the theoretically relevant variables.[69] In fact, only two remain significant. TRI33/50 participants have more violations for toxic pollution. KLD good citizens overcomply significantly more with conventional pollutant quantity standards. Thus, out of 72 comparisons (each measure of citizenship, each independent variable) only 2 comparisons remain statistically significant. One would expect 3.5 by

[69] I have approached the two research hypotheses as separate questions, in part because the data are at different levels of analysis. However, sanction threats can also influence compliance. As a proxy for sanction threats, I included the number of sanctions received the previous year in these models. The two significant associations remain after controlling for prior sanctions and the tolerances are still at a reasonable level (generally 0.4 or greater; none below 0.34). In addition, I include the relevant firm characteristics in the sanctions models.

chance alone (p=0.05). Thus, these analyses leave little evidence that citizenship has any influence on environmental behavior in these data with these measures.

Firm Citizenship, Sanctions, and Environmental Behavior

It is difficult to disentangle the association between sanctions and environmental behavior because the worst violators are targeted for sanctions. Sanctions may appear to impact environmental behavior when in fact the association is in the opposite direction. In these data (Table 48) the number of total, informal, and formal sanctions is positively associated with violations. The association holds when total sanctions are lagged by one or two quarters (data not shown). In all likelihood the positive relationship is capturing the sanctioning practices of the EPA rather than any deviance amplification effect. Although panel or survival analysis with fixed effects would be ideal to control for unobserved differences in firms that create high violations and high sanctions, neither are possible with these data.

Instead, the interaction between citizenship and sanction effects is examined using a pooled regression model with a control for clustering and control for prior environmental behavior (a proxy for the "risk" of sanction). While not ideal, this method still provides useful information about the association between citizenship, sanctions, and recidivism.[70]

Violators: Number of Violations

After controlling for prior behavior and the relevant covariates (firm profits, size, and industry), *total sanctions* have no effect on future violations for the full sample of companies. However, some differences emerge by citizenship subgroup and once again

the findings differ by citizenship measure. As shown in Table 49, among TRI 33/50 and Wastewise program *participants*, total sanctions are associated with an increase in violations during the following quarter. Among the non-participants sanctions have no effect. The sanction coefficient is significantly different for TRI participants and nonparticipants.[71] Although labeling and defiance theory suggest that under certain conditions sanctions may increase future crime, in these data the positive coefficient probably reflects a continuation of an earlier pollution problem. For the converse argument, i.e., a firm chooses to increase pollution (and therefore violations) to be true, a firm would have to deliberately reduce equipment maintenance and undermine safety controls with full knowledge of pollution reporting requirements. This seems unlikely. In addition, barring a deliberate bypass of the pollution control systems, any changes (positive or negative) are likely to occur over a longer period of time. To explore this issue further, the same analysis was conducted with total sanctions lagged by two quarters and sanctions no longer had a significant effect on violations in any of these models. Therefore, it seems that the TRI participants take longer to correct whatever problem lead to high violations in the first place. Once again these findings are inconsistent with hypotheses. Sanctions are not irrelevant to the TRI participants and the extreme volunteers are not more responsive to sanctions. Instead, using the TRI participation as the measure of citizenship, "good citizens" are somewhat less responsive to sanctions

INSERT TABLE 49 HERE

[70] The dichotomous violation measure is not used because it is problematic to use the cluster command with a dichotomous outcome.
[71] I use the formula provided by Paternoster and colleagues (1998) to test the difference in coefficients.

The findings are different when citizenship is measured with the KLD social ratings data. Regardless of the specification of the KLD rank, Table 50 shows that as *total sanctions* increase firms categorized as "bad citizens" have more violations in the following quarter. Sanctions have no effect on the "good" citizens' environmental performance. Once again, the sanction measures are insignificant when lagged by two quarters. Even though the direction of the effect is consistent with hypotheses (i.e., sanctions are irrelevant to good citizens), the sanction coefficients for good and bad citizens are not significantly different from one another.

INSERT TABLE 50 HERE

Table 52 presents the relationship between *informal* sanctions, KLD citizenship, and recidivism. It is similar to the total sanctions results. Among the "bad" citizens, informal sanctions are associated with an increase in violations the following quarter but sanctions have no effect on violations for good citizens. The sanctions coefficient for the bad corporate citizens is no longer significant when informal sanctions are lagged by two quarters. Again, the bad citizens take a longer period of time to deal with high violations. However, the coefficient for informal sanctions is not significantly different for good and bad citizens in the original model with a one quarter lag. Informal sanctions are unrelated to subsequent violations among the TRI and Wastewise participants and nonparticipants (Table 51).

INSERT TABLES 51 AND 52 HERE

Finally, the patterns are similar for formal sanctions. As Tables 53 and 54 show, formal sanctions are followed by an increase in violations among TRI participants, Wastewise participants, and KLD "bad" citizens. Formal sanctions have no significant

impact on future violations for firms categorized as "good citizens" by KLD or firms that did not participate in the voluntary programs. The difference between the coefficients is only significant for the TRI participants versus nonparticipants. All of these effects are rendered insignificant when formal sanctions are lagged by two quarters. Again, this suggests that the "bad" citizens (KLD bad citizens) and the program participants (supposed "good" citizens) take longer to reduce violations.

INSERT TABLES 53 AND 54 HERE

The tolerance for each of the variables in these models is generally above 0.4. However, in some models (mainly those where the sample is split by voluntary program participation) the tolerance for the industry dummy variables is below 0.3 (0.27 specifically). The models were reexamined excluding the industry dummy variables and the sanction results were generally replicated. In the total and formal sanction models, the difference in the sanction coefficients (when lagged one quarter) for "good" and "bad" KLD citizens became statistically significant at the p=0.10 level.

Full Sample: Compliance Ratio

The effect of sanctions on overcompliance was examined for conventional and toxic pollutant quantity and concentration ratios. Some significant differences were found that are similar to those reported in the previous section. However, the tolerance and variance inflation factors indicate that multicollinearity is more of an issue in these models. In particular, the industry dummy variables have a low tolerance. In some models the tolerance is as low as 0.08. When the industry dummies are excluded, the results change and sanctions are no longer significant. However, multicollinearity is only a problem when citizenship is measured by program participation. Using the KLD

citizenship measures, the coefficient for sanctions is significant for one group—sanctions are followed by less overcompliance among the bad citizens. However, the difference in the sanction effect for the good and bad citizens is never close to statistical significance.

Summary: Firm Citizenship, Sanctions, and Environmental Behavior

Sanctions were expected to have a smaller impact on "good citizens" because the sanction is not needed to achieve conformity. On the other hand, good citizens might be more responsive to sanctions because these firms are more apt to recognize that a change needs to be made. Results vary according to the citizenship measure. An increase in sanctions is followed by an increase in violations among the program participants. An increase in sanctions is also followed by an increase in violations among the KLD "bad citizens." In some cases the difference in the effect between groups is significant and in others it is not. One could interpret these findings to say that sanctions actually increase violations among certain firms, but this interpretation is illogical given the nature of the pollution process. Instead, more total sanctions are given to those firms with the most violations. Among some groups, the firms have a higher number of violations for a slightly longer period of time (one quarter). Sanctions have little effect.

Consistent with some of the earlier substantive differences, the results differ by citizenship measure. It is the program *participants*—firms theoretically designated as "good citizens"—that take longer to reduce the number of violations. But, the KLD "bad citizens" have higher violations for a longer period of time.

In the following section results are summarized across each of the research questions. The results are followed by a discussion of the meaning and implications of

the study. The section concludes with an overview of study limitations and directions for future research.

CHAPTER 5: DISCUSSION AND CONCLUSION

Traditionally the corporate crime literature has not measured environmental crime with self-reports and has ignored theoretical explanations of compliance and overcompliance. The environmental crime literature, on the other hand, has failed to fully explore the relevance of the parent company. This investigation sought to address this intersection by studying firm-level environmental performance. In particular, it added corporate citizenship as a new explanation for environmental behavior with a specific focus on explaining compliance.

The data show some small substantive differences between good and bad citizens. Even so, the utility of corporate citizenship for explaining environmental performance is quite limited. Few differences are significant either statistically or with regard to magnitude. In addition, the association between citizenship and other variables of interest suggests that with additional data the small substantive differences may disappear. In these data with these measures, citizenship adds little to our theoretical understanding of environmental performance.

Still, it is worth revisiting the results. Consistent with hypotheses, the environmental record of KLD good citizens appears to be substantively better than less socially responsible companies. In particular, "better" KLD citizens are in compliance more often, have fewer total and toxic violations on average and in the total sample period, and overcomply more. In contrast, KLD "bad" citizens tend to have poorer environmental records. Total, informal, and formal sanctions have no impact on "good"

KLD citizens. Sanctions are unnecessary to produce the better record among good citizens. In fact, bad citizens continue to have a higher number of violations in the quarter following total and formal sanctions.

Moving into the next citizenship measure, logically the program volunteers should also have better records. The TRI 33/50 program was designed to reduce (legal) environmental emissions. At the very least one might expect that the program participants would have a better environmental record because of some spillover effects. Instead, participants are actually in violation more often, have more violations on average, and have high violations in the quarter following sanctions. Moreover, TRI 33/50 participants also account for most of the total sample violations (compared to non-participants) and generally overcomply less.

The difference in results requires explanation. The contradictory findings for the two types of measures are likely due to measurement error. As discussed in the measurement section, the KLD measures are objectively stronger than the voluntary program measures. Firms can participate in voluntary programs fairly easily, particularly Wastewise, without a real commitment to the program goals. It is possible that firms enroll in these programs only to create an image as a "green" company. In these cases, program participation is mere "window dressing" designed to improve firm reputation and attract customers. Voluntary programs may not reflect a commitment to social responsibility.

Although not enforced, the TRI 33/50 program did require real changes. In fact, the program met its overall pollution reduction goals but the reductions in discharges represent an average treatment effect. The success of the program does not necessarily

indicate that all firms had equivalent discharge reductions. Some firms may still use the program for reputation purposes without reducing toxic discharges. However, these findings have other explanations as well and do not necessarily indicate that firms were using the program participation as "window dressing." For instance, the literature indicates that many firms that participated in the TRI program had worse compliance records prior to the program inception. Thus, while they may have improved their TRI emissions (and this improvement may have had some spill over to water pollution), the firms may still have poorer records than others.

Some may argue that the null findings are a result of data limitations rather than reality. For example, is it possible that the small sample size is driving the null findings? This is unlikely for a few reasons. First, a lower criterion for statistical significance is used (p=0.10). Second, although a larger sample size might result in more statistical significance (because of the reduced error) there is no apriori reason to believe that the *size of the coefficients* would change even if the sample size was larger. Assume for a moment that KLD rankings do capture something about firm culture and the direction of the differences would be the same if the data were available for additional firms in the sample. With this larger sample size the findings might become significant, but the differences between good and bad citizens would likely still be small. Thus, even if the lack of significant findings is attributable to sample size, with additional data citizenship would still have only a small effect on compliance.

Additional evidence suggests that the small existing findings may not hold up under scrutiny. KLD citizenship rank is positively associated with variability. Good citizens have higher variability. Thus, they may overcomply in order to achieve overall

(monthly) compliance despite the daily and seasonal fluctuation (Bandyopadhyay and Horowitz, 2006). To the extent that variability is uncontrollable and random (i.e., due to weather and random events), it is unclear why variability would be positively correlated with any firm characteristic other than size. However, to the extent that variability is controllable (i.e., due to plant maintenance, etc) it seems that truly good citizens would target the origin of the fluctuation for technological advancements in order to reduce all pollution, not just the overall record. Conversely, program participation is negatively correlated with variability. Thus, program participants may overcomply less simply because they can do so and still maintain a good record overall. These findings could mean that firms overcomply for instrumental reasons. But, they may also suggest that there are limits to citizenship. When measured appropriately, good citizens with high variability will take steps to overcomply but will not take the additional step of improving technology to reduce the root cause of the variability.

Theoretical and Policy Implications: Citizenship Results

Despite the null findings, it is important to take a step back and assess the policy and theoretical implications of this work. Based on these data and measures, information about citizenship provides little guidance for regulators to target monitoring and determine effective punishments. Even if the effects were statistically significant, the environmental records of good and bad citizens are more similar than they are different. In addition, the firms vary little in their responsiveness to sanctions.

The citizenship results do have a theoretical impact. It is possible that the theoretical basis for citizenship is flawed. Moral and altruistic motives may be less relevant to company decisions than theorized. Although the business and society

literature suggests that firms vary in social performance, the important difference may be in firm outcomes. Perhaps citizenship should not be conceptualized as an independent variable. Instead, firms may be distinguished as good or bad citizens because of their record of misconduct. In fact, the descriptive findings show that the firms do vary in record: most firm/years reflect overcompliance but a few firms continue to be laggards with chronic violations. In this work, firms were not categorized according to their overall record. But building on the patterns found here, future work should explore whether companies can be categorized based on their overall record (i.e., outcomes) into the citizenship types discussed by Carroll (1979) in the business and society literature (proactive, reactive, etc).

The differences in environmental record in these data are clearly the result of something other than citizenship as measured here. If the theoretical motivation underlying the concept of citizenship is irrelevant to this type of crime, one must think about other theoretical frameworks that might explain this firm behavior. It is possible that command and control strategies in earlier decades were successful in reducing pollution and violations. Some of the other explanations for overcompliance and low violations may also be more relevant (curry favor with regulators; establish good reputation, etc). Environmental behavior may be better explained by a deterrence or pure rational choice framework.

While the tests of corporate citizenship, sanctions, and environmental behavior were the main research questions, this work has additional findings and implications as well.

Theoretical and Policy Implications: Other Results

In this study environmental performance is examined with a new unit of analysis—the firm. Several pieces of evidence support the firm-level approach. First, as the analysis of variance demonstrates, there is more similarity in the environmental record within firm (i.e., firms owned by the same plant) than between firm (i.e., plants owned by different firms). Second, moving to the firm-level does not distort the patterns of environmental performance found at the plant-level. In fact, the overall record of environmental violations and overcompliance and the distribution by industry is similar when each unit of analysis is used. The patterns that change do so in logical ways (e.g., firms are in violation more than plants because unit of analysis is larger). In addition, variability of pollution is related to firm-level overcompliance in the same manner as it relates to plant-level overcompliance. Although this is a plant-level phenomenon, the association is not distorted by moving to the firm-level. Finally, firm characteristics matter. Although explored primarily in bivariate analyses (because the multivariate models are only presented when citizenship is significant), firm characteristics are significantly related to firm-level environmental performance measured with self-reports. Not only do they matter, the associations make sense either in conjunction with the existing environmental and/or corporate crime literature. For example, firms with a higher return on sales (more efficient use of assets to produce sales) have more violations, but they also overcomply more. Firms with a higher return on sales have more variability. Companies that focus on generating more sales from their assets may be less wiling to spend money to target underlying problems that create variability in the first place. They overcomply to compensate, but do not upgrade technology.

Other associations are not associated with other environmental explanations, but are understood within the context of the corporate crime literature. For example, larger firms are in violation more often. One would expect this based on the corporate crime literature because the dichotomous measure does not account for differences in size, larger firms are in violation more often because they have more opportunity.

Clearly some tie connects firms and plants, even when the plants are located in different states. The corporate crime and organizational literature would point to firm structure (e.g., organizational form) and firm culture to explain the similarity in behavior and in the predictors of behavior across unit. Regardless of the specific form (refer back to Figures 1A and 1B), multiple levels of management are built into the corporate organizational form. Managers at each ancillary unit implement policies from the parent company that are designed to create this similarity in behavior.

Research findings from the environmental literature might also help explain these patterns. The generally public cares about environmental performance. In some cases, companies have been informally "punished" with decreases in stock prices following reports of high *legal* emissions (Hamilton, 1995). In striving to maintain a reputation as a "green" company and avoid such penalties, firms might be particularly vigilant in using their structure to convey environmental policies down the ranks.

The descriptive section also provides some results that are relevant to the larger field of criminology. For example, in most years the plants and firms have few violations and overcomply substantially. But, some plants and particularly some firms have a very high number of violations and are responsible for a disproportionate amount of violations. These patterns are consistent with those found for street criminals (Wolfgang

et al 1972), white-collar offenders (Weisburd et al., 2001), hotspots (Weisburd, Maher, and Sherman, 1992), and micro places (Weisburd, Bushway, Lum, and Yang, 2004).

Although citizenship provides little guidance to regulators, the broader study findings do inform policy. First, sanctions have little impact on environmental behavior. Perhaps the null findings reflect that EPA sanctions are too lenient to create changes in behavior. Or the null findings may occur because most firms are complying and overcomplying already. Earlier command and control policies may have successfully reduced the level of pollution and violations so that point sources are no longer a major source of pollution (Vandenbergh, 2004).

Second, this research finds that plants owned by the same firm tend to have similar records. Accordingly, knowledge about plant ownership may help regulators target monitoring. If one facility has chronic violations, it is likely that other plants owned by the firm will be problematic as well. Knowledge about the parent company might also help regulators target sanctions more effectively. Currently the EPA sanctions each plant individually. Regulators might consider moving up the command chain to deal with the parent company itself. Perhaps addressing sanctions in this level would result in greater effectiveness. In the end this is an empirical question.

Limitations

Like any empirical investigation, this study also has limitations. First, the data are somewhat limited. Variability is low, the sample size is small, and the stronger citizenship measures (KLD ratings) are available for only half of the sample. Aside from these data issues, the study has several other limitations. Although the KLD social ratings are objectively stronger than the voluntary program measures, they are far from

perfect measures of citizenship. Behavioral measures (e.g., the KLD ratings) are preferred because they demonstrate real actions on the part of the firm instead of mere "lip service" paid to social responsibility. The KLD social ratings data provide information on charitable donations and employee benefits programs, but ideal citizenship measures would directly reflect *the balance* a firm strikes between profits and social concerns.

In addition, the models could not sustain additional covariates and the data do not contain of these covariates (e.g., public pressure, etc). Including these measures would produce a better specified model.

As with any agency data, there are also issues with the EPA data quality. The data issues are similar to problems with the Uniform Crime Report (UCR) when state data are transmitted to the Federal Bureau of Investigation (FBI). In the EPA data, there are some differences between headquarters and the states that result in data discrepancies. For instance, states are not required to report "informal" enforcement actions to headquarters. Thus, there is missing information on some sanctions. However, states have incentives to report the information because, absent reporting, the facility will show up in the data as noncompliant. In addition, if informal enforcement actions are not entered from state records it would appear that the state did nothing to fix the problem.

Finally, EPA self-report data are subject to the same set of problems as traditional self-report data. Firms may have an incentive to misrepresent pollution levels. However, firms do report (sometimes quite significant) violations. In addition, the EPA does conduct site inspections, interview those who do the reports, and in some instances inspectors take samples to test the accuracy of the reports. Therefore, inspections—while

rare—are a constant threat that challenge false self-reports. Despite its limitations, this study produces many questions for future research.

Directions for Future Research

In this study, the measures of citizenship have little association with environmental performance. However, these results do not necessarily indicate that the concept of citizenship is completely irrelevant to firm behavior. More research is necessary before the question is closed.

First, citizenship may have more of an impact with other kinds of corporate misconduct. Other factors may have reduced violations and rendered citizenship irrelevant to environmental behavior, but good citizens may have fewer financial crimes, OSHA violations, or discrimination cases. These questions can actually be addressed in the future using these data. The KLD social ratings data contain some information about non-environmental cases and settlements against the firms. Although limited, the association between citizenship and these crimes can be examined with these data.

In addition, researchers can explore whether citizenship matters more for particular kinds of organizations. The sample in this study is limited to publicly-traded companies. Among these types of firms, other explanations for compliance and overcompliance may be more relevant. Firms that produce consumer products may be particularly vulnerable to public pressure for environmental friendly products or for "green" companies. In addition, the goal of publicly-traded firms is to increase shareholder profits. Firms that maintain a good environmental record and/or market environmentally friendly products may have a competitive advantage. But, citizenship may be relevant for other organizations, even other types of businesses. Privately owned

businesses, where profit concerns do not weigh quite as heavy, may be more conducive to balancing social and economic concerns.

The sample is also limited to companies based in the United States. To the extent that firms engage in socially responsible activities and/or comply because of social pressure, the association between citizenship and environmental behavior may vary internationally. In some European countries the ideas of social responsibility and environmental preservation took hold much earlier than in the United States. Thus, firms based in these countries may have equivalent or better records than firms based in the U.S. However, in other parts of the world environmental protection is not a prominent social concern. Firms based in these countries (or U.S. owned facilities and subsidiaries that are located in these countries) may have less impressive environmental records than found in these data. Thus, expanding beyond U.S. based companies may provide additional insight in to the causes of compliance and other socially responsible activities.

The association between firm characteristics and environmental performance also warrants further exploration. Future studies (with a larger sample of firms) should include these *and* measures of additional competing explanations. However, to engage in this sort of research, scholars need data. This study highlights an important obstacle for those who study corporate crime—data.

First, there are few existing firm-level databases. Most of the existing ones have been compiled by researchers. There is no Uniform Crime Report, National Victimization Survey, or stockpile of self-report data on corporate crime. In order to study firm-level environmental data, we had to compile the data ourselves.

Aside from data on crime and/or conformity, any attempt to compile corporate crime data is difficult because very little company information of any kind is publicly available. Essentially researchers are left with 10K reports and sources that draw information from the 10K reports (e.g., Industrial Compustat and Mergent's Online). We were left combing through industry news listings and company websites to find missing information. In addition, corporate crime researchers can only construct a limited number of variables from this information. In fact, the citizenship measures used in this study are virtually the only ones that are publicly available.

In addition to the data availability problems described above, the environmental database created problems. On the plus side, the PCS data provided self-reported pollution amounts. Unfortunately, the facility pollution data were not already linked to the parent company. These links had to be made with the existing (limited) sources. Information we received at an EPA workshop helps to put this task in perspective. After the Exxon-Valdez oil spill it took the EPA six months to link Exxon's facilities and discuss the company's overall record. In fact, the *only source* that provides company/facility linkages in database form (Dunn and Bradstreet) is prohibitively expensive. Further, the EPA does not do quality control on the Dunn and Bradstreet identification numbers in its system and they are highly inaccurate (Grant et al 2002).

Thus, although this study and these data provide many starting points for additional research, data improvements would help achieve future research goals. The EPA has several existing databases, but the firm-level links are not easily accessible and the data quality could be improved. In addition, researchers need access to additional

data sources. Mandatory reporting and more open access to corporations will ultimately assistant scholars to build on these and future questions.

Appendix

Figure 1A: Functional Form

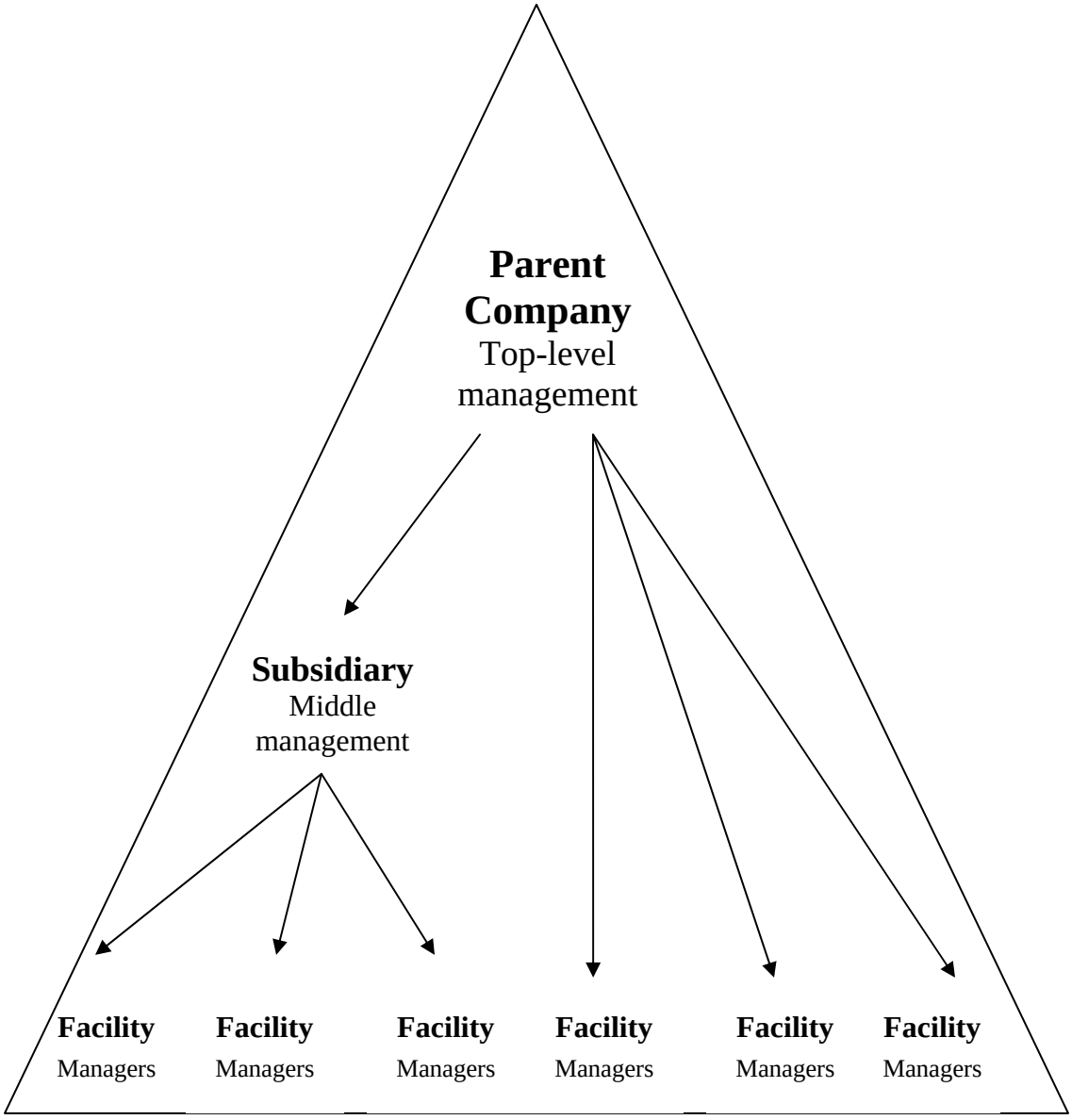


Figure 1B: Multidivisional Form

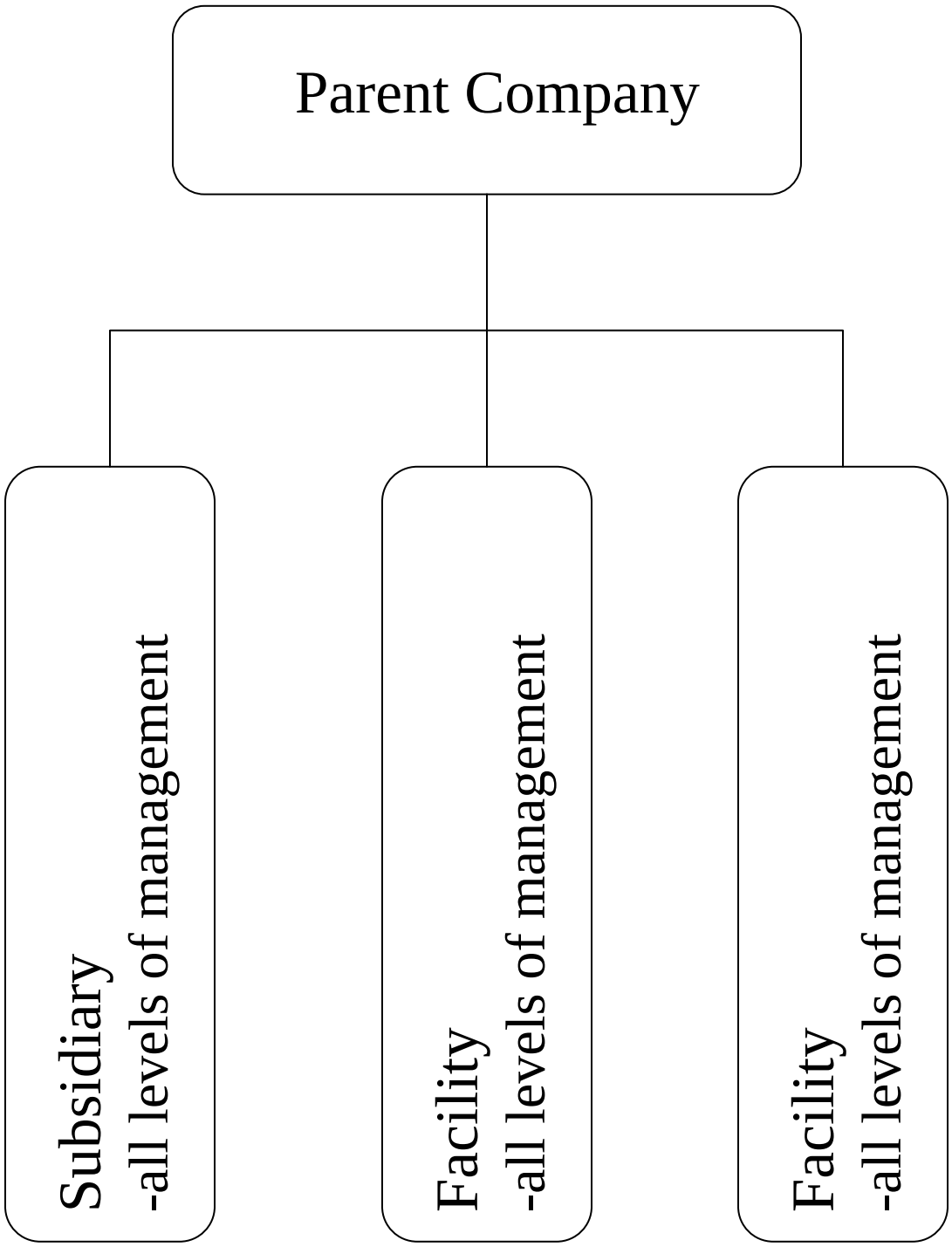


Table 1A: Full Sample - Descriptive Statistics Pooled Across Six Waves (nT=378)

Variables	nT	Range	Mean (Std. Dev.) Median
DICHOTOMOUS MEASURES			
All	378	0 – 1	0.91 (0.29) 1.00
BOD	274	0 – 1	0.50 (0.50) 0.50
TSS	355	0 – 1	0.48 (0.50) 0.00
Con Poll	364	0 – 1	0.74 (0.44) 1.00
Tox Poll	332	0 – 1	0.50 (0.50) 0.50
NUMBER OF VIOLATIONS			
All	374	1 – 106	13.55 (16.47) 8.00
BOD	274	1 – 27	3.16 (3.28) 2.00
TSS	355	1 – 33	4.34 (5.02) 3.00
Con Poll	364	1 – 73	8.44 (10.88) 4.00
Tox Poll	332	1 – 48	6.02 (8.37) 3.00

Table 1A (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
COMPLIANCE RATIO—QUANTITY			
BOD	210	0.03 – 24.32	0.46 (1.66) 0.33
TSS	300	-8.16 – 39.40	0.28 (2.41) 0.23
Con Poll	323	-3.18 – 34.50	0.35 (1.93) 0.26
Tox Poll	205	-15.19 – 2.54	-0.15 (1.88) 0.09
COMPLIANCE RATIO—CONCENTRATION			
BOD	119	0.00 – 1.56	0.29 (0.20) 0.25
TSS	211	-7.38 – 0.96	0.11 (1.10) 0.25
Con Poll	258	-3.25 – 32.16	0.35 (2.04) 0.25
Tox Poll	181	-12.71 – 3.93	-2.55 (2.25) -2.16

Table 1A (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
CITIZENSHIP			
TRI 33/50	N/A	0 – 1	0.66 (0.48) 1.00
Wastewise	N/A	0 – 1	0.20 (0.40) 0.00
PCS SANCTIONS			
Total Sanctions	378	0 – 41	1.75 (3.84) 0.00
Informal Sanctions	378	0 – 15	0.93 (2.14) 0.00
Formal Sanctions	378	0 – 38	0.82 (2.75) 0.00
FORMAL CASES			
Administrative	378	0 – 4	0.23 (0.56) 0.00
Civil	378	0 – 3	0.08 (0.34) 0.00
Criminal	378	0 – 1	0.01 (0.09) 0.00

Table 1A (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
FINANCIAL PERFORAMNCE			
TSE	358	-$1,838,428,928.00 – $70,756,999,168.00	$3,033,541,670.75 ($7,991,302,506.2) $1,016,388,992.00
ROA	352	-0.32 – 0.18	0.03 (0.06) 0.03
ROS	339	0.30 – 5.02	1.20 (0.66) 1.03
Liquidity	352	-1.00 – 0.44	0.09 (0.12) 0.08
CORPORATE STRUCTURE			
# of Facilities Owned	378	1 – 23	3.43 (2.96) 2.00
# of Employees	336	291 – 112,900	15,419 (19,666) 6,907.00

Table 1B: Description of the Variables
Dependent Variables

Variable	Definition
Measures	
Dichotomous Violation Measure	=1 if in violation
Number of Violations	Number of Violations (among violators)
Compliance Ratio	Portion of permitted limit that is discharged. Numbers closer to zero indicate more overcompliance. Numbers closer to one indicate less overcompliance. Numbers over one indicate violation.
Parameters of Interest	
Biochemical Oxygen Demand (BOD)	A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. The greater the BOD, the greater the degree of pollution.
Total Suspended Solids (TSS)	A measure of the suspended solids in wastewater, effluent, or water bodies, determined by tests for "total suspended non-filterable solids."
Conventional Pollutants	Pollutants that will break down. Statutorily listed pollutants understood well by scientists. These may be in the form of organic waste, sediment, acid, bacteria, viruses, nutrients, oil and grease, or heat.
Toxic Pollutants	Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.

Table 1B (cont): Independent Variables

Variable	Definition
Sanctions	
Total Sanctions	Yearly count of total number of sanctions received
Informal Sanctions	Yearly count of number of informal sanctions received (e.g., phone calls and warning letters)
Formal Sanctions	Yearly count of number of formal sanctions received (e.g., civil and administrative actions and cases)
KLD Social Ratings Data	Sum of Total Strengths minus Total Concerns
Community (Strengths)	
	Generous Giving. The company has consistently given over 1.5% of trailing three-year net earnings before taxes (NEBT) to charity, or has otherwise been notably generous in its giving.
	Innovative Giving. The company has a notably innovative giving program that supports nonprofit organizations, particularly those promoting self-sufficiency among the economically disadvantaged. Companies that permit nontraditional federated charitable giving drives in the workplace are often noted in this section as well.
	Non-US Charitable Giving. The company has made a substantial effort to make charitable contributions abroad, as well as in the U.S. To qualify, a company must make at least 20% of its giving, or have taken notably innovative initiatives in its giving program, outside the U.S.
	Support for Housing. The company is a prominent participant in public/private partnerships that support housing initiatives for the economically disadvantaged, e.g., the National Equity Fund or the Enterprise Foundation.
	Support for Education. The company has either been notably innovative in its support for primary or secondary school education, particularly for those programs that benefit the economically disadvantaged, or the company has prominently supported youth job-training programs.
	Volunteer Programs. The company has an exceptionally strong volunteer program.
	Other Strength. The company has an exceptionally strong giving program or engages in other notably positive community activities.

Table 1B (cont)

Community (Concerns)	
	Investment Controversies. The company is a financial institution whose lending or investment practices have led to controversies, particularly ones related to the Community Reinvestment Act.
	Negative Economic Impact. The company's actions have resulted in major controversies concerning its economic impact on the community. These controversies can include issues related to environmental contamination, water rights disputes, plant closings, "put or pay" contracts with trash incinerators, or other company actions that adversely affect the quality of life, tax base, or property values in the community.
	Other Concern. The company is involved with a controversy that has mobilized community opposition, or is engaged in other noteworthy community controversies.
Corporate Governance (Strengths)	
	Limited Compensation. The company has recently awarded notably low levels of compensation to its top management or its board members. The limit for a rating is total compensation of less than $500,000 per year for a CEO or $30,000 per year for outside directors.
	Ownership Strength. The company owns between 20% and 50% of another company KLD has cited as having an area of social strength, or is more than 20% owned by a firm that KLD has rated as having social strengths. When a company owns more than 50% of another firm, it has a controlling interest, and KLD treats the second firm as if it is a division of the first.
	Other Strength. The company has an innovative compensation plan for its board or executives, a unique and positive corporate culture, or some other initiative not covered by other KLD ratings.
Corporate Governance (Concern)	
	High Compensation. The company has recently awarded notably high levels of compensation to its top management or its board members. The limit is total compensation of more than $10 million per year for a CEO or $100,000 per year for outside directors.
	Ownership Concern. The company owns between 20% and 50% of a company KLD has cited as having an area of social concern, or is more than 20% owned by a firm KLD has rated as having areas of concern. When a company owns more than 50% of another firm, it has a controlling interest, and KLD treats the second firm as if it is a division of the first.

Table 1B (cont)

	Other Concern. The company restated its earnings over an accounting controversy, has other accounting problems, or is involved with some other controversy not covered by other KLD ratings.
	Tax Disputes. The company has recently been involved in major tax disputes involving more than $100 million with the Federal, state, or local authorities.
Diversity(Strength)	
	CEO. The company's chief executive officer is a woman or a member of a minority group.
	Promotion. The company has made notable progress in the promotion of women and minorities, particularly to line positions with profit-and-loss responsibilities in the corporation.
	Board of Directors. Women, minorities, and/or the disabled hold four seats or more (with no double counting) on the board of directors, or one-third or more of the board seats if the board numbers less than 12.
	Work/Life Benefits. The company has outstanding employee benefits or other programs addressing work/life concerns, e.g., childcare, elder care, or flextime.
	Women & Minority Contracting. The company does at least 5% of its subcontracting, or otherwise has a demonstrably strong record on purchasing or contracting, with women- and/or minority-owned businesses.
	Employment of the Disabled. The company has implemented innovative hiring programs, other innovative human resource programs for the disabled, or otherwise has a superior reputation as an employer of the disabled.
	Gay & Lesbian Policies. The company has implemented notably progressive policies toward its gay and lesbian employees. In particular, it provides benefits to the domestic partners.
	Other Strength. The company has made a notable commitment to diversity that is not covered by other KLD ratings.
Diversity (Concern)	
	Non-Representation. The company has no women on its board of directors or among its senior line managers.
	Other Concern. The company is involved in other diversity controversies.

Table 1B (cont)

Employee Relations (Strength)	
	Union Relations. The company has a history of notably strong union relations.
	Cash Profit Sharing. The company has a cash profit-sharing program through which it has recently made distributions to a majority of its workforce.
	Employee Involvement. The company strongly encourages worker involvement and/or ownership through stock options available to a majority of its employees, gain sharing, stock ownership, sharing of financial information, or participation in management decision-making.
	Retirement Benefits. The company has a notably strong retirement benefits program.
	Other Strength. The company is noted by the US Occupational Health and Safety Administration for its safety programs, or has other strong employee relations initiatives not covered by other KLD ratings.
Employee Relations (Concern)	
	Union Relations. The company has a history of notably poor union relations.
	Workforce Reductions. The company has reduced its workforce by 15% in the most recent year or by 25% during the past two years, or it has announced plans for such reductions.
	Retirement Benefits Concern. The company has either a substantially underfunded defined benefit pension plan, or an inadequate retirement benefits program.
	Other Concern. The company is involved in an employee relations controversy that is not covered by other KLD ratings.
Environment (Strength)	
	Beneficial Products and Services. The company derives substantial revenues from innovative remediation products, environmental services, or products that promote the efficient use of energy, or it has developed innovative products with environmental benefits.
	Pollution Prevention. The company has notably strong pollution prevention programs including both emissions reductions and toxic-use reduction programs.

Table 1B (cont)

	Recycling. The company either is a substantial user of recycled materials as raw materials in its manufacturing processes, or a major factor in the recycling industry.
	Alternative Fuels. The company derives substantial revenues from alternative fuels. The term "alternative fuels" includes natural gas, wind power, and solar energy. The company has demonstrated an exceptional commitment to energy efficiency programs or the promotion of energy efficiency.
	Other Strength. The company has demonstrated a superior commitment to management systems, voluntary programs, or other environmentally proactive activities.
Environment (Concern)	
	Ozone Depleting Chemicals. The company is among the top manufacturers of ozone depleting chemicals such as HCFCs, methyl chloroform, methylene chloride, or bromines.
	Substantial Emissions. The company's legal emissions of toxic chemicals (as defined by and reported to the EPA) from individual plants into the air and water are among the highest of the companies followed by KLD.
	Agricultural Chemicals. The company is a substantial producer of agricultural chemicals, i.e., pesticides or chemical fertilizers.
	Other Concern. The company has been involved in an environmental controversy that is not covered by other KLD ratings.
Voluntary Program Participation	
TRI 33/50	=1 if participated in TRI 33/50 program
Wastewise	=1 if participated in Wastewise program

Table 1B (continued): Control Variables

Variable	Definition
Financial Performance	
Total Company Profit	Total Stockholders Equity: The common and preferred shareholders' interest in the company. It is the amount stockholders might obtain if a corporation is liquidated.
Return on Assets	Net Income/Total Assets: Profitability in relation to assets or investment reflects how efficiently the firm utilizes its resources. Measure of management effectiveness.
Return on Sales	Total Sales/Total Assets: This standard measure indicates the sales generating ability of firm assets.
Liquidity	(Total Current Assets – Total Current Liabilities)/Total Assets: Captures a firm's working capital.
Corporate Structure	
Complexity	Number of facilities owned
Size	Number of employees
Standard Industrial Classification (SIC)	
Oil	=1 if SIC is 2911
Steel	=1 if SIC is 3211
Pulp and Paper (omitted)	=1 if SIC is 2621 or 2611

Figure 2

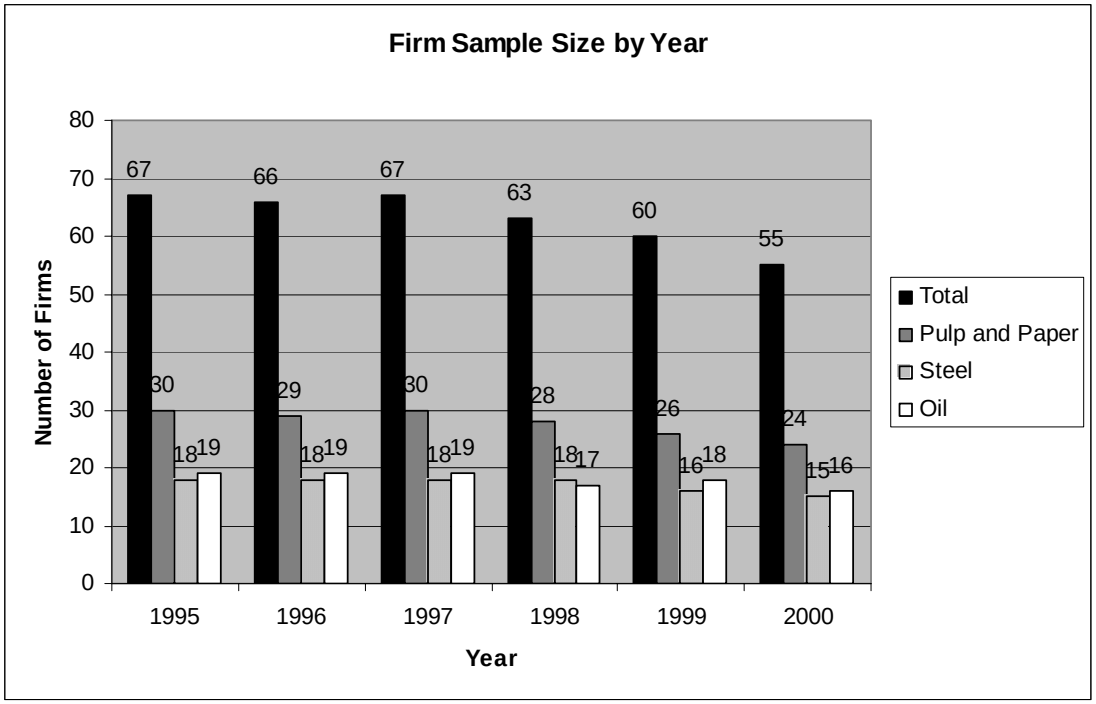
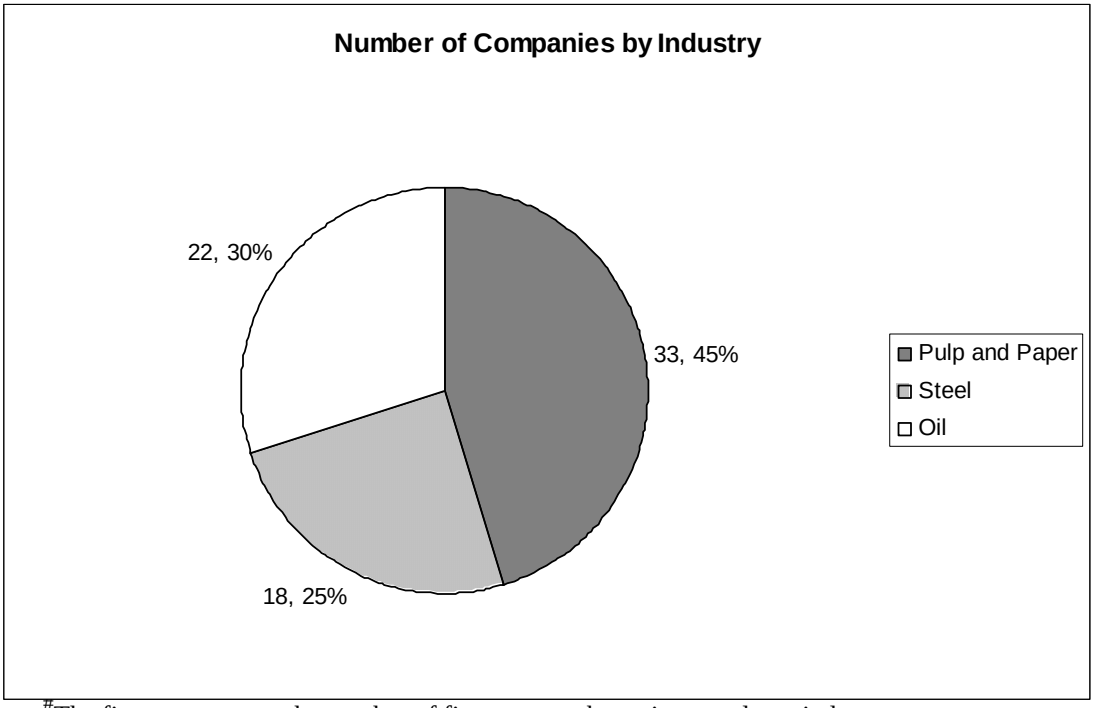

Firm Sample Size by Year
Number of Firms
80
70
60
50
40
30
20
10
0
67
66
67
63
60
55
30
29
30
28
26
24
18
19
18
19
18
19
18
17
16
18
15
16
1995
1996
1997
1998
1999
2000
Year
Total
Pulp and Paper
Steel
Oil

Figure 3[#]



[#]The figure represents the number of firms across the entire sample period.

Figure 4

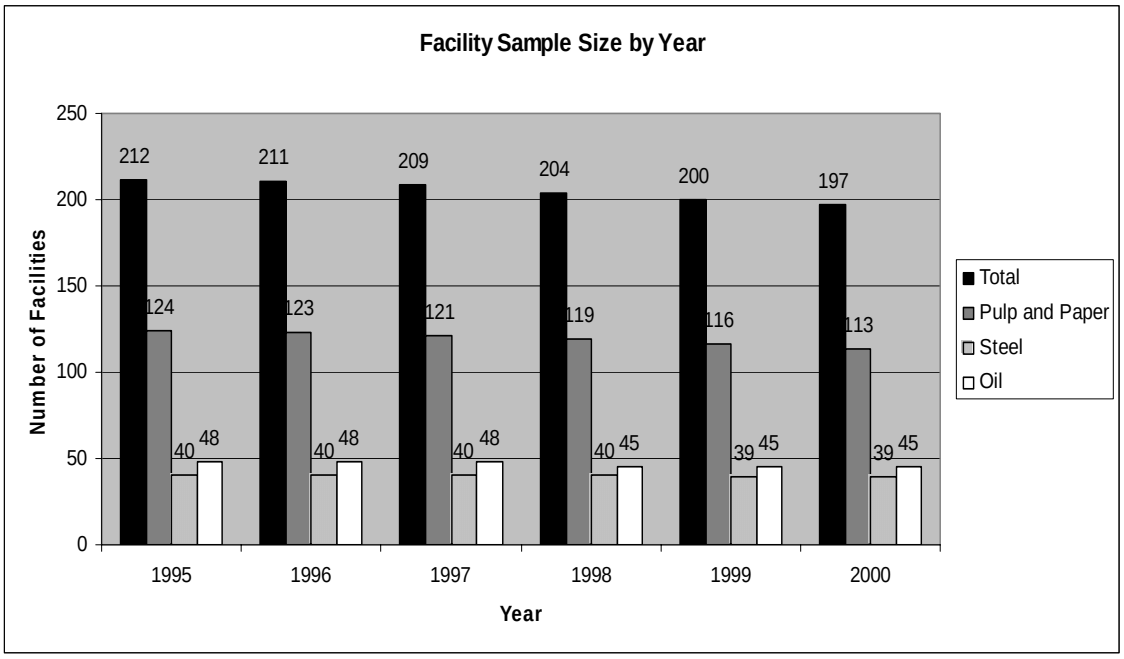
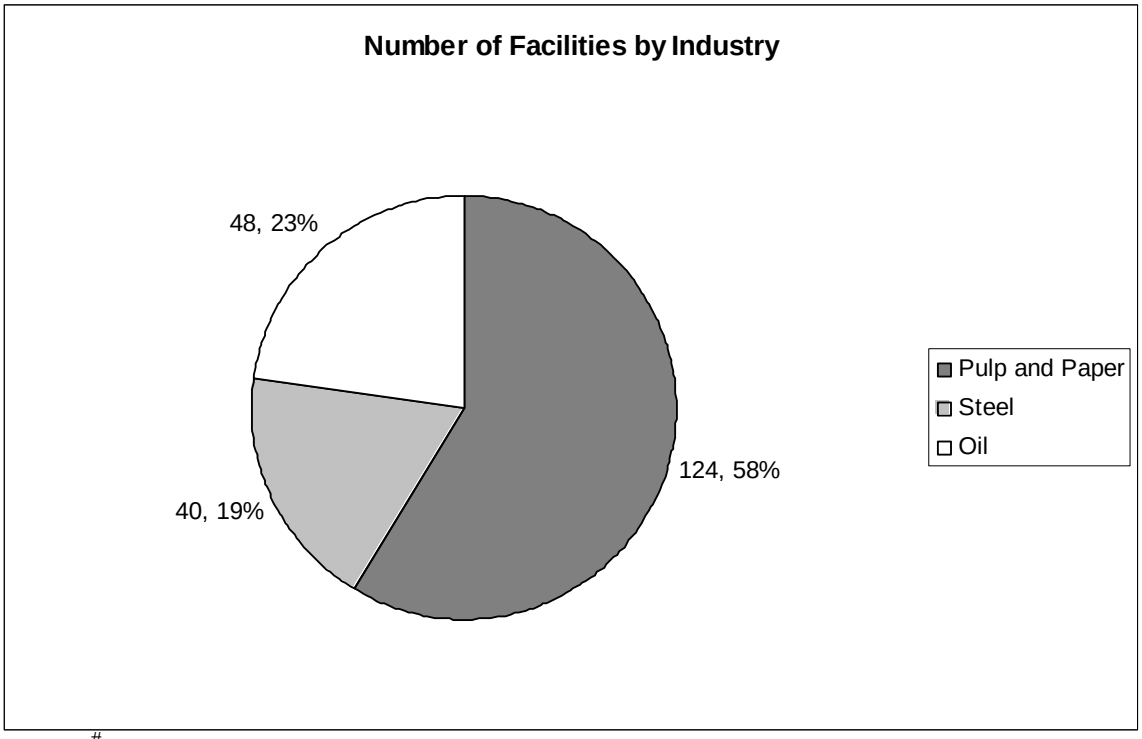

Facility Sample Size by Year
Number of Facilities
250
200
150
100
50
0
212
211
209
204
200
197
124
123
121
119
116
113
40
48
40
48
40
48
40
45
39
45
39
45
1995
1996
1997
1998
1999
2000
Year
Total
Pulp and Paper
Steel
Oil

Figure 5[#]



[#]The figure includes the number of facilities in the sample at least one year.

Figure 6

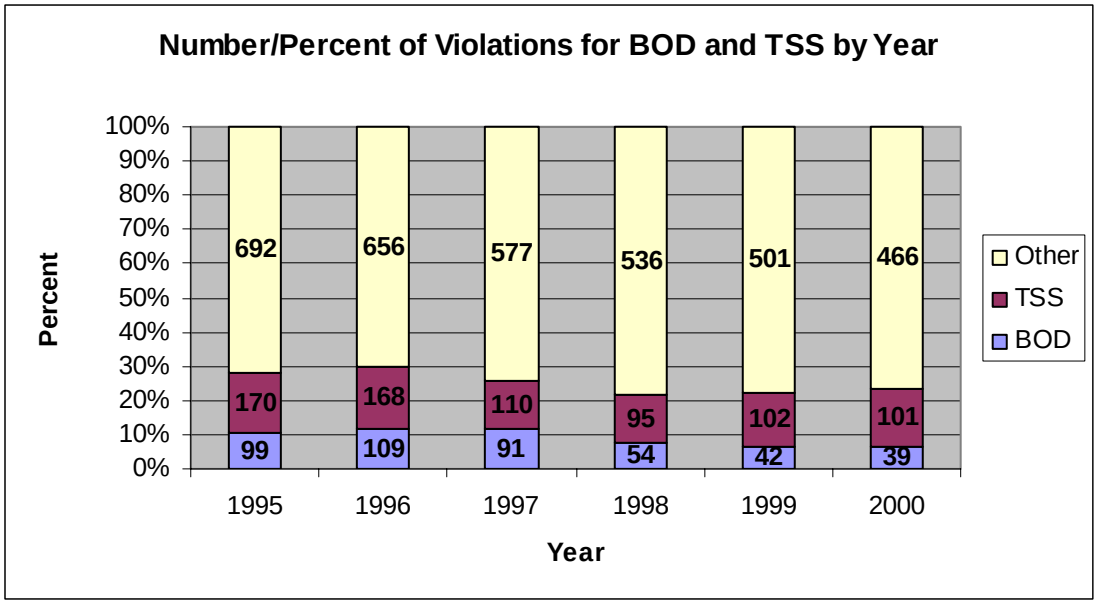

Number/Percent of Violations for BOD and TSS by Year
Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
692
656
577
536
501
466
170
168
110
95
102
101
99
109
91
54
42
39
1995
1996
1997
1998
1999
2000
Year
Other
TSS
BOD

Figure 7

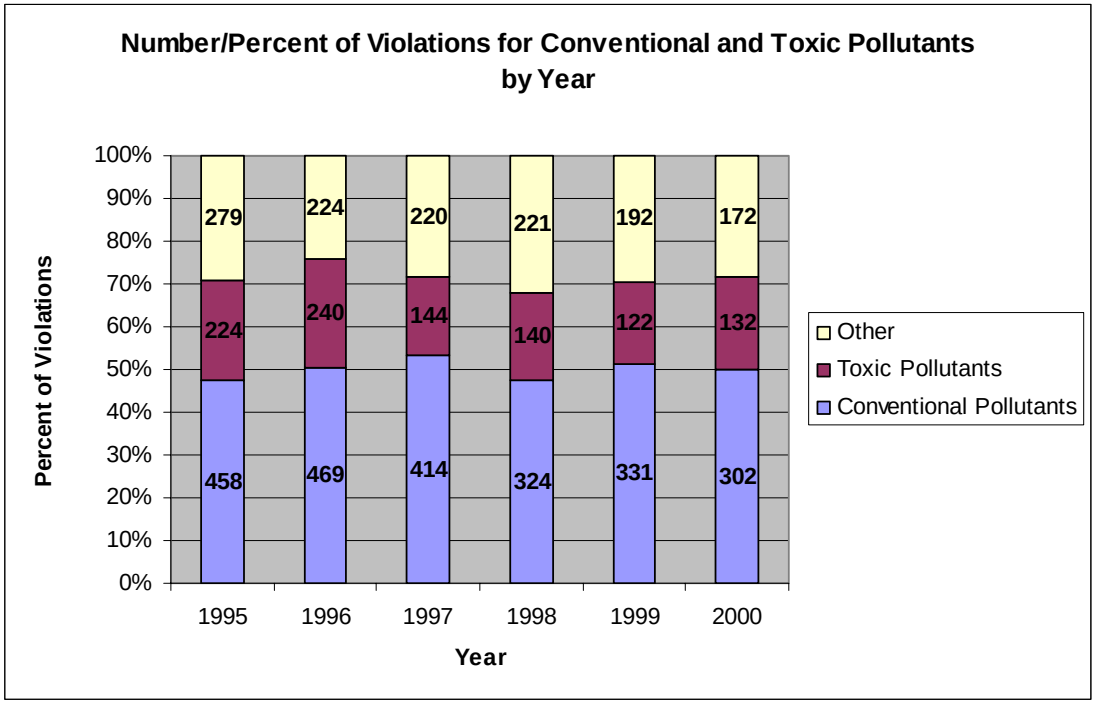

Number/Percent of Violations for Conventional and Toxic Pollutants by Year
Percent of Violations
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
279
224
458
224
240
469
220
144
414
221
140
324
192
122
331
172
132
302
1995
1996
1997
1998
1999
2000
Year
Other
Toxic Pollutants
Conventional Pollutants

Table 2: Sanction Severity Scale

Action	Frequency	Percent
(0) Comment, Permit Mod Request	54	8%
(1) Phone Call, Meeting with Permittee, Enforcement Notice Letter	13	2%
(2) Final Order of the Board, Letter of Violation-Effluent, Section 308 Letter, Warning Letter, Notice of Violation (multiple versions—letter), Notice of Noncompliance (multiple versions—letter)	299	43%
(3) Administrative Action Planned, Administrative Action Pending, Under Review by State Agency, Under Enforcement Review	17	2%
(4) Enforcement Conference, Enforcement Conference Letter	5	0.7%
(5) AO Stipulated Penalty, Amended Administrative Order, 308 Administrative Order, Administrative Order, Administrative Consent Order, Jud Action Planned, Referred to Higher Level Review, Notice of Potential Penalty, Compliance Order	196	28%
(6) Jud Action Pending, Consent Decree, Stipulation Court Order, Stipulation Court Order, Stipulation Agreement, Order of Revocation, Emergency Order (Governor)	23	3%
(7) NPDES Penalty AO Category I, NPDES Penalty AO Category II, Penalty AO Issued by State	84	12%

Table 3: Informal and Formal Sanctions

	Frequency	Percent
Informal Sanctions	366	53%
Formal Sanctions	325	47%

Table 4: Cases Filed

	Frequency	Percent
Administrative	89	72%
Civil	31	25%
Criminal	3	3%

Table 5: Sample Descriptives. Firms with KLD Data (with Replacements), Pooled Across Six Waves (nT=174)

Variables	nT	Range	Mean (Std. Dev.) Median
CITIZENSHIP			
KLD Social Ratings (with substitutions)	174	-3.00 – 8.00	1.24 (2.24) 1.00
PCS SANCTIONS			
Total Sanctions	174	0 – 23	2.09 (3.88) 0.00
Informal Sanctions	174	0 – 12	1.14 (2.43) 0.00
Formal Sanctions	174	0 – 17	0.95 (2.38) 0.00
FORMAL CASES			
Administrative	174	0 – 4	0.30 (0.64) 0.00
Civil	174	0 – 2	0.09 (0.36) 0.00
Criminal	174	0 – 1	0.01 (0.08) 0.00

Table 5 (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
FINANCIAL PERFORMANCE			
TSE	167	$-230,400,000.00 – $70,756,999,168.00	$5,471,937,368.57 ($10,004,898,851.7) $2,254,200,064.00
ROA	160	-0.08 – 0.18	0.04 (0.04) 0.04
ROS	156	0.56 – 5.02	1.11 (0.50) 1.01
Liquidity	161	-0.21 – 0.27	0.04 (0.07) 0.05
CORPORATE STRUCTURE			
# of Facilities Owned	174	1.00 – 23.00	4.78 (3.63) 3.00
# of Employees	148	291 – 112,900.00	27,377.66 (23,404.28) 20,080.00

Table 5 (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
DICHOTOMOUS MEASURE			
All	173	0 – 1	0.94 (0.24) 1.00
BOD	144	0 – 1	0.56 (0.50) 1.00
TSS	173	0 – 1	0.56 (0.50) 1.00
Con Poll	173	0 – 1	0.79 (0.41) 1.00
Tox Poll	157	0 – 1	0.48 (0.50) 0.00
NUMBER OF VIOLATIONS			
All	173	0 – 87	14.10 (14.85) 10.00
BOD	144	0 – 15	3.40 (2.54) 3.00
TSS	173	0 – 21	3.86 (3.83) 3.00
Con Poll	173	0 – 48	8.58 (9.26) 5.50
Tox Poll	157	0 – 45	5.43 (7.51) 3.00

Table 5 (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
COMPLIANCE RATIO—QUANTITY			
BOD	114	0.03 – 0.92	0.34 (0.16) 0.33
TSS	142	-3.68 – 0.73	0.21 (0.53) 0.27
Con Poll	154	-0.36 – 0.84	0.28 (0.16) 0.28
Tox Poll	104	0.00 – 2.54	0.14 (0.27) 0.08
COMPLIANCE RATIO--CONCENTRATION			
BOD	67	0.05 – 0.73	0.25 (0.15) 0.22
TSS	108	0.00 – 0.83	0.26 (0.16) 0.24
Con Poll	138	0.00 – 32.16	0.50 (2.72) 0.24
Tox Poll	95	-7.40 – 0.00	-2.31 (1.40) -2.11

Table 6: Sample Descriptives. Firms with KLD Data (No Replacements), Pooled Across Six Waves (nT=156)

Variables	nT	Range	Mean (Std. Dev.) Median
CITIZENSHIP			
KLD Social Ratings (no substitutions)	156	-3.00 – 8.00	1.22 (2.16) 1.00
PCS SANCTIONS			
Total Sanctions	156	0 – 23	2.08 (3.88) 0.00
Informal Sanctions	156	0 – 11	1.06 (2.31) 0.00
Formal Sanctions	156	0 – 17	1.01 (2.47) 0.00
FORMAL CASES			
Administrative	156	0 – 4	0.31 (0.65) 0.00
Civil	156	0 – 2	0.09 (0.37) 0.00
Criminal	156	0 – 1	0.01 (0.08) 0.00

Table 6 (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
FINANCIAL PERFORMANCE			
TSE	152	$-230,400,000.00 – $70,756,999,168.00	$5,628,402,596.21 ($10,386,954,132.5) $2,258,224,000.00
ROA	145	-0.07 – 0.18	0.04 (0.04) 0.03
ROS	141	0.56 – 2.73	1.05 (0.35) 1.01
Liquidity	146	-0.21 – 0.27	0.04 (0.07) 0.05
CORPORATE STRUCTURE			
# of Facilities Owned	156	1.00 – 23.00	4.94 (3.75) 3.00
# of Employees	139	5,700 – 112,900.00	28,733.96 (23,452.93) 20,845.00

Table 6 (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
DICHOTOMOUS MEASURE			
All	155	0 – 1	0.93 (0.26) 1.00
BOD	126	0 – 1	0.56 (0.50) 1.00
TSS	155	0 – 1	0.57 (0.50) 1.00
Con Poll	155	0 – 1	0.77 (0.42) 1.00
Tox Poll	139	0 – 1	0.47 (0.50) 0.00
NUMBER OF VIOLATIONS			
All	155	0 – 87	14.42 (14.93) 10.00
BOD	126	0 – 15	3.48 (2.59) 3.00
TSS	155	0 – 21	3.78 (3.90) 2.00
Con Poll	155	0 – 43	8.48 (8.81) 5.50
Tox Poll	139	0 – 45	5.76 (7.94) 3.00

Table 6 (cont)

Variables	nT	Range	Mean (Std. Dev.) Median
COMPLIANCE RATIO--QUANTITY			
BOD	103	0.03 – 0.92	0.35 (0.15) 0.33
TSS	130	-3.68 – 0.73	0.20 (0.56) 0.26
Con Poll	143	-0.36 – 0.84	0.28 (0.16) 0.28
Tox Poll	92	0.00 – 2.54	0.15 (0.28) 0.08
COMPLIANCE RATIO--CONCENTRATION			
BOD	59	0.06 – 0.73	0.26 (0.14) 0.23
TSS	101	0.00 – 0.83	0.26 (0.16) 0.24
Con Poll	126	0.00 – 32.16	0.52 (2.85) 0.24
Tox Poll	85	-7.40 – 0.00	-2.34 (1.44) -1.44

Table 7: Correlations of Independent Variables

	1	2	3	4	5	6	7	8	9	10
1. KLD Social Rating	1.00									
2. KLD Social Rating (no replacement)	1.00 156	1.00								
3. TRI 33/50	0.02 163	0.00 151	1.00							
4. Wastewise	0.15* 168	0.19* 156	0.18** 348	1.00						
5. Total Sanctions	0.01 174	-0.02 156	-0.00 348	-0.08 348	1.00					
6. Informal Sanctions	0.11 174	0.08 156	0.04 348	-0.12* 372	0.72** 378	1.00				
7. Formal Sanctions	-0.11 174	-0.10 156	-0.03 348	-0.02 372	0.84** 378	0.20** 348	1.00			
8. TSE	-0.01 167	-0.06 152	0.24** 333	0.02 355	0.01 358	0.06 358	-0.03 358	1.00		

	1	2	3	4	5	6	7	8	9	10
9. ROA	0.13+ 160	0.13 145	0.03 327	-0.08 349	0.01 358	0.06 352	-0.09+ 352	0.19** 348	1.00	
10. ROS	0.01 156	0.09 141	-0.30** 314	-0.11* 336	-0.03 352	-0.04 339	0.12* 339	-0.03 335	0.02 333	1.00
11. Liquidity	0.13+ 161	0.15+ 146	-0.19** 327	-0.10+ 349	0.07 339	0.05 352	-0.02 352	-0.23** 349	0.19** 346	0.01 337
12. # of facilities owned	0.06 174	0.09 156	0.32** 348	0.27** 372	0.01 352	0.08 378	0.02 378	0.18** 358	0.06 352	-0.19** 339
13. # of employees	0.18* 148	0.16* 139	0.38** 316	0.35** 336	0.05 378	0.02 336	-0.03 336	0.66** 335	0.12* 328	-0.12* 321
14. BOD Quan Variability	0.27** 115	0.30** 103	-0.29** 181	-0.16* 205	0.24** 210	0.23** 210	0.12+ 210	-0.10 200	-0.01 198	0.47** 189
15. TSS Quan Variability	0.03 142	0.04 130	-0.08 265	-0.12* 288	0.05 293	0.12+ 210	0.03 293	0.05 276	-0.04 268	0.22** 264
16. Con Poll Quan Variability	-0.07 153	-0.07 141	-0.09 290	-0.16** 314	0.15** 319	0.24** 210	0.13* 319	0.07 302	-0.03 294	0.15** 287
17. Tox Poll Quan Variability	0.28** 103	0.41** 91	-0.14+ 185	-0.12+ 189	0.07 194	0.05 293	0.05 194	-0.16* 182	0.06 180	0.09 177

	1	2	3	4	5	6	7	8	9	10
18. BOD Conc	-0.01	-0.03	0.00	0.06	0.02	0.02	0.00	-0.12	-0.22*	0.18+
Variability	68	59	109	114	118	118	118	113	111	104
19. TSS Conc	0.07	0.08	0.07	0.22**	-0.11	-0.11	-0.04	-0.04	0.04	0.20**
Variability	106	98	186	197	302	202	202	187	186	179
20. Con Poll Conc	-0.01	-0.03	-0.02	0.12+	-0.03	-0.05	0.03	-0.14*	-0.00	0.15*
Variability	136	123	227	245	250	250	250	233	230	220
21. Tox Poll Conc	0.16	0.20+	-0.12	0.02	0.12	0.11	0.07	-0.14+	0.05	0.27**
Variability	94	84	163	172	177	177	177	166	158	164

Figure 8

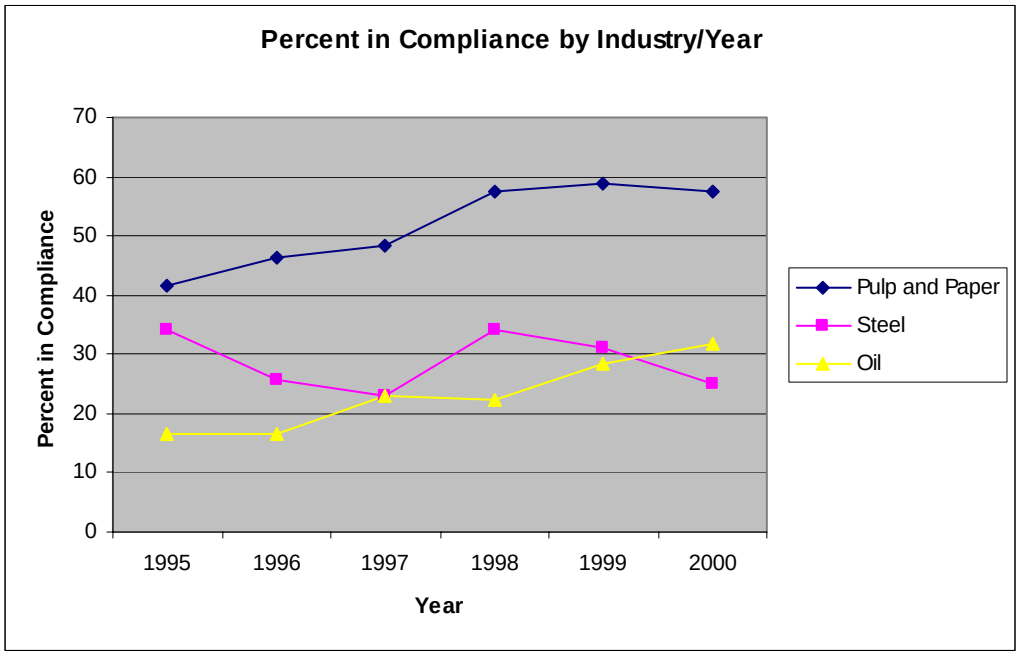

Percent in Compliance by Industry/Year
Percent in Compliance
70
60
50
40
30
20
10
0
1995
1996
1997
1998
1999
2000
Year
Pulp and Paper
Steel
Oil

Figure 9

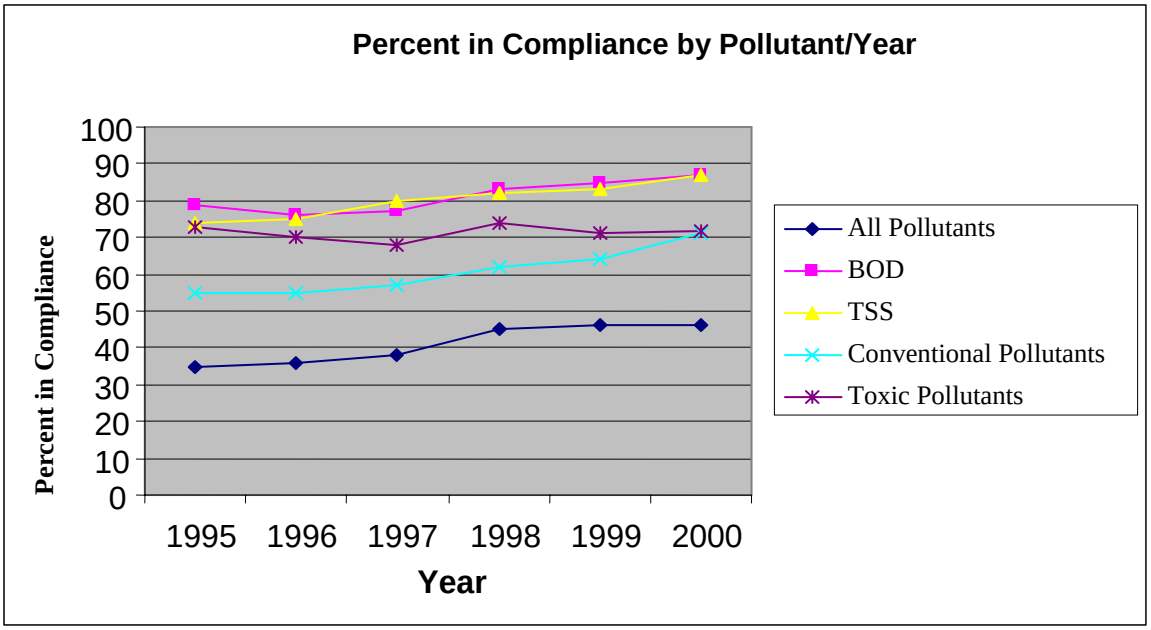

Percent in Compliance by Pollutant/Year
Percent in Compliance
100
90
80
70
60
50
40
30
20
10
0
1995
1996
1997
1998
1999
2000
Year
All Pollutants
BOD
TSS
Conventional Pollutants
Toxic Pollutants

Figure 10

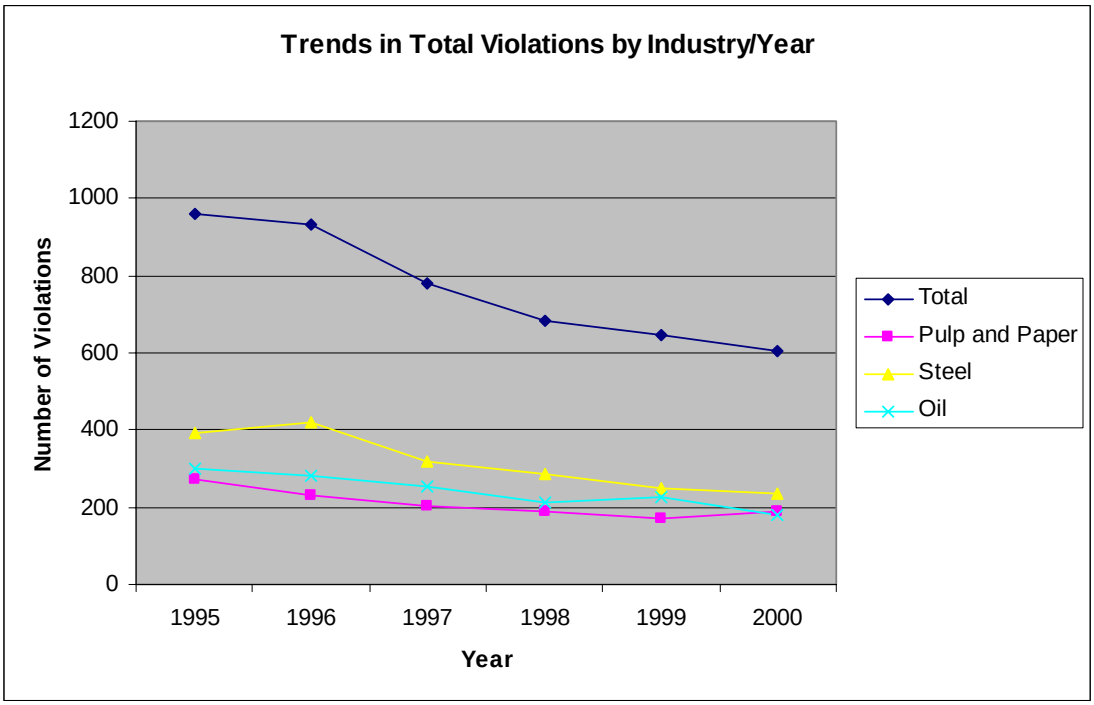

Trends in Total Violations by Industry/Year
Number of Violations
1200
1000
800
600
400
200
0
1995
1996
1997
1998
1999
2000
Year
Total
Pulp and Paper
Steel
Oil

Figure 11

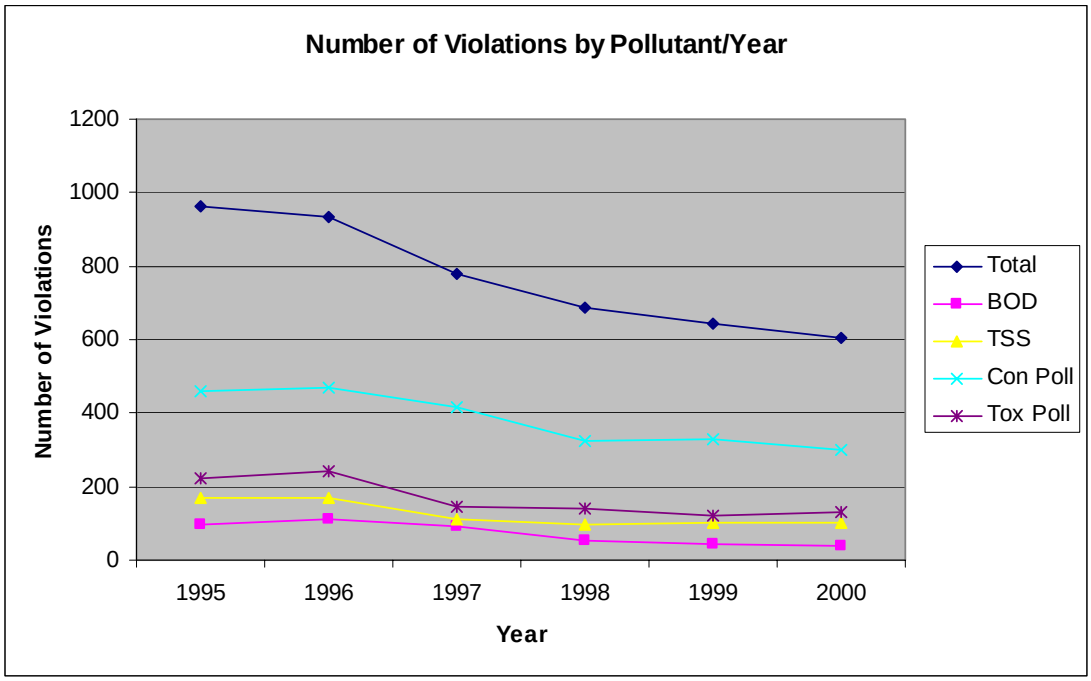

Number of Violations by Pollutant/Year
Number of Violations
1200
1000
800
600
400
200
0
1995
1996
1997
1998
1999
2000
Year
Total
BOD
TSS
Con Poll
Tox Poll

Figure 12

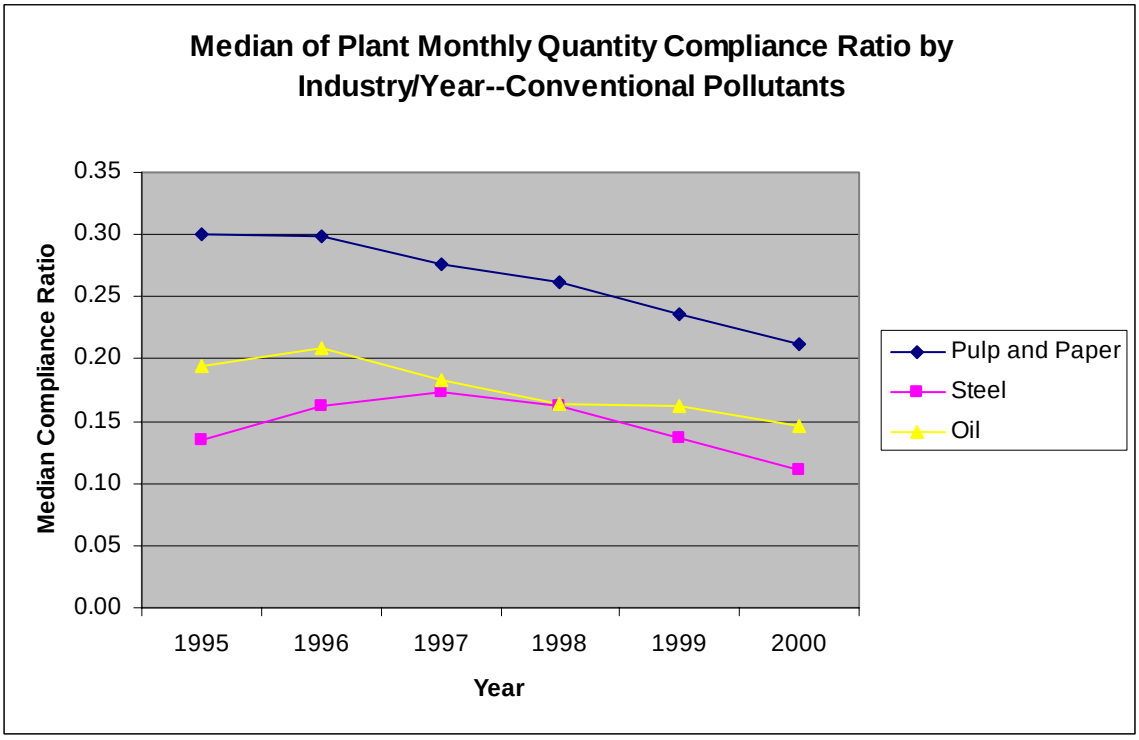

Median of Plant Monthly Quantity Compliance Ratio by Industry/Year--Conventional Pollutants
Median Compliance Ratio
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1995
1996
1997
1998
1999
2000
Year
Pulp and Paper
Steel
Oil

Figure 13

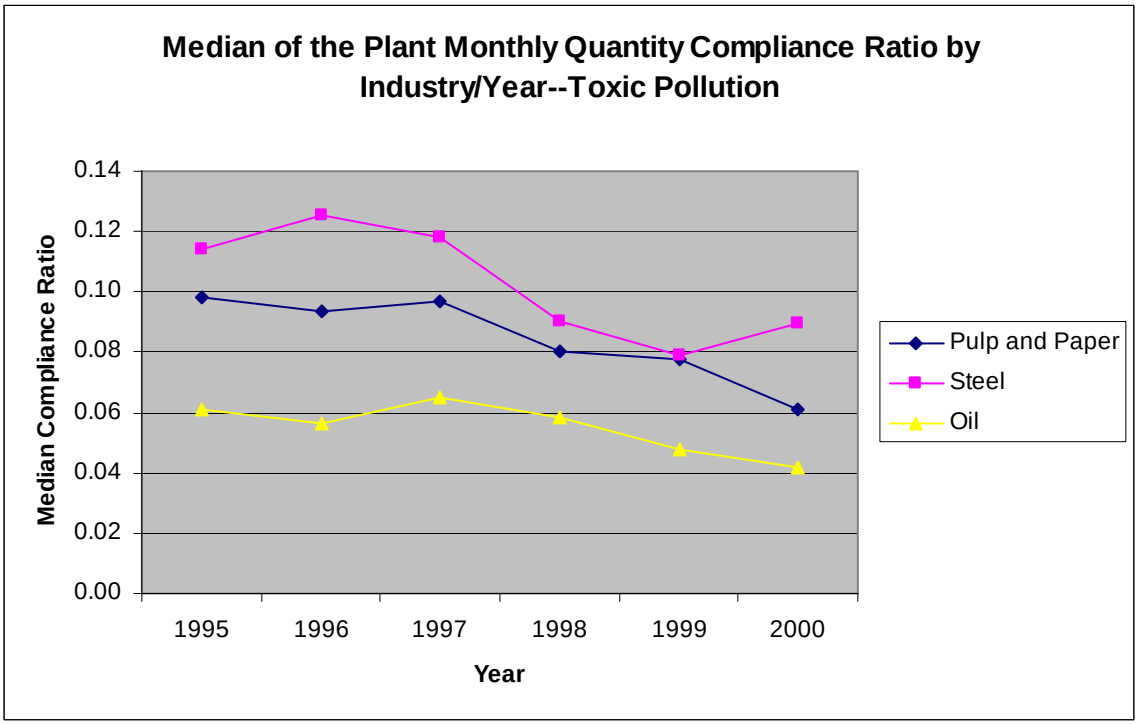

Median of the Plant Monthly Quantity Compliance Ratio by Industry/Year--Toxic Pollution
Median Compliance Ratio
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1995
1996
1997
1998
1999
2000
Year
Pulp and Paper
Steel
Oil

Figure 14

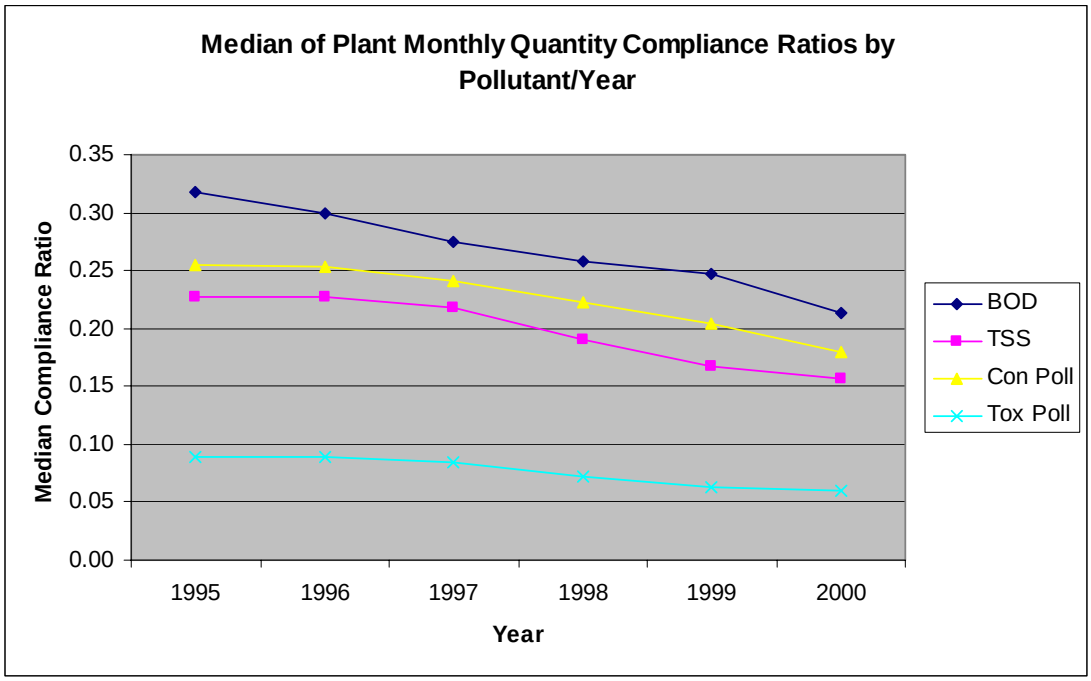

Median of Plant Monthly Quantity Compliance Ratios by Pollutant/Year
Median Compliance Ratio
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1995
1996
1997
1998
1999
2000
Year
BOD
TSS
Con Poll
Tox Poll

Figure 15

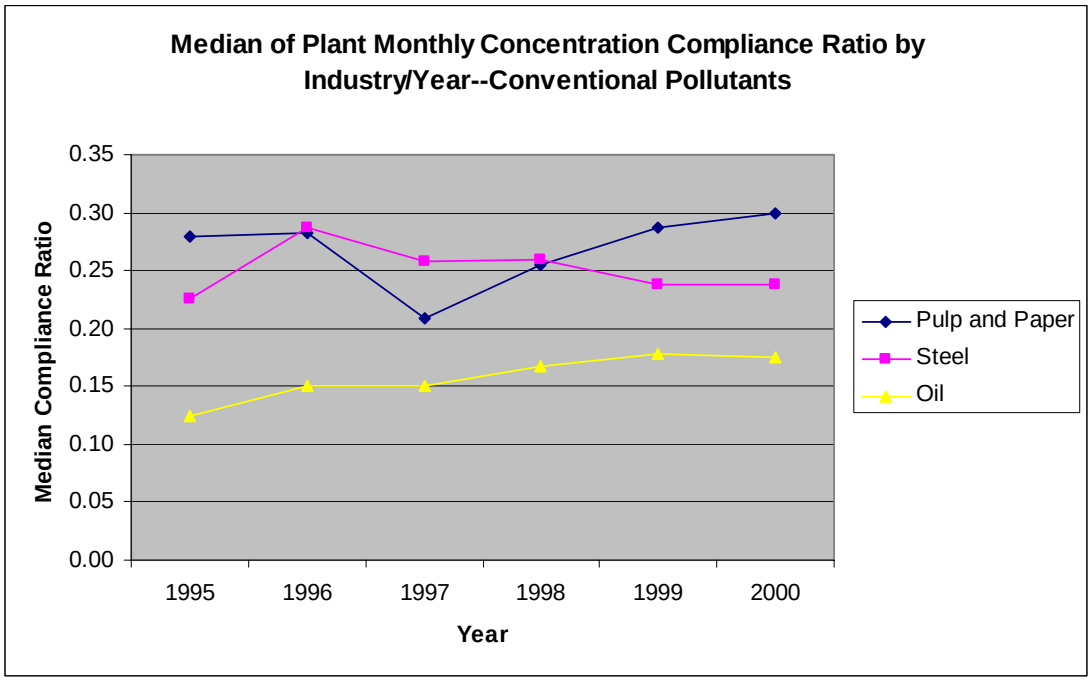

Median of Plant Monthly Concentration Compliance Ratio by Industry/Year--Conventional Pollutants
Median Compliance Ratio
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1995
1996
1997
1998
1999
2000
Year
Pulp and Paper
Steel
Oil

Figure 16

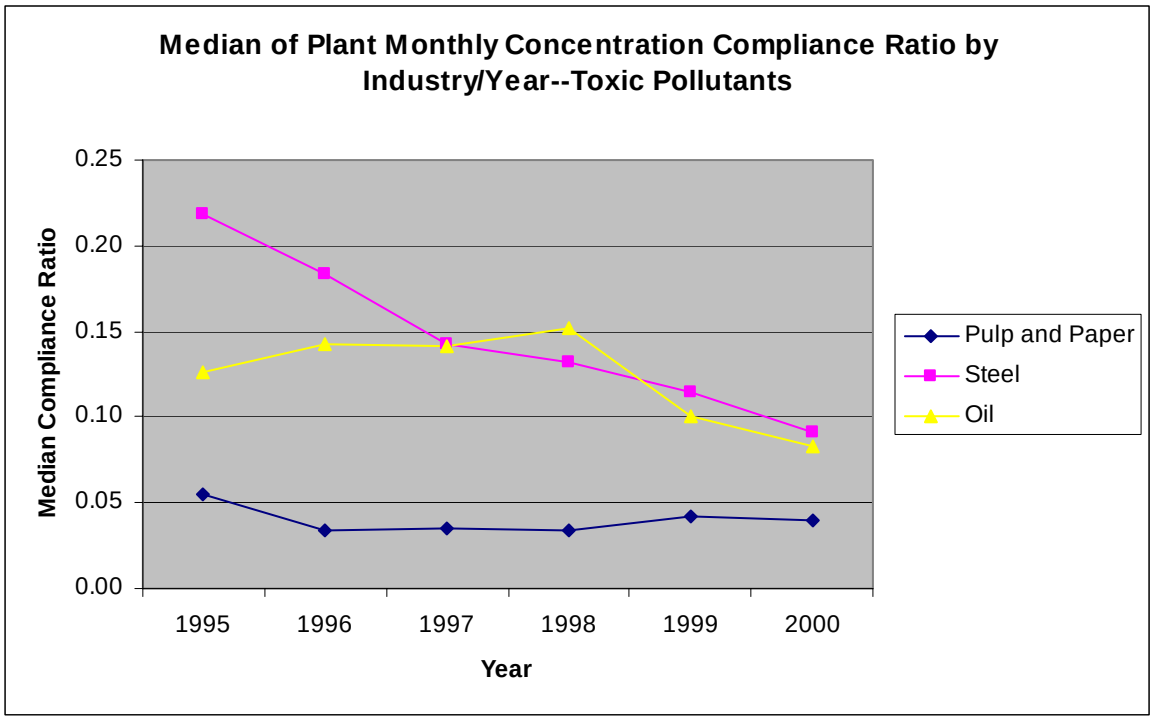

Median of Plant Monthly Concentration Compliance Ratio by Industry/Year--Toxic Pollutants
Median Compliance Ratio
0.25
0.20
0.15
0.10
0.05
0.00
1995
1996
1997
1998
1999
2000
Year
Pulp and Paper
Steel
Oil

Figure 17

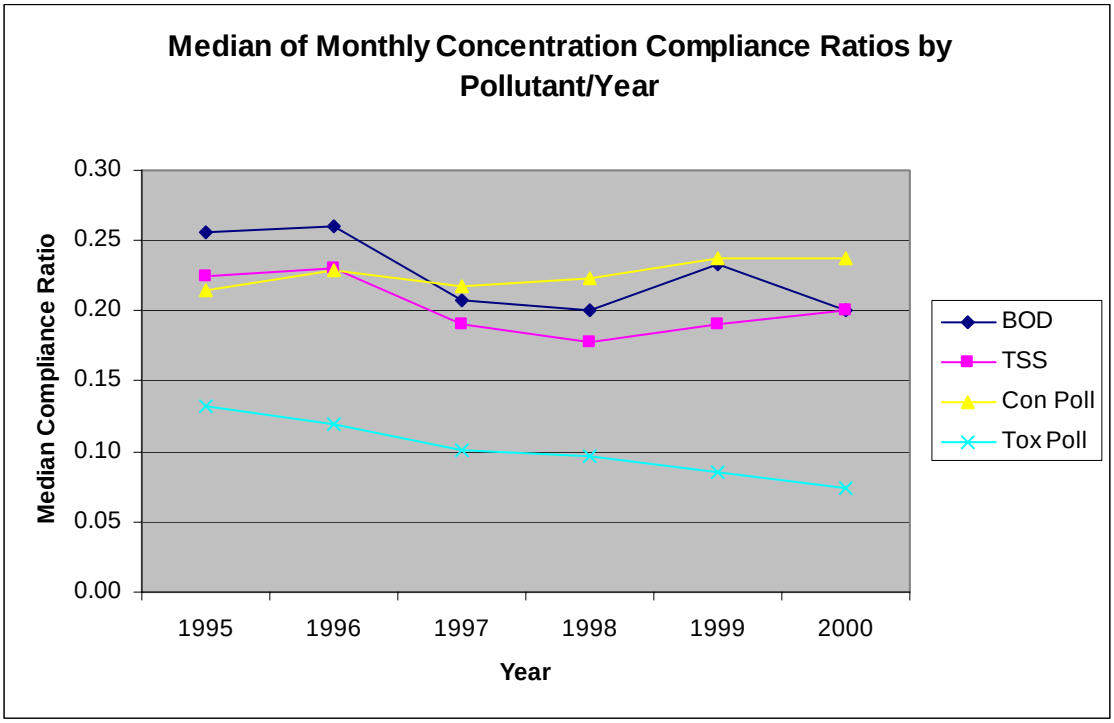

Median of Monthly Concentration Compliance Ratios by Pollutant/Year
Median Compliance Ratio
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1995
1996
1997
1998
1999
2000
Year
BOD
TSS
Con Poll
Tox Poll

Table 8: Average Time Spent in Violation
All Facilities, Pooled Data

	Dichotomous Violation Measure				
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=14,149	n=10,231	n=12,436	n=13,459	n =7,164
mean (std dev)	0.17 (0.38)	0.03 (0.17)	0.04 (0.19)	0.09 (0.29)	0.08 (0.28)
% in compliance	83%	97%	96%	91%	92%
Plant / Quarter	n=4,857	n=3,537	n =4,305	n =4,629	n =2,743
mean (std dev)	0.32 (0.47)	0.07 (0.26)	0.09 (0.28)	0.19 (0.39)	0.15 (0.35)
% in compliance	68%	93%	91%	81%	85%
Plant / Year	n=1,279	n=947	n =1,141	n=1,224	n=770
mean (std dev)	0.59 (0.49)	0.19 (0.39)	0.20 (0.40)	0.39 (0.49)	0.29 (0.45)
% in compliance	41%	81%	80%	61%	71%

Table 9: Average Time Spent in Violation
Pulp and Paper Facilities, Pooled Data

	Dichotomous Violation Measure				
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=8385	n=7352	n=7922	n=8210	n=2241
mean (std dev)	0.12 (0.32)	0.02 (0.15)	0.02 (0.14)	0.04 (0.21)	0.06 (0.23)
% in compliance	88%	98%	98%	96%	94%
Plant / Quarter	n=2874	n=2534	n=2722	n=2818	n=1031
mean (std dev)	0.24 (0.43)	0.06 (0.23)	0.05 (0.22)	0.11 (0.31)	0.08 (0.28)
% in compliance	86%	94%	95%	89%	92%
Plant / Year	n=762	n=680	n=724	n=750	n=313
mean (std dev)	0.48 (0.50)	0.15 (0.36)	0.13 (0.34)	0.27 (0.44)	0.17 (0.38)
% in compliance	52%	85%	87%	73%	83%

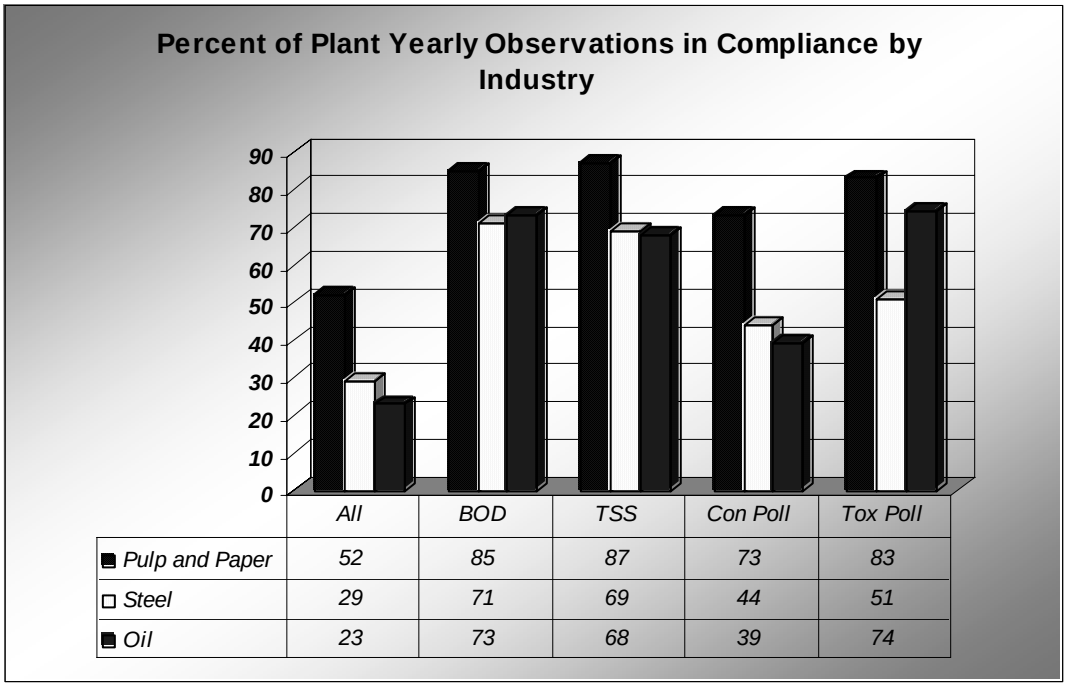
Table 10: Average Time Spent in Violation
Steel Facilities, Pooled Data

	Dichotomous Violation Measure				
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=2629	n=302	n=1978	n=2122	n=2186
mean (std dev)	0.28 (0.45)	0.06 (0.24)	0.07 (0.26)	0.16 (0.37)	0.14 (0.35)
% in compliance	72%	94%	93%	84%	86%
Plant / Quarter	n=900	n=107	n=676	n=729	n=760
mean (std dev)	0.45 (0.50)	0.13 (0.34)	0.15 (0.36)	0.29 (0.46)	0.27 (0.44)
% in compliance	55%	87%	85%	71%	73%
Plant / Year	n=235	n=28	n=175	n=192	n=205
mean (std dev)	0.71 (0.45)	0.29 (0.46)	0.31 (0.46)	0.56 (0.50)	0.49 (0.50)
% in compliance	29%	71%	69%	44%	51%

Table 11: Average Time Spent in Violation
Oil Facilities, Pooled Data

	Dichotomous Violation Measure				
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=3135	n=2577	n=2536	n=3127	n=2737
mean (std dev)	0.24 (0.43)	0.05 (0.21)	0.07 (0.26)	0.16 (0.37)	0.05 (0.23)
% in compliance	76%	95%	93%	84%	95%
Plant / Quarter	n=1083	n=896	n=907	n=1082	n=952
mean (std dev)	0.43 (0.50)	0.11 (0.31)	0.15 (0.36)	0.31 (0.46)	0.12 (0.32)
% in compliance	57%	89%	85%	69%	88%
Plant / Year	n=282	n=239	n=242	n=282	n=252
mean (std dev)	0.77 (0.42)	0.28 (0.45)	0.32 (0.47)	0.61 (0.49)	0.26 (0.44)
% in compliance	23%	73%	68%	39%	74%

Figure 18



	All	BOD	TSS	Con Poll	Tox Poll
Pulp and Paper	52	85	87	73	83
Steel	29	71	69	44	51
Oil	23	73	68	39	74

Table 12: Average Number of Violations (Among Violators)
Pulp and Paper Facilities, Pooled Data

	Number of Violations				
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=987 1.27 (0.72)	n=163 1.19 (0.39)	n=163 1.15 (0.36)	n=365 1.32 (0.78)	n=124 1.18 (0.54)
Plant / Quarter	n=704 1.78 (1.44)	n=140 1.39 (0.80)	n=140 1.34 (0.70)	n=302 1.60 (1.28)	n=85 1.72 (1.03)
Plant / Year	n=369 3.39 (3.50)	n=105 1.85 (1.49)	n=97 1.94 (1.73)	n=200 2.42 (2.84)	n=54 2.70 (2.69)

Table 13: Average Number of Violations (Among Violators)
Steel Facilities, Pooled Data

	Number of Violations				
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=723 2.63 (2.59)	n=19 1.26 (0.73)	n=143 2.04 (1.51)	n=348 2.51 (2.18)	n=150 1.45 (0.68)
Plant / Quarter	n=402 4.72 (5.92)	n=14 1.71 (0.83)	n=104 2.87 (2.94)	n=215 4.07 (4.75)	n=203 3.15 (3.27)
Plant / Year	n=167 11.37 (17.48)	n=8 3.00 (2.51)	n=54 5.52 (7.07)	n=107 8.17 (12.87)	n=101 6.33 (8.88)

Table 14: Average Number of Violations (Among Violators)
Oil Facilities, Pooled Data

	Number of Violations				
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=750 1.95 (1.50)	n=127 1.70 (0.88)	n=179 1.45 (0.72	n=500 1.88 (1.38)	n=592 1.69 (1.26)
Plant / Quarter	n=464 3.14 (2.91)	n=100 2.16 (1.25)	n=134 1.97 (1.89)	n=340 2.77 (2.50)	n=113 1.92 (1.51)
Plant / Year	n=217 6.72 (7.99)	n=66 3.27 (3.98)	n=77 3.38 (3.29)	n=171 5.50 (6.33)	n=66 3.29 (4.26)

Figure 19

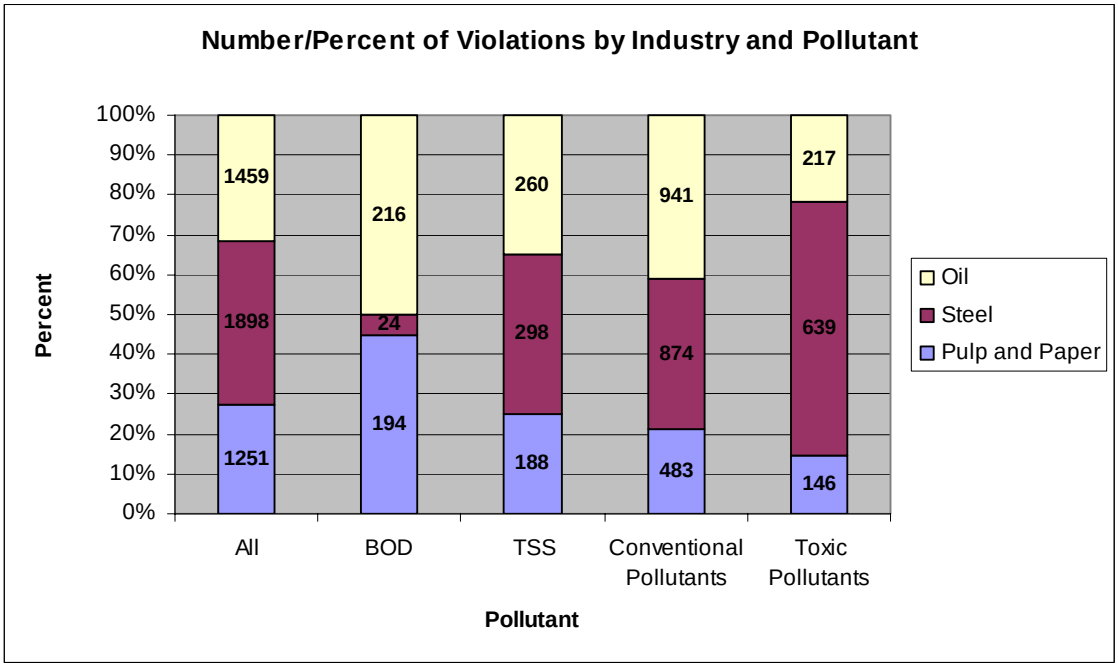

Number/Percent of Violations by Industry and Pollutant
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent
1459
1898
1251
216
24
194
260
298
188
941
874
483
217
639
146
All
BOD
TSS
Conventional Pollutants
Toxic Pollutants
Pollutant
Oil
Steel
Pulp and Paper

Table 15: Range of Violations, All Facilities

Range of Violations					
Unit of Analysis / Time	All	BOD	TSS	Con Poll	Tox Poll
Plant / Month	n=2460 1.87 (1.78) 1 – 20	n=309 1.40 (0.70) 1 – 4	n=488 1.53 (1.02) 1 – 9	n=1213 1.89 (1.59) 1 – 16	n=592 1.69 (1.26) 1 – 11
Plant / Quarter	n=1570 2.94 (3.72) 1 – 55	n=254 1.71 (1.25) 1 – 8	n=378 1.97 (1.89) 1 – 20	n=857 2.68 (3.10) 1 – 40	n=401 2.50 (2.59) 1 – 20
Plant / Year	n=753 6.12 (10.08) 1 – 106	n=179 2.42 (2.79) 1 – 26	n=228 2.27 (4.30) 1 – 33	n=478 4.81 (7.72) 1 – 73	n=221 4.53 (6.76) 1 – 48

Table 16: Median of the Monthly Compliance Ratios
Full and Industry Specific, Pooled Data

	Median of Logged Compliance Ratio			
	BOD	TSS	Con Poll	Tox Poll
Total Sample				
Conc	0.23	0.20	0.22	0.10
Quantity	0.27	0.20	0.22	0.08
Pulp & Paper				
Conc	0.27	0.24	0.27	0.04
Quantity	0.29	0.22	0.26	0.09
Steel				
Conc	0.15	0.20	0.25	0.15
Quantity	0.21	0.10	0.14	0.10
Oil				
Conc	0.20	0.16	0.16	0.12
Quantity	0.19	0.22	0.17	0.06

Figure 20

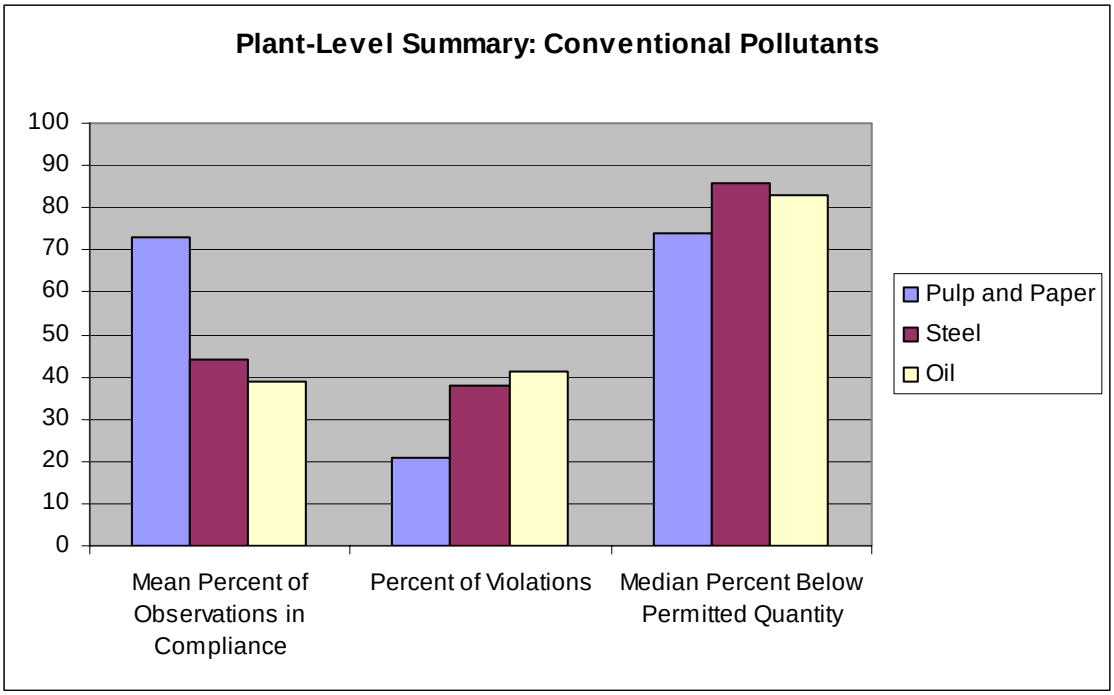

Plant-Level Summary: Conventional Pollutants
100
90
80
70
60
50
40
30
20
10
0
Mean Percent of Observations in Compliance
Percent of Violations
Median Percent Below Permitted Quantity
Pulp and Paper
Steel
Oil

Figure 21

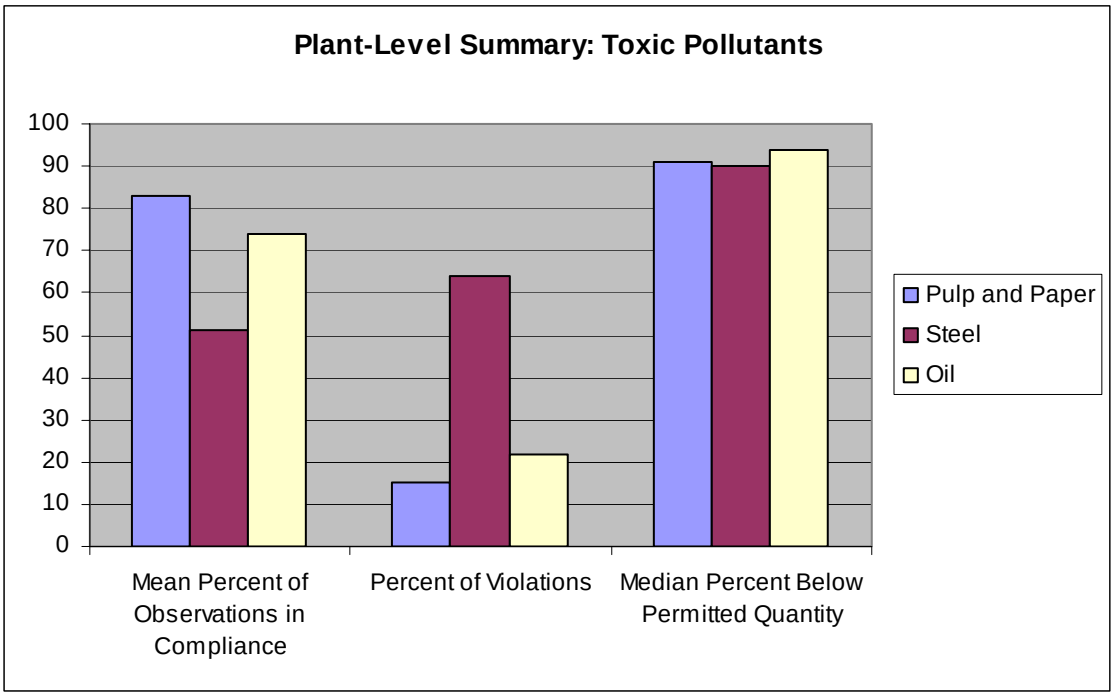

Plant-Level Summary: Toxic Pollutants
100
90
80
70
60
50
40
30
20
10
0
Mean Percent of Observations in Compliance
Percent of Violations
Median Percent Below Permitted Quantity
Pulp and Paper
Steel
Oil

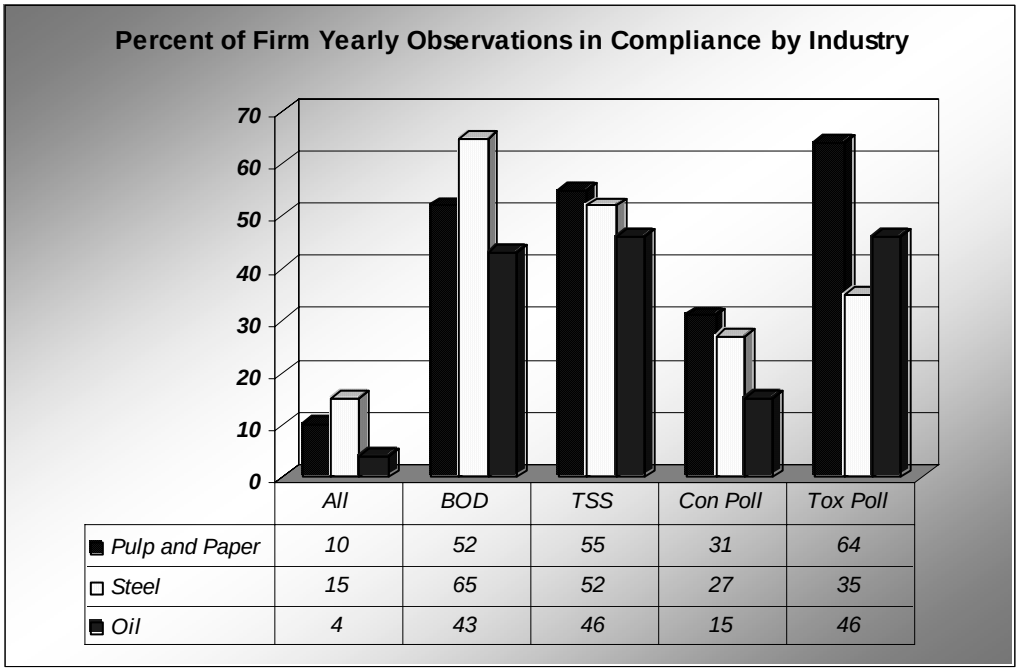
Table 17A: Firm Average Time Spent in Violation
Total and Industry Specific, Pooled Data

	Dichotomous Violation Measure				
	All	BOD	TSS	Con Poll	Tox Poll
All Companies: Firm / Year	n=377	n=277	n=358	n=367	n=335
mean (std dev)	0.91 (0.29)	0.50 (0.50)	0.49 (0.50)	0.75 (0.44)	0.50 (0.50)
% in compliance	9%	50%	51%	25%	50%
Pulp & Paper Industry: Firm/Year	n=167	n=155	n=167	n=167	n=135
mean (std dev)	0.90 (0.30)	0.48 (0.50)	0.45 (0.50)	0.69 (0.46)	0.36 (0.48)
% in compliance	10%	52%	55%	31%	64%
Steel Industry: Firm/Year	n=102	n=23	n=92	n=92	n=98
mean (std dev)	0.85 (0.36)	0.35 (0.49)	0.48 (0.50)	0.73 (0.45)	0.65 (48)
% in compliance	15%	65%	52%	27%	35%
Oil Industry: Firm/Year	n=105	n=96	n=96	n=105	n=99
mean (std dev)	0.96 (0.19)	0.57 (0.50)	0.54 (0.50)	0.85 (0.36)	0.54 (0.50)
% in compliance	4%	43%	46%	15%	46%

Table 17B: Firm One Way Analysis of Variance
Dichotomous Violation Measure

Dichotomous Violation Measure					
	All	BOD	TSS	Con Poll	Tox Poll
Between SS	13.33 df=72	28.48 df=58	39.48 df=70	31.12 df=71	41.58 df=68
Within SS	18.40 df=301	40.02 df=215	49.15 df=284	38.12 df=292	41.42 df=263
Total SS	31.73 df=373	68.50 df=273	88.63 df=354	69.24 df=363	83.00 df=331
F	3.03**	2.64**	3.26**	3.59**	3.88**

Figure 22



	All	BOD	TSS	Con Poll	Tox Poll
Pulp and Paper	10	52	55	31	64
Steel	15	65	52	27	35
Oil	4	43	46	15	46

Table 18A: Firm Average Number of Violations (Among Violators)
Total and Industry Specific, Pooled Data

	Number of Violations				
	All	BOD	TSS	Con Poll	Tox Poll
All Companies: Firm / Year	n=339 13.55 (16.47) 1 – 106	n=137 3.16 (3.28) 1 – 27	n=171 4.34 (5.02) 1 – 33	n=271 8.44 (10.88) 1 – 73	n=166 6.02 (8.37) 1 – 48
Pulp & Paper Industry: Firm / Year	n=151 8.28 (6.98)	n=74 2.62 (2.10)	n=75 2.51 (2.12)	n=115 4.20 (4.05)	n=49 2.98 (2.79)
Steel Industry: Firm / Year	n=87 21.82 (25.09)	n=8 3.00 (2.51)	n=44 6.77 (7.67)	n=67 13.04 (15.63)	n=64 9.98 (11.52)
Oil Industry: Firm / Year	n=101 14.32 (14.15)	n=55 3.91 (4.40)	n=52 4.92 (4.19)	n=89 10.46 (10.74)	n=53 4.06 (4.77)

Table 18B: Firm One Way Analysis of Variance
Number of Violations

Number of Violations					
	All	BOD	TSS	Con Poll	Tox Poll
Between SS	62623.374 df=71	691.50 df=48	2455.19 df=55	19672.85 df=69	7106.27 df=52
Within SS	29034.37 df=267	770.97 df=88	1831.13 df=115	12310.02 df=201	4465.63 df=113
Total SS	91657.74 df=338	1462.47 df=136	4286.33 df=170	31982.86 df=270	11571.90 df=165
F	8.11**	1.64*	2.80**	4.66**	3.46**

Table 19A: Firm Median of the Monthly Compliance Ratios
Total and Industry Samples

	Median of Logged Monthly Compliance Ratio			
	BOD	TSS	Con Poll	Tox Poll
Total Sample				
Conc	0.25	0.25	0.25	0.11
Quantity	0.32	0.23	0.26	0.09
Pulp & Paper				
Conc	0.27	0.26	0.25	0.05
Quantity	0.39	0.27	0.31	0.10
Steel				
Conc	0.19	0.28	0.27	0.19
Quantity	0.30	0.14	0.20	0.18
Oil				
Conc	0.24	0.18	0.22	0.09
Quantity	0.24	0.26	0.22	0.06

Table 19B: Firm One Way Analysis of Variance
Median Quantity Compliance Ratio

	Median Quantity Compliance Ratio			
	BOD	TSS	Con Poll	Tox Poll
Between SS	87.54 df=46	162.79 df=63	124.77 df=66	250.17 df=45
Within SS	20.15 df=164	33.93 df=234	36.29 df=256	51.26 df=153
Total SS	107.69 df=210	196.72 df=297	161.06 df=322	301.44 df=198
F	15.49**	17.82**	13.34**	16.59**

Table 19C: Firm One Way Analysis of Variance
Median Concentration Compliance Ratio

Median Concentration Compliance Ratio				
	BOD	TSS	Con Poll	Tox Poll
Between SS	37.24 df=29	85.52 df=46	113.39 df=53	293.85 df=43
Within SS	14.51 df=90	26.77 df=161	30.58 df=202	116.97 df=137
Total SS	51.75 df=119	112.28 df=207	143.98 df=255	410.82 df=180
F	7.96**	11.18**	14.13**	8.00**

Table 20: Firm-Level (One Observation per Firm) Mean Differences, Program Participation and Dichotomous Violation Measure

	Dichotomous Violation Measure				
	All	BOD	TSS	Con Poll	Tox Poll
TRI 33/50					
0	0.89 n=22	0.43 n=19	0.37 n=21	0.68 n=22	0.50 n=21
1	0.92 n=43	0.58 n=32	0.55 n=42	0.79 n=42	0.48 n=40
	p=0.61	p=0.14	p=0.06	p=0.16	p=0.81
Wastewise					
0	0.90 n=56	0.51 n=46	0.46 n=54	0.74 n=55	0.47 n=52
1	0.96 n=15	0.49 n=11	0.52 n=15	0.77 n=15	0.48 n=15
	p=0.10	p=0.87	p=0.59	p=0.68	p=0.96

Table 21: Full Sample (Pooled) Bivariate Probit Regression, Program Participation and Dichotomous Violation Measure[#]

	Dichotomous Violation Measure				
Independent Variable	All	BOD	TSS	Con Poll	Tox Poll
Model A	n=344	n=244	n=325	n=334	n=302
TRI 33/50	0.15 (0.29)	0.44 (0.25)+	0.45 (0.22)*	0.41 (0.23)+	-0.09 (0.23)
Model B	n=368	n=268	n=349	n=358	n=326
Wastewise	0.71 (0.33)*	0.03 (0.26)	0.03 (0.24)	0.12 (0.27)	0.11 (0.29)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 22: Firm-Level (One Observation per Firm) Pearson's Correlation, KLD Citizenship and Dichotomous Violation Measure

	Dichotomous Violation Measure				
	ALL	BOD	TSS	Con Poll	Tox Poll
KLD Rank	-0.12 38	-0.00 34	-0.14 38	-0.04 38	-0.14 35
KLD Rank (no replace)	-0.16 34	-0.03 30	-0.05 34	-0.08 34	-0.07 31

Table 23: Full Sample (Pooled) Bivariate Pooled Probit Regression, KLD Citizenship and Dichotomous Violation Measure[#]

	Dichotomous Violation Measure				
Independent Variable	ALL	BOD	TSS	Con Poll	Tox Poll
Model A	n=140	n=114	n=140	n=140	n=126
KLD Rank	0.01 (0.07)	0.06 (0.06)	-0.01 (0.08)	0.01 (0.08)	-0.05 (0.06)
Model B	n=126	n=100	n=126	n=126	n=112
KLD Rank (no replace)	-0.01 (0.08)	0.08 (0.08)	-0.00 (0.09)	0.01 (0.08)	-0.06 (0.07)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 24: Full Sample (Pooled) Mean Differences, Program Participation and Number of Violations (Among Violators)

	Average Number of Violations				
	All	BOD	TSS	Con Poll	Toxic Poll
TRI 33/50					
0	9.64 n=106	2.26 n=38	4.70 n=41	7.85 n=79	3.22 n=55
1	15.83	3.59 n=87	4.37 n=117	8.89 n=170	8.18 n=96
	p=0.06	p=0.06	p=0.78	p=0.68	p=0.01
Wastewise					
0	12.68 n=261	3.20 n=110	3.98 n=130	7.93 n=208	5.65 n=122
1	15.93 n=72	2.96 n=24	5.67 n=36	9.40 n=57	7.51 n=39
	p=0.58	p=0.75	p=0.51	p=0.72	p=0.61

Table 25: Full Sample (Pooled) Bivariate OLS Pooled Regression, Program Participation and Number of Violations (Among Violators)[#]

Number of Violations					
Independent Variable	All	BOD	TSS	Con Poll	Tox Poll
Model A	n=310	n=125	n=158	n=249	n=151
TRI 33/50	6.19 (3.21)+	1.32 (0.68)+	-0.34 (1.23)	1.04 (2.52)	4.96 (1.83)**
Model B	n=333	n=134	n=166	n=265	n=161
Wastewise	3.25 (5.78)	-0.24 (0.77)	1.69 (2.57)	1.47 (4.02)	1.87 (3.67)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 26: Full Sample (Pooled) Pearson's Correlation, KLD Citizenship and Number of Violations (Among Violators)

	Number of Violations				
	All	BOD	TSS	Con Poll	Tox Poll
KLD rating	-0.04 162	0.20 80	0.11 97	0.00 136	-0.17+ 75
KLD rating (No Replace)	-0.03 144	0.20 71	0.10 89	0.01 120	-0.19 66

Table 27: Full Sample (Pooled) Bivariate OLS Pooled Regression, KLD Citizenship and Number of Violations (Among Violators)[#]

	Number of Violations				
Independent Variables	All	BOD	TSS	Con Poll	Tox Poll
Model A	n=133	n=60	n=76	n=110	n=60
KLD Rank	-0.09 (0.64)	0.23 (0.14)	0.33 (0.30)	0.14 (0.43)	-0.82 (0.45)+
Model B	n=120	n=55	n=70	n=97	n=55
KLD Rank (no rep)	-0.09 (0.73)	0.17 (0.17)	0.26 (0.35)	0.08 (0.51)	-0.93 (0.56)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 28: Program Participation and the Number and Percent of Violations Over Study Period[#]

TRI 33/50 Participation				
	# of violations		% of violations	
	"Bad" Citizen	"Good" Citizen	"Bad" Citizen	"Good" Citizen
All	1022	3242	22%	70%
BOD	86	313	20%	72%
TSS	193	515	26%	69%
Con Poll	620	1521	27%	66%
Tox Poll	177	787	18%	79%
Wastewise Participation				
	# of violations		% of violations	
	"Bad" Citizen	"Good" Citizen	"Bad" Citizen	"Good" Citizen
All	3310	1160	72%	25%
BOD	352	72	81%	17%
TSS	517	208	69%	28%
Con Poll	1650	546	72%	24%
Tox Poll	689	295	69%	29%

[#]These percentages do not sum to 100 percent because they are calculated based on the total violations. Firms that were ineligible for participation in these programs account for the remaining percent of the total violations.

Table 29: KLD Social Ratings Data and the Number and Percent of Violations Over Study Period[#]

KLD Social Ratings Data				
	# of violations		% of violations	
	"Bad" Citizen	"Good" Citizen	"Bad" Citizen	"Good" Citizen
All	1470	817	32%	18%
BOD	140	132	32%	30%
TSS	227	148	30%	20%
Con Poll	744	425	32%	18%
Tox Poll	313	94	31%	9%
KLD Social Ratings Data (no replacements)				
	# of violations		% of violations	
	"Bad" Citizen	"Good" Citizen	"Bad" Citizen	"Good" Citizen
All	1293	787	28%	17%
BOD	123	124	28%	29%
TSS	196	141	26%	19%
Con Poll	619	400	27%	17%
Tox Poll	287	93	29%	9%

[#]The percentages do not sum to 100 percent because they are calculated based on the total violations. Firms that were not ranked in the KLD data account for the remaining percent of the total violations.

Table 30: Full Sample (Pooled) Mean Differences, Program Participation and Quantity Compliance Ratio

Median of Logged Quantity Compliance Ratio				
	BOD	TSS	Con Poll	Tox Poll
TRI 33_50				
0	-1.57 n=55	-1.67 n=74	-1.55 n=90	-2.96 n=50
1	-1.23 n=127	-1.64 n=195	-1.54 n=204	-2.34 n=139
	p=0.24	p=0.91	p=0.96	p=0.17
Wastewise				
0	-1.35 n=168	-1.73 n=228	-1.55 n=248	-2.42 n=140
1	-1.06 n=38	-1.35 n=65	-1.41 n=70	-2.68 n=54
	p=0.07	p=0.13	p=0.44	p=0.59

Table 31: Full Sample (Pooled) Bivariate OLS Pooled Regression, Program Participation and Quantity Compliance Ratio[#]

	Median of Logged Quantity Compliance Ratio			
Independent Variables	BOD	TSS	Con Poll	Tox Poll
Model A	n=182	n=269	n=294	n=189
TRI 33/50	0.34 (0.29)	0.03 (0.26)	0.01 (0.19)	0.62 (0.45)
Model B	n=206	n=293	n=318	n=194
Wastewise	0.29 (0.16)+	0.38 (0.25)	0.14 (0.18)	-0.26 (0.48)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 32: Full Sample (Pooled) Mean Differences, Program Participation and Concentration Compliance Ratio

Median of Logged Concentration Compliance Ratio				
	BOD	TSS	Con Poll	Tox Poll
TRI 33_50				
0	-1.39 n=40	-1.51 n=59	-1.49 n=62	-2.66 n=46
1	-1.71 n=71	-1.56 n=133	-1.59 n=171	-2.25 n=120
	p=0.16	p=0.83	p=0.65	p=0.41
Wastewise				
0	-1.61 n=95	-1.53 n=155	-1.53 n=196	-2.51 n=138
1	-1.46 n=21	-1.62 n=48	-1.62 n=55	-2.07 n=38
	p=0.35	p=0.72	p=0.73	p=0.39

Table 33: Full Sample (Pooled) Bivariate OLS Pooled Regression, Program Participation and Concentration Compliance Ratio[#]

Median of Logged Concentration Compliance Ratio				
Independent Variables	BOD	TSS	Con Poll	Tox Poll
Model A	n=111	n=192	n=233	n=166
TRI 33/50	-0.32 (0.22)	-0.05 (0.23)	-0.10 (0.22)	0.41 (0.49)
Model B	n=116	n=203	n=251	n=176
Wastewise	0.15 (0.16)	-0.10 (0.27)	-0.09 (0.26)	0.44 (0.51)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 34: Full Sample (Pooled) Pearson's Correlation, KLD Citizenship and Quantity Compliance Ratio

	Median of Logged Quantity Compliance Ratio			
	BOD	TSS	Con Poll	Tox Poll
KLD Rating	-0.27 115	-0.11 142	-0.16 154	-0.30 104
KLD Rating (No Replace)	-0.22 103	-0.12 130	-0.17# 142	-0.31 92

Table 35: Full Sample (Pooled) Bivariate OLS Pooled Regression, KLD Citizenship and Quantity Compliance Ratio[#]

Median of Logged Quantity Compliance Ratio				
	BOD	TSS	Con Poll	Tox Poll
Model A	n=90	n=114	n=125	n=84
KLD Rank	-0.09 (0.07)	-0.06 (0.04)	-0.05 (0.03)	-0.16 (0.12)
Model B	n=82	n=106	n=117	n=76
KLD Rank (no replace)	-0.09 (0.08)	-0.07 (0.04)	-0.06 (0.03)+	-0.19 (0.15)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time. The association between the first KLD measure and toxic pollution is significant (p=0.09) when contemporaneous measures are used.

Table 36: Full Sample (Pooled) Pearson's Correlations, KLD Citizenship and Concentration Compliance Ratio

	Median of Logged Concentration Compliance Ratio			
	BOD	TSS	Con Poll	Tox Poll
KLD Rating	-0.16 68	0.05 109	-0.26 139	-0.14 95
KLD Rating (No Replace)	-0.23 59	0.06 101	-0.21 126	-0.16 85

Table 37: Full Sample (Pooled) Bivariate OLS Pooled Regression, KLD Citizenship and Concentration Compliance Ratio[#]

Median of Logged Concentration Compliance Ratio				
	BOD	TSS	Con Poll	Tox Poll
Model A	n=55	n=89	n=114	n=75
KLD Rank	-0.07 (0.06)	-0.00 (0.05)	-0.09 (0.07)	-0.15 (0.10)
Model B	n=59	n=101	n=126	n=85
KLD Rank (no replace)	-0.06 (0.06)	0.02 (0.06)	-0.08 (0.08)	-0.10 (0.10)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 38: Firm-Level (One Observation per Firm) Pearson's Correlations, Firm Characteristics and Dichotomous Violation Measure

	Dichotomous Violation Measure				
	All	BOD	TSS	Con Poll	Tox Poll
TSE	0.14 71	0.14 57	0.08 69	0.22+ 70	-0.19 67
Return on assets	0.21+ 70	-0.02 56	-0.08 68	-0.14 69	-0.07 66
Return on sales	0.15 68	0.04 54	0.08 66	0.05 67	0.14 66
Liquidity	-0.22+ 71	-0.25+ 57	-0.21+ 69	-0.39** 70	0.15+ 67
# of employees	0.18 67	0.25+ 56	0.18 65	0.21+ 66	-0.13 67
# of facilities	0.23* 73	0.23+ 59	0.23* 71	0.21+ 72	-0.03 69

Table 39: Full Sample (Pooled) Pearson's Correlations, Firm Characteristics and Number of Violations[#]

	Number of Violations				
	All	BOD	TSS	Con Poll	Tox Poll
TSE	-0.06 320	-0.04 132	-0.07 164	-0.06 258	-0.13+ 160
Return on assets	-0.04 315	-0.07 131	-0.07 163	-0.02 257	-0.09 159
Return on sales	0.03 306	0.41** 123	0.22* 154	0.21** 248	-0.13+ 154
Liquidity	0.10 315	0.11 128	0.23 158	0.09 253	0.25 159
# of employees	-0.03 298	0.10 118	-0.15+ 148	-0.08 237	-0.10 152
# of facilities owned	0.02 339	0.07 137	-0.18+ 171	-0.07 271	-0.12 166

[#]This table presents correlation coefficients. However, the significance levels are taken from bivariate regression models in which the STATA cluster command was used to adjust the standard errors for the dependence of observations over time.

Table 40: Full Sample (Pooled) Pearson's Correlations, Firm Characteristics and Quantity Compliance Ratio[#]

	Median of Logged Quantity Compliance Ratio			
	BOD	TSS	Con Poll	Tox Poll
TSE	0.11 201	0.02 281	0.03 306	-0.03 186
Return on Assets	-0.13 199	0.04 273	0.01 298	-0.10 184
Return on Sales	-0.32* 190	0.00 269	-0.1 291	-0.32** 181
Liquidity	0.09 196	-0.08 275	-0.05 300	0.16 184
# of employees	0.18* 184	0.17* 265	0.17** 289	-0.00 177
# of facilities owned	0.15 211	0.16+ 298	0.17* 323	-0.04 199
Variability	-0.41** 210	-0.28** 293	-0.30** 319	-0.23+ 194

[#]This table presents correlation coefficients. However, the significance levels are taken from bivariate regression models in which the STATA cluster command was used to adjust the standard errors for the dependence of observations over time.

Table 41: Full Sample (Pooled) Pearson's Correlations, Firm Characteristics and Concentration Compliance Ratio[#]

	Median of Logged Concentration Compliance Ratio			
	BOD	TSS	Con Poll	Tox Poll
TSE	0.05 115	0.08 193	-0.07 239	-0.02 161
Return on Assets	0.05 113	-0.01 192	-0.08 234	-0.02 161
Return on Sales	0.11 106	-0.02 185	-0.03 226	0.06 167
Liquidity	0.13 113	0.19+ 192	0.08 235	0.08 167
# of employees	-0.08 110	-0.18 188	-0.12 225	0.09 164
# of facilities owned	-0.05 120	-0.15 208	0.08 256	0.07 181
Variability	-0.31* 118	-0.31** 202	-0.33** 250	0.15+ 177

[#]This table presents correlation coefficients. However, the significance levels are taken from bivariate regression models in which the STATA cluster command was used to adjust the standard errors for the dependence of observations over time.

Table 42: Firm-Level (Pooled) Partial Correlations, TRI33/50 Participation and Dichotomous Violation Measure

	Dichotomous Violation Measure		
	BOD	TSS	Con Poll
TRI 33_50	0.09 40	0.18 52	0.08 53
Controlling for return on sales, employees, and industry			

Table 43: Firm-Level Partial Correlation, Wastewise Participation and Dichotomous Violation Measure

	Dichotomous Violation Measure
	All
Wastewise	0.11 59
Controlling for return on sales, employees, and industry	

Table 44: Full Sample (Pooled) Multivariate OLS Regression, Program Participation and Number of Violations[#]

	Number of Violations		
Independent Variables	All n=225	BOD n=85	Toxic n=112
TRI 33/50	5.00 (3.39)	0.93 (0.61)	3.90 (1.68)*
Return on sales	1.28 (1.92)	2.04 (0.67)**	0.73 (0.77)
# of employees	0.00 (0.00)	0.00 (0.00)*	-0.00 (0.00)
Pulp and paper company	-4.80 (2.99)	-0.12 (0.77)	1.36 (1.32)
Steel company	9.75 (5.27)+	0.18 (0.95)	5.44 (2.23)*

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 45: Full Sample (Pooled) Multivariate OLS Regression, KLD Citizenship and Number of Violations[#]

	Number of Violations
Independent Variables	Toxic n=52
KLD Citizenship	-0.67 (0.46)
Return on sales	-0.83 (2.18)
# of employees	0.00 (0.00)
Pulp & paper company	1.78 (1.42)
Steel company	4.05 (1.76)*

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 46: Full Sample (Pooled) Multivariate OLS Regression, Program Participation and Quantity Compliance Ratio[#]

	Median of Logged Quantity Compliance Ratio
Independent Variables	BOD n=148
Wastewise	0.06 (0.16)
Return on sales	-0.05 (0.20)
# of employees	2.04 e-06 (3.63 e-06)
Pulp & Paper	0.19 (0.23)
Steel	0.56 (0.16)**
Variability	-1.09 (0.26)**

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 47: Full Sample (Pooled) Multivariate OLS Regression, KLD Citizenship and Quantity Compliance Ratio[#]

	Median of Logged Quantity Compliance Ratio	
Independent Variables	Con Poll n=75	Tox Poll n=77
KLD Rank	--------	-0.15 (0.11)
KLD Rank (no replacement)	-0.06 (0.02)**	--------
Return on sales	-0.17 (0.22)	-0.79 (0.69)
# of employees	4.28 e-06 (1.41 e-06)**	5.32 e-06 (7.29 e-06)
Pulp & Paper	0.11 (0.21)	0.10 (0.40)
Steel	-0.04 (0.18)	-0.06 (0.73)
Variability	-0.51 (0.14)**	-0.61 (0.42)

[#]The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 48: Full Sample (Pooled) Pearson's Correlations, Sanctions and Environmental Performance[#]

	Number of Violations	Quantity Compliance Ratio		Concentration Compliance Ratio	
	All	Con Poll	Tox Poll	Con Poll	Tox Poll
Total Sanctions	0.14** 1006	0.03 1237	-0.05 723	0.03 935	-0.06 660
Informal Sanctions	0.14** 1001	0.03 1237	-0.03 723	0.03 935	-0.04 660
Formal Sanctions	0.08* 1001	0.01 1237	-0.05 723	0.01 935	-0.04 660

[#]This table presents correlation coefficients. However, the significance levels are taken from bivariate regression models in which the STATA cluster command was used to adjust the standard errors for the dependence of observations over time.

Table 49: Multivariate OLS Pooled Regression, Sanctions and Number of Violations by Program Participation[#]

Number of Violations				
Independent Variables	TRI 33/50		Wastewise	
	0	1	0	1
	n=233	n=521	n=599	n=203
Total Sanctions	-0.03 (0.08)	0.32 (0.11)**	0.09 (0.11)	0.74 (0.41)+

[#]These models include the firm characteristics that were relevant in previous models as well as a control for prior violations. The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 50: Multivariate OLS Pooled Regression, Total Sanctions and Number of Violations by KLD Citizenship[#]

Number of Violations				
Independent Variables	KLD Citizenship		KLD Citizenship (no replacement)	
	0	1	0	1
	n=222	n=172	n=205	n=170
Total Sanctions	0.49 (0.09)**	0.13 (0.22)	0.46 (0.09)**	0.13 (0.22)

[#]These models include the firm characteristics that were relevant in previous models as well as a control for prior violations. The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 51: Multivariate OLS Pooled Regression, Informal Sanctions and Number of Violations by Program Participation[#]

	Number of Violations			
	TRI 33/50		Wastewise	
Independent Variables	0	1	0	1
	n=233	n=521	n=599	n=203
Informal Sanctions	-0.16 (0.28)	0.24 (0.20)	-0.01 (0.21)	0.99 (0.86)

[#]These models include the firm characteristics that were relevant in previous models as well as a control for prior violations. The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 52: Multivariate OLS Pooled Regression, Informal Sanctions and Number of Violations by KLD Citizenship[#]

Number of Violations				
	KLD Citizenship		KLD Citizenship (no replacement)	
Independent Variables	0	1	0	1
	n=222	n=172	n=205	n=170
Informal Sanctions	0.52 (0.16)**	0.04 (0.56)	0.47 (0.17)**	0.04 (0.56)

[#]These models include the firm characteristics that were relevant in previous models as well as a control for prior violations. The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 53: Multivariate OLS Pooled Regression, Formal Sanctions and Number of Violations by Program Participation[#]

	Number of Violations			
	TRI 33/50		Wastewise	
Independent Variables	0	1	0	1
	n=233	n=521	n=599	n=203
Formal Sanctions	0.03 (0.10)	0.43 (0.16)**	0.14 (0.15)	0.69 (0.37)+

[#]These models include the firm characteristics that were relevant in previous models as well as a control for prior violations. The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

Table 54: Multivariate OLS Pooled Regression, Formal Sanctions and Number of Violations by KLD Citizenship[#]

Number of Violations				
	KLD Citizenship		KLD Citizenship (no replacement)	
Independent Variables	0	1	0	1
	n=222	n=172	n=205	n=170
Formal Sanctions	0.64 (0.11)**	0.21 (0.24)	0.61 (0.12)**	0.21 (0.24)

[#]These models include the firm characteristics that were relevant in previous models as well as a control for prior violations. The STATA cluster command has been used to adjust the standard errors for the dependence of observations over time.

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