

## ABSTRACT

Title of Thesis:       EXPLORING THE RELATIONSHIP BETWEEN PROFIT-SQUEEZE AND OCCUPATIONAL SAFETY AND HEALTH VIOLATIONS

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One challenge for corporate crime scholars has been to distinguish criminal firms from non-criminal firms. A common explanation for this distinction is that offending companies are more economically troubled than firms that offend less or not at all. This study examines the relationship between firm characteristics and crime by focusing on Occupational Safety and Health Administration (OSHA) violations. Specifically, this research applies a profit-squeeze explanation to account for OSHA violations using a cross-sectional analysis of 77 companies for the time period 1993-2000. Results indicate mixed support for the profit-squeeze argument at the firm level using a variety of financial performance measures. Analyses also reveal that union membership was related to OSHA violations.

EXPLORING THE RELATIONSHIP BETWEEN PROFIT-SQUEEZE AND  
OCCUPATIONAL SAFETY AND HEALTH VIOLATIONS

by

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## Chapter 1 - Introduction

While some studies have shown corporate crime to be a pervasive problem (Sutherland, 1983, Clinard & Yeager, 1980, Simpson, 1986), others have reported that not all corporations engage regularly in illegal behavior and a few even go beyond “mere compliance” with rules, setting higher standards of behavior (Harrington, 1988, Cohen, 1998, Arora & Cason, 2001, King & Lenox, 2000). Thus, a challenge for corporate crime scholars has been to determine whether those corporations that regularly engage in illegal behavior are distinguishable from those that do not. One of the main predictions produced in response to this question is that companies in financial distress are more likely to commit illegal acts (Staw & Sz wajkowski, 1975, Asch & Seneca, 1976, Singh, 1986, Simpson, 1986, Keane, 1993).

This hypothesis of a relationship between financial performance and illegal behavior is based on the fact that organizational goals affect managerial decisions. Prevailing corporate values and beliefs in a corporation become institutionalized and define legitimate goals for employees to pursue (Vaughan, 1998). The over-arching goal of all corporations is profit; companies are profit-seeking organizations and in order to survive, they must make money. In fact, some have argued that the only responsibility of a business is to its shareholders and that a corporation’s social responsibility is to make a profit (Griffin & Mahon, 1997). In corporations where organizational values emphasize profit as the main goal, they create a great deal of pressure to maintain profitability no matter what means are used. Thus, when a company is experiencing financial decline, there is pressure to increase profits and reduce costs, even in ways that may be illegal. For example, a firm with declining profits might engage in price-fixing in order to

increase profits or alternately might ignore Occupational Safety and Health Administration or Environmental Protection Agency regulations in order to reduce costs (Hill et al., 1992).

Despite the common-sense attraction of this prediction, empirical evidence has been mixed. While some studies find support for the relationship between poor financial performance and crime (Staw & Sz wajkowski, 1975, Clinard & Yeager, 1980, Simpson, 1986), others have failed to support this hypothesized relationship (Hill et al., 1992). In fact, some research finds the opposite prediction to be the case, that firms with moderate or very good financial performance are more likely to commit illegal acts (Baucus and Near, 1991). A somewhat more consistent finding is that industry profitability and characteristics are related to corporate crime (Simpson, 2002, Clinard & Yeager, 1980, Keane, 1993). Such discrepant results may be due to the type of offending under consideration. One limitation of previous empirical tests of profit-squeeze at the firm level and crime is that it has been conducted largely using organizations convicted of antitrust violations (Staw & Sz wajkowski, 1975, Asch & Seneca, 1976, Simpson, 1986, Simpson, 1987).<sup>1</sup> Less attention has been paid to other types of violations (See Clinard & Yeager, 1980 for an exception). It is important to examine a variety of offense types to determine whether the profit-squeeze crime relationship holds for all types of corporate crime or just for certain illegal organizational behaviors as has been suggested by some (Hill et al., 1992, Alexander & Cohen, 1996). More recent studies have begun to widen the scope of violations investigated to include environmental, discrimination, and safety

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<sup>1</sup> Antitrust violations include a wide-range of behaviors aimed at creating a competitive advantage, such as price-fixing, price discrimination, illegal mergers, tying agreements, unfair advertising, warranty, and patent violations (Simpson, 1986).

and health violations (Alexander & Cohen, 1996, Hill et al, 1992, Baucus & Near, 1991, Jenkins & Braithwaite, 1993).

In this paper, I add to the studies that have widened the scope of violations by investigating the relationship between firm and industry profitability and Occupational Safety and Health Administration (OSHA) violation. Thus far, three studies have reported on this relationship. McKendall et al. (2002) included a control variable for financial performance in their analysis of the effects of ethical compliance on OSHA violations and reported it as the only significant control in their study showing that declining profits were related to more violations. Alexander and Cohen (1996) examined companies convicted of federal crimes, including some convicted for violations of safety regulations, and found some support for the profit-squeeze argument. Finally, Hill et al. (1992) found no support for the profit-squeeze argument in their study of OSHA and EPA administration violations.

A problem associated with studies that use OSHA data, such as those discussed above is that, like official data reported by the police, it is difficult to disentangle whether the data are picking up the behavior patterns of criminals or the behavior patterns of the enforcement agency. Thus, I attempt to improve on previous studies that have examined the profit-squeeze argument using OSHA data by controlling for the inspection behaviors of OSHA. Drawing from the body of literature that has examined the effectiveness of OSHA inspections, I gathered data to control for OSHA inspection behavior. A unique aspect of OSHA is that workers have the power to influence OSHA enforcement. All employees may initiate an OSHA inspection by filing a complaint and an even greater ability to influence the outcome of the inspection by accompanying the inspector

throughout the inspection process. Unionized employees have been shown to take advantage of these rights more than nonunionized employees (Weil, 1991 & Weil, 1996). Further, other studies have shown that unions lobby OSHA to inspect nonunion firms more heavily. In their study, Bartel and Thomas (1985) found that OSHA inspected nonunion firms more heavily resulting in higher costs for competitors who were not union members. Regardless of whether OSHA inspects unionized or nonunionized firms more heavily, controlling for union membership should parcel out some of the inspection behavior of OSHA.<sup>2</sup>

I also include a measure for prior violations in my analysis, which no other studies investigating the profit-squeeze and crime relationship using OSHA violations have done. Prior violations have been a fairly consistent predictor of future illegal acts in the corporate crime literature (Sutherland, 1983, Baucus & Near, 1991, Simpson & Koper, 1997) and the larger criminological literature (Gottfredson & Hirschi, 1990, Hirschi & Gottfredson, 2001, Agnew, 1991). Further, Finney and Lesieur (1982) suggest that past violations have a powerful impact on criminal decision-making within firms. Firms with a history of illegal behavior may become committed to illegal activities because of complications and dependencies created by earlier violations. This, in turn, can lead to a development of a corporate culture that supports illegal behavior, which leads to repeated violations (Finney & Lesieur, 1982, Vaughan, 1983). Therefore, it

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<sup>2</sup> Later in the paper, I discuss the impact of profit-squeeze on union members' ability to influence inspections. It is reasonable to assume that this influence may be minimized when firms are experiencing profit-squeeze because unions may direct their attention at issues other than health and safety, e.g., wages and benefits. In this case, they may be less likely to file complaints or accompany inspectors on inspections. However, it is unlikely that the effect of unions on inspection behavior completely disappears, especially in light of the findings by Bartel & Thomas (1985). If OSHA inspectors are inspecting nonunion firms more heavily to impose higher costs, then unions may be more likely to encourage this practice by OSHA during times of financial distress in order to put nonunion competitors out of business. Thus, it is still important to control for union membership even during times of financial distress when union members might file fewer complaints against their own companies.



seems important to include a measure of prior violations in a study examining the relationship between financial performance and OSHA violations. Thus, in this study, I contribute to the corporate crime literature by including a control for enforcement behavior and a measure of prior offending in my examination of the relationship between declining profits and OSHA violations.<sup>3</sup>

Before proceeding, however, it is important to define corporate crime and profit-squeeze. There is no universally agreed-upon definition for corporate crime. The debate surrounding the definition usually focuses on whether it should be an offense- or offender-based definition and whether it should include all illegal behavior or just criminal behavior (Sutherland, 1983, Tappan, 1977, Clinard & Yeager, 1980, Shapiro, 1990). Also in dispute is whether the definition should encompass the behavior of corporations, the individuals employed by them, or both.

According to Clinard and Yeager (1980) corporate crime is “any act committed by corporations that is punished by the state, regardless of whether it is punished under administrative, civil, or criminal law” (p. 16). For this research, Clinard and Yeager’s (1980) definition of corporate crime provides the best fit for the data. It is an offense-based definition that encompasses a wide range of behaviors including, tax and securities violations, intentional pollution of the environment, numerous anticompetitive behaviors (e.g., price-fixing), and the focus of this study: knowingly failing to provide a safe work environment. It focuses on acts committed by corporations, which is what OSHA

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<sup>3</sup> Violations of OSHA include infractions of both worker health and worker safety. Firms can be cited for relatively minor violations, like failure to post safety instructions and failure to maintain records on health and safety. On the other end of the spectrum, firms might be cited for lack of safety equipment, poor electrical wiring, and any worker illnesses, injuries, or deaths that result from the violations of an OSHA standard. The data are readily available from OSHA’s Management Information System (MIS) and provide detailed information about facility characteristics, inspections, offense types, and penalties.

investigates, and it widens the net of illegal behaviors to include any act by corporations punishable by the state rather than simply those acts punishable by criminal law. This is integral to this study since OSHA enforcement is based on administrative, and not criminal, penalties.

Profit-squeeze is generally defined as a decline in profits. In order to more fully understand profit-squeeze, then, it is first necessary to define profit. The most basic definition of profit is the difference between a company's total revenue and total costs. With this in mind, there are three ways a company can experience profit-squeeze. First, if a company's revenues remain constant while costs rise, the company will experience profit-squeeze. Alternatively, if a company's revenues rise but its costs rise even faster, the company will experience profit-squeeze. Finally, if a company's revenue falls while costs rise, remain constant, or fall slower than revenue, the company will experience profit-squeeze (Kalecki, 1991). The extent to which profit-squeeze is harmful to a company is relative, but for the purposes of this paper, the larger the decline in profits, the greater the profit-squeeze is assumed to be.

In the next section, I introduce the theoretical framework for the profit-squeeze argument followed by a review of the empirical evidence, including the few studies that have used OSHA data. The second section provides a brief introduction to OSHA and its inspection procedures, violations and fines. I describe characteristics of the four industries from which the sample in this study is drawn in the third section, and in the fourth section, I detail the data and methods used. The next section reports the results of the analysis, and that section is followed by a discussion of the results and my conclusions.

## Chapter II - Literature Review

### Theoretical Background

Rational choice theory is based on the classical view that human behavior can be explained by the basic human characteristics of rationality and intelligence. This classical school of thought also holds that each person possesses free will to choose his or her own fate (Bentham, 1977, Beccaria, 1963). Given these tenets, crime is seen as the choice of the individual who has rationally weighed the costs and benefits of his actions. Rational choice theory, therefore, states that to deter individuals from committing crime, the punishment must outweigh the benefits of the crime. In order to achieve this goal, punishments must be proportionate to the severity of the crime; punishments that are either too lenient or too severe will not deter crime (Beccaria, 1963). Punishments must also be prompt or swift so that the criminal associates the punishment with the crime, and they should be certain so that anyone committing a crime knows that they will be punished for the crime. The deterrent quality of punishments is lost if criminals continually do not receive punishment for their crimes (Beccaria, 1963).

Rational choice theories are generally thought to be especially applicable to corporate offenses because they are assumed to be highly rational and calculated crimes (Paternoster & Simpson, 1993). Corporate crimes are rarely crimes of passion and are more likely the result of a manager weighing the costs and benefits of an illegal action. Accordingly, managers of companies will violate the law to attain organizational goals when the expected profit is higher than the potential penalties (Vaughan, 1998). Paternoster and Simpson (1993) assert, however, that the classical rational choice model with its emphasis on formal costs is unlikely to be adequate to explain corporate crime.

They propose a rational choice theory that focuses on perceived costs and benefits and includes informal as well as formal costs and benefits of actions. The formal costs are similar to those listed above, but they are the *perceived* certainty and severity of formal legal sanctions. The informal costs include negative publicity for the corporation and disapproval from friends and family (Paternoster & Simpson, 1993). The authors also include the perceived certainty and severity of loss of self-respect and the perceived costs of rule compliance and perceived benefits of rule violation. The empirical tests of this revised rational choice theory showed that it might more accurately capture the decision making of corporate offenders compared to the classical rational choice theory (Simpson, 2002). Managers did fear formal sanctions and considered them consequential, but they did not seem to adjust their behavior based on formal sanctions. Managers considered threats to significant relationships, feeling of guilt, and the negative impact on the reputation of the firm (Simpson, 2002).

Managers are generally assumed to be risk-averse; that is, they are generally unwilling to jeopardize the future of their corporation or their position in it (Paternoster & Simpson, 1993). As a result, punishments available to corporate offenders, such as fines and loss of relationships and punishments available to corporations, such as fines and damage to their reputation, are viewed as meaningful threats to potential corporate offenders. Declining profits, though, can alter the manager's perceptions of these threats as well as the benefits of illegal actions. Economic performance is one of the major factors used to determine the reputation of a company and so poor financial performance may minimize these formal and informal threats while maximizing the benefits of illegal gains. Thus, the manager of a failing company might not consider the harm to the

reputation of a firm if s/he perceives that the firm has less reputation at stake (Alexander & Cohen, 1996). Further, the manager might even perceive the crime as a way to improve the firm's reputation by increasing its profitability. By ignoring OSHA regulations, for instance, a manager could reduce costs, thereby inflating revenue. Similarly, the manager of a failing company may worry that friends and colleagues will think of him or her as a failure or that the respect of colleagues and friends is lost so the loss of those relationships may not represent the threat they would to a manager of a thriving company. Alternatively, the same manager might not weigh the cost of criminal, civil, or regulatory fines, believing that the company would be unable to pay them in a state of bankruptcy (Alexander & Cohen, 1996). Therefore, an illegal act that would raise profits or reduce costs and prevent bankruptcy might seem worth the risk.

In the case of OSHA violations, rational choice explanations seem especially applicable because the formal penalties for OSHA violations have been historically sporadic and minor due to infrequent inspections (Gleason & Barnum, 1976, Bartel & Thomas, 1985, Weil, 1996). Infrequent inspections lower the probability of detection and hence punishment, including both formal and informal sanctions. (If a company is not formally sanctioned, there is less chance that family and friends will be aware of a manager's actions and less chance that the reputation of the firm will be tarnished). This is specifically true for the time period covered in this study. In the early 1990s, inspections were stabilized at roughly 40,000 annually, but they fell to 29,000 annually in 1995 and 24,259 in 1996, the lowest levels in OSHA's history. A partial recovery in inspections did occur from 1997-2000, bringing inspections up to 36,613 in 2000. At the same time, penalties did increase from an average of \$461 per violation in 1991 to \$900

per violation in 2000 (Siskind, 2002). Despite this increase, penalties remained fairly minor throughout this study period. In other words, inspections and penalties have not been certain or severe, and so the risk of penalty and its cost are likely to be perceived as low.

Conversely, the savings a company can achieve by ignoring OSHA regulations can be high since many regulations require expensive renovations to plants, new machinery and/or new safety equipment (Gleason & Barnum, 1976). Thus, a usually risk-averse manager of a company, when faced with declining profits and changing perceptions of informal threats, could weigh the uncertain and minor costs of formal threats from OSHA against the money saved from disobeying regulations and decide to violate OSHA standards in order to save money. Scholz and Gray (1990) provide evidence that this cost-benefit calculus of getting caught does occur concerning OSHA violations; they found evidence that firms monitor OSHA enforcement activity and respond by decreasing injury rates when perceived enforcement risk increases. The authors also discovered that firms reduced injury rates after OSHA assessed penalties against them. This specific deterrence effect occurred when controlling for the expected penalty associated with general deterrence, which suggests the importance of “surprise” in focusing manager attention on enforcement risk (Scholz & Gray, 1990).

### Empirical Support

Despite the theoretical basis for a relationship between organizational performance and corporate crime, empirical evidence on the relationship is mixed. Many early studies of large firms discovered a significant negative relationship between organizational performance and various antitrust violations. For example, Staw and

Szwajkowski (1975) found that for the five years preceding a trade complaint, the financial performance of 105 violating firms was significantly below all other nonviolating firms on the Fortune 500 List during the period of 1968-1972. They also found that the financial performance of the industries of the violating firms was also lower than the performance of industries of nonviolating firms on the Fortune 500 list. Similarly, Asch and Seneca (1976) reported that for 51 collusive firms selected from the Fortune 500 list, collusive behavior<sup>4</sup> was negatively associated with firm profitability. Simpson (1987) found that macro-level profit-squeeze had a positive relationship with antitrust and trade violations for 52 survivor firms in seven basic manufacturing industries between 1927 and 1981. However, when her data were disaggregated, she found that more serious anti-competitive behaviors occurred during periods of declining industry profitability (Simpson, 1986).

More recent studies of other offense types also reported support for a profit motive-crime relationship. Jenkins and Braithwaite (1993) analyzed questionnaires from 410 for-profit and non-profit nursing homes in Australia. They found that for-profit homes, which operate under the pressure to turn a profit, broke the new federal regulations more often than the non-profit homes. The authors noted that their findings replicate those found for nursing homes in the United States. McKendall et al. (1999) also demonstrated a relationship between profits and corporate crime. In their analysis of 150 large manufacturing firms, the authors reported that lower industry profits were significantly and positively related to both serious and non-serious Environmental

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<sup>4</sup> Collusion is the illegal act of firms conspiring to fix prices or divide markets in order to increase profits (Asch & Seneca (1976).

Protection Act (EPA) violations, and lower firm profits were significantly and positively associated with serious EPA violations.

The preceding studies indicated general support for a relationship between poor economic performance and various illegal behaviors. However, as McKendall et al. (1999) pointed out, several recent and more methodologically complex studies have not replicated the same profit-squeeze and corporate crime relationship. For instance, Hill et al. (1992) completely failed to find a relationship between organizational performance and corporate crime. Using EPA and OSHA violations for 174 Fortune 1000 manufacturing firms, Hill et al. (1992) found no statistical support for the hypothesis that financial strain influenced the predisposition of managers to violate the law and actually found the opposite, that firms were more likely, though not significantly more likely, to behave illegally when their performance was moderate or good. Finally, Baucus & Near (1991) reported weak evidence of a relationship between profits and illegal behavior, but one in the opposite direction so that firms with good financial performance committed more violations than firms in financial distress. Interestingly, the authors also found a curvilinear relationship between environmental munificence and violations. Illegal behavior was likely when resources were scarce but even more likely when resources were plentiful. These studies demonstrate that the empirical evidence on the exact relationship between organizational performance and corporate crime is equivocal.

As mentioned earlier, other studies have included OSHA data in their samples to examine the profit-squeeze argument. These studies also provide mixed evidence on the relationship. For example, Alexander and Cohen (1996) examined 101 public corporations convicted of federal violations spanning fraud, environmental crimes,



antitrust violations, regulatory violations and safety violations. Since OSHA rarely brings criminal charges against corporations, though, the OSHA violations made up only 5% of their sample. The authors did not find any relationship between prior earnings growth and safety violations and only found slight evidence for a relationship between prior sales growth and their small sample of safety violations. In fact, with the exception of the environmental violations, which made up less than one fourth of their sample, the authors were unable to find a strong connection between firm profits and crime. As mentioned above, Hill et al. (1992) analyzed OSHA and EPA violations for 174 U.S. Fortune 1000 manufacturing firms. In their study, OSHA violations actually made up the largest number of violations at 6,233 compared to 343 EPA violations. However, they, too, failed to find a negative relationship between financial strain and OSHA violations. McKendall et al. (2002) used OSHA violations in their examination of the relationship between ethical compliance programs and corporate illegality. While the focus of their paper was not the financial performance of their sample, they did control for an organization's profitability. This variable was the only control variable to significantly predict willful and repeat violations, in that lower firm profitability was associated with more violations (McKendall et al., 2002). The results of this study provide some evidence that profit-squeeze may be linked to OSHA violations.

One reason for the mixed findings in the corporate crime literature on the relationship between financial strain and illegal behaviors could be the lack of a common measure for organizational performance (Keane, 1993). The studies mentioned above used a variety of measures for the independent variable, financial performance. For example, Asch and Seneca (1976) used the mean value of the ratio of net income after

taxes to stockholder's equity; Hill et al. (1992) used Altman's Z index; and Alexander and Cohen (1996) used prior sales and employment growth of the firm as well as an industry-adjusted earnings growth variable. Operationalizing the performance variable can be problematic and may be one factor causing the divergent findings.

Keane (1993) attempted to improve the measurement of financial performance by thinking of it as a latent concept since companies have multiple financial performance goals. He hypothesized that two latent financial performance variables, one at the firm level and one at the industry level, would have equal effects, and that companies and industries experiencing poor financial performance would cope with this strain using illegal behavior. Keane (1993) used financial ratios as indicators of financial performance including Net Income to Total Sales and Net Income to Total Assets, which provided measures of the firm's efficiency of operation. He also used Earnings Per Share and Working Capital to Total Assets, although the latter ratio was the least reliable of his measures. Using these financial ratios as indicators of financial performance, Keane (1993) found that firms experiencing a decline in financial performance over the five-year period 1971-1975 were more likely to be charged with a violation. By using latent financial performance variables, Keane (1993) replicated the negative relationship found in earlier studies between financial performance and illegal behavior.<sup>5</sup>

Another reason for the mixed results in the literature could be the lack of a common measure for illegal behavior. McKendall et al. (1999), Simpson (1986), and Keane (1993) measured illegal behavior using administrative, civil, and criminal sanctions brought against companies in their samples. Hill et al. (1992), on the other

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<sup>5</sup> Keane used data collected by Clinard and Yeager (1980) so illegal behavior was captured through federal administrative, civil, and criminal actions initiated or completed by 25 federal agencies during 1975-1976.

hand, used only administrative sanctions brought by the EPA and OSHA, while Baucus & Near (1991), Asch & Seneca (1976), and Alexander & Cohen (1996) all used criminal convictions for a Federal crime as their measure of illegal behavior. This variation in the measurement of illegal behavior could be another reason for the diverse findings in the literature on whether declining profits affect corporate offending.

Yet another possible reason for the disparate findings may rest with the offense type under investigation. It is possible that financial performance pressure is more likely to lead to some violations than others. Alexander and Cohen (1996) arrive at a similar explanation for their findings, concluding that performance is more likely to affect the occurrence of environmental crime than fraud because frauds tend to occur in the context of a voluntary transaction. Hill et al. (1991) actually test for the possibility that different antecedents lead to different types of illegality. Although their results were mixed, they concluded that firm performance was related to different illegal behaviors.

While findings in the literature have been mixed on the effects of profit-squeeze at the firm level on illegal behavior, the literature has provided stronger evidence for a relationship between economic performance and criminal actions at the industry level. Empirical research has shown that the market (or industry) in which a firm operates is related to offending at the firm level (Keane, 1993, Alexander & Cohen, 1996). One industry characteristic that has been shown to influence criminal behavior is profitability. In their analyses, McKendall et al. (1999) and Keane (1993) found that both firm and industry profitability significantly predicted illegal behaviors. In McKendall et al.'s (1999) analysis of the relationship between environmental violations and dimensions of corporate board structure, the control variables for firm and industry profitability were

significantly and negatively related to violations. As mentioned above, Keane (1993) found that firms experiencing a decline in financial performance between 1971-1975 were more likely to be charged with criminal, civil, and administrative violations. He also found that firms in industries that were experiencing similar financial strain were more likely to be charged with a violation.

Alternatively, Simpson (2002), and Clinard and Yeager (1980) found industry characteristics to be *more important and consistent* predictors of corporate offending than firm level measures. Simpson (1986) analyzed 52 survivor firms over 55 years of economic and criminal activity. She reported that firm level financial performance was unrelated to antitrust behavior but that as industry profitability decreased, antitrust crimes increased; this relationship held for three of her four industries. Interestingly, when Simpson (1986) broke the dependent variable into serious and trivial categories, she found decreasing industry profits led to serious crimes while increasing industry profits led to more trivial crimes.

Alexander and Cohen (1996), using environmental violations, also discovered an interesting interactive effect between firm and industry performance. They found that the performance of the corporation relative to that of the industry best predicted violations (Alexander & Cohen, 1996). In other words, firms with declining profits in an economically healthy industry were more likely to violate environmental regulations.

The empirical literature also showed that the concentration of an industry can influence illegal behavior. The concentration of an industry is the number of firms operating in that industry, which determines the market power held by firms and their ability to compete in the industry. Studies showed that both high and low industry

concentration may create the opportunity for illegal behavior. For example, a small number of firms in an industry make collusion easier while a large number of firms make it difficult for regulatory agencies to monitor and detect illegalities (McKendall et al., 2002). A few studies have confirmed that industry concentration is indeed related to illegal corporate behavior, but that concentration (like size) may have different effects depending on industry of offense type. Asch and Seneca (1976) found that concentration increased the probability of collusion in the consumer goods industry but decreased probability of collusion in the producer goods industry. McKendall et al. (1999) and McKendall and Wagner (1997) found that lower levels of industry concentration were positively related to serious environmental law violations. It seems likely that low industry concentration could affect opportunities for OSHA violations since a larger number of firms would strain the already tight resources of OSHA, making it safer for firms to take more risks.

Prior violations are a well-known predictor of future violations in both the wider criminological literature (Gottfredson & Hirschi, 1990, Hirschi & Gottfredson, 2001, Agnew, 1991) and the corporate crime literature (Sutherland, 1983, Baucus & Near, 1991, Simpson & Koper, 1997). Yet prior violations have never been included in a study of profit-squeeze and OSHA violations. One study that investigated the relationship between profit-squeeze and illegal corporate behavior found that companies with three or more prior violations were significantly more likely to engage in antitrust, product liability, and discrimination than firms without three or more prior violations (Baucus & Near, 1991).

In the current study, I further investigate the possible relationship between poor firm and industry financial performance and corporate crime using violations cited by the Occupational Safety and Health Administration (OSHA) from the years 1993-2000. As mentioned earlier, I attempt to improve upon the studies that have used OSHA violations in the past by controlling for OSHA enforcement behavior and prior OSHA violations. Before describing the research design and data used in this thesis, a brief description of OSHA and its policies and practices is provided. In addition, I present a brief overview of characteristics of the four industries that are included in this research.

### The Occupational Safety and Health Administration

Since its inception in 1971, the mission of OSHA has been to ensure safe and healthful workplaces in America through enforcement of OSHA regulations. The Occupational Safety and Health Act, which sets forth standards, laws, and regulations in the interest of labor safety, was passed in 1970, in large part as a response to protests by rank-and-file workers against working conditions that annually killed at least 100,000 U.S. workers and disabled another 390,000 (Donnelly 1982). Under accusations that OSHA was merely a symbolic gesture and useless for enforcement of safety and health regulations and amidst the deregulation policies of the Reagan administration, OSHA experienced difficulty in its first two decades of existence (Calavita, 1983). However, since its inception, the number of workers employed in the U.S. has doubled while workplace fatalities have declined by 50%, and occupational injuries and illnesses have declined 40% (U.S. Department of Labor, 2004a).

Despite the steady declines in workplace fatalities, injuries, and illnesses, only modest evidence has been produced to show OSHA has had a direct impact on injuries

and illnesses. Several studies using injury and illness data and OSHA inspection data actually found that OSHA had no impact on firms' injury rates (Viscusi, 1978, McCaffrey, 1983, and Ruser & Smith, 1990). The majority of studies, though, seem to have found some modest direct and indirect effects of OSHA inspections and penalties on injury rates (Smith, 1978, Cooke & Gautschi, 1981, Robertson & Keeve, 1983, Bartel & Thomas, 1985, Viscusi, 1986, Scholz & Gray, 1990, Gray & Jones, 1991). For instance, Cooke and Gautschi (1981) found a substantial and significant reduction in days lost due to injuries in Maine manufacturing firms with 200 or more employees. Viscusi (1986) reported some evidence for the effectiveness of inspections in preventing severe injuries during the sample years from 1973-1983. Gray and Jones (1991) found that the initial inspection of an establishment reduced subsequent violations but that following inspections had little effect on compliance. Overall, the empirical evidence on OSHA effectiveness is mixed, but there is modest evidence that OSHA enforcement helps make workplaces safer for workers.

OSHA enforces workplace safety through inspections and fines, and is authorized to conduct workplace inspections and investigations to determine whether employers are complying with standards issued by the agency. Inspections are conducted for four main reasons. First, accidents are reported to OSHA by employers and receive high priority for inspections when they result in death or hospitalization of three or more employees. OSHA inspectors investigate to determine the cause of the accident and whether regulations were violated. Complaints and referrals by employees generate inspections and are second in priority to accidents. OSHA policies give all employees the right to request an OSHA inspection if they believe a standard is being violated. Third, OSHA

places the next priority on programmed inspections. These general schedule inspections can be aimed at specific high-hazard industries, workplace, occupations or health substances, or they can be randomly selected.<sup>6</sup> Planned inspections generally result in a bias toward larger corporations being inspected more often than small corporations (Scholz & Gray, 1990, Ruser & Smith, 1990, Weil, 1991, Weil, 1996). Finally, inspections can also originate from the need to follow-up a previous inspection that resulted in a citation. Inspection tours can cover part or all of an establishment, even if the inspection resulted from a specific complaint or accident (U.S. Department of Labor, 2002).

Inspections can result in one or more violations, which range in seriousness and carry various fines (See Table 1, p.21). Other-Than-Serious violations ('other') are violations that have a direct relationship to job safety and health but probably would not cause death or serious physical harm. OSHA can assess a penalty of up to \$1000 per violation for 'other' violations. Serious violations are classified as violations where there is a substantial probability that death or serious physical harm could result. These violations can incur penalties from \$1,500 to \$7,000 depending on the gravity of the violation. Willful violations are violations that the employer intentionally and knowingly commits. In other words, the employer is aware that a dangerous condition exists, knows the condition violates a standard of OSHA, and makes no reasonable effort to eliminate it. The minimum penalty for a willful violation is \$5,000, and the maximum is \$70,000. An employer who is convicted in a criminal proceeding of a willful violation that has resulted in the death of an employee may be fined up to \$250,000 or imprisoned up to 6

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<sup>6</sup> Establishments are randomly selected by industry. OSHA designates a given industry as a priority for planned inspections, and then each area office compiles a list of establishments in those industries in their area and selects sites from that list at random (Gomez, 1997).



months, or both. Repeat violations are violations of any standard where, upon reinspection, a similar violation is found. OSHA can propose up to \$70,000 for each repeat violation (U.S. Department of Labor, 2002). In 1991, OSHA instituted a new policy that, in effect, removed an earlier willful or repeat violation, replacing them with an unclassified violation. This designation was given if an employer corrected all violations and paid all the fines but wished to be purged of the averse public perception attached to a willful or repeat violation (Siskind, 2002). Consequently, records of willful and repeat violations are difficult to track through the entire inspection process. Willful and repeat violations cited in the initial report may be unclassified in the final violation report stage.

**Table 1. OSHA Violation Types**

VIOLATION TYPE	DESCRIPTION	MINIMUM FINE	MAXIMUM FINE
Other	Related to job safety and health but would not result in death or serious physical harm	\$0	\$1000
Serious	Substantial probability that death or serious physical harm could result	\$1500	\$7000
Willful	Intentionally and knowingly committed	\$5000	\$70000
Repeat	Upon reinspection, similar violation is found	\$5000	\$70000
Unclassified	Reclassification of willful or repeat violations to purge company of averse public reaction	\$5000	\$70000

The above policies are relevant to all states covered by Federal OSHA (Federal OSHA); however, some states administer their own occupational safety and health programs. OSHA approves and monitors state plans and provides up to 50% of an approved plan's operating costs. During the 1990s, there were 21 states with their own

state plans.<sup>7</sup> All state plans have standards that are “at least as effective as” comparable federal standards, and most states adopt standards identical to the federal standards and have similar inspection procedures, including citations and penalties<sup>8</sup> (U.S. Department of Labor, 2004b). During the 1990s, states with state plans conducted about twice the number of inspections that Fed OSHA did, and a larger proportion of their inspections were conducted in industries other than manufacturing and construction. The state plan states also tended to cite more violations than Fed OSHA, however, the states generally assessed lower penalties per violations (Siskind, 2002). Due to the different inspection processes of Fed OSHA and state OSHA programs, I plan to include a control variable for the two programs; this is discussed further in the data and methods section of this paper.

As mentioned earlier, OSHA inspections were not stable during the time period of interest in this paper. In the early 1990s, inspections were stabilized at roughly 40,000 annually. Due to threatened budget cuts and an emphasis on egregious violations, which use more resources, inspections fell steeply in 1995 to 29,000 annually and continued to decline in 1996 until they reached 24,259, the lowest levels in OSHA’s history. A partial recovery in inspections did occur from 1997-2000, bringing inspections up to 36,613 in 2000 (Siskind, 2002). This change in OSHA inspections is discussed more in the data and methods section of the paper.

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<sup>7</sup> States with their own state plans included: Alaska, Arizona, California, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, South Carolina, Tennessee, Utah, Vermont, Virginia, Washington, and Wyoming.

<sup>8</sup> States with standards that were not identical to Fed OSHA included California, Hawaii, Michigan, Oregon, and Washington.

## Industry Overviews

As shown in the literature review, the environment in which the firms operate is an important consideration for the profit-squeeze argument. Empirical research reviewed earlier showed that the industry in which a firm operates is an important predictor of corporate crime (Keane, 1993, Alexander & Cohen, 1996). Some studies reported that industry characteristics were stronger predictors of corporate crime than firm level characteristics (Simpson, 2002, and Clinard & Yeager, 1980) while other studies suggested interaction effects between the firm and industry characteristics (Alexander & Cohen, 1996). In addition to the empirical support, there are theoretical reasons for examining industry characteristics. I have argued that under normal operating conditions formal and informal threats are typically strong enough to deter the risk-averse managers of companies. However, when managers are faced with economic failure, these threats are minimized and the benefits of illegal actions are amplified (Alexander & Cohen, 1996). Profit-squeeze at the industry level can have a similar effect by further minimizing informal and formal threats (Paternoster & Simpson, 1996, Simpson, 2002). If an entire industry is failing economically, this means many managers are readjusting their perception of formal and informal sanctions. They may also adjust their perception of the regulations themselves and see the regulations as restraining the industry's ability to make a profit. In this context, violating the regulations may become commonplace in an industry. This would minimize the informal sanctions further if coworkers, employers, and even family sanctioned the violation because they believed the regulations to be unfair and harmful to the industry. Other industry characteristics, like concentration, also can minimize the threat of formal and informal sanctions. OSHA

inspections have been historically infrequent due to restricted resources in the agency and in industries with many firms these resources are stretched especially thin (Gleason & Barnum, 1976, Bartel & Thomas, 1985, Weil, 1996). Thus, firms in these industries may perceive that they are less likely to get caught for violating OSHA standards. In this section, I provide an overview of the four industries and examine these industry characteristics.

The firms in this study operate in four industries: the pulp, paper, steel, and oil industries. This thesis expands on data collected by Simpson & Garner (2001) so the four industries were chosen based on their relevance for examining EPA water permit violations.<sup>9</sup> The industries, therefore, were not specifically chosen for the analysis of OSHA data or a profit-squeeze argument. Fortunately, the industries are also subject to OSHA regulations and turned out to have substantial variation in offending patterns. Hill et al. (1992) reported that the paper and steel industries were among the worst offenders in their sample while oil was an average offender. My data reflect a similar pattern, with paper and steel being the worst offenders measured by an average rate of total violations per inspection over the eight-year period. However, the oil industry rate was not, on average, much lower than the rate for the steel industry, and this industry produced the highest average rate of the most serious violations per inspection. The pulp industry had the lowest rate of total violations but slightly more serious violations per inspection than paper (See Table 2, p.25). The limitation of using these four industries is that, as I will discuss below, there is not a great deal of variation in the key characteristics of interest.

It is still important, though, to know what variation does exist between the four industries

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<sup>9</sup> The industries are known to be above average polluters (see McKendall & Wagner, 1997 and Magat & Viscusi, 1990) and they utilize similar chemicals in their manufacturing processes making comparisons across industries possible.

because these characteristics might drive illegal firm actions. In this section, I briefly review the empirical literature on industry effects that are relevant to OSHA policies and violations, including economic performance, industrial concentration, and specific OSHA regulations that apply to each industry. The pulp and paper industries are highly interconnected; however, analysis (discussed in the Statistical Procedure section) suggests that it is best to treat them as separate industries.<sup>10</sup>

**Table 2. Average Rates of Violations per Inspection by Industry from 1993-2000**

INDUSTRY	RATE OF TOTAL VIOLATIONS PER INSPECTION (TOTAL AVERAGE VIOLATIONS)	RATE OF MOST SERIOUS VIOLATIONS PER INSPECTION (TOTAL AVERAGE SERIOUS VIOLATIONS)
Pulp	2.1888 (11.188)	.1243 (.625)
Paper	3.7181 (73.539)	.1135 (2.385)
Oil	3.5307 (42.526)	1.3550 (7.526)
Steel	3.6804 (60.063)	1.0428 (16.250)

### *Economic Performance*

The corporate crime literature reviewed earlier showed that industry profitability is relevant to corporate illegality. Most findings suggested that firms in industries with declining profits are more likely to commit illegal actions than firms in industries with steady or growing profits (Simpson, 1986, Keane, 1993, McKendall et al., 1999).

Therefore, it is important to be familiar with the economic status of the three industries in my study.

Leading up to the period of interest for this study (1993-2000), the four industries experienced similar patterns of economic decline, although the petroleum industry fared

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<sup>10</sup> The industries are interconnected because pulp facilities produce pulp, which is utilized in the production of paper products. Also, the majority of facilities in these two industries operate as both pulp and paper facilities or as paper-only facilities. There are very few pulp-only facilities, 50 out of 555 pulp and paper facilities, in the United States (SNP Pulp and Paper, 1995).

the best. In the mid-1990s, the industries all returned to more economically stable conditions. Paper and pulp industries began to generate returns in 1994 that met the cost of capital, and mills operated at between 92 and 95 percent of capacity (SNP Pulp and Paper, 1995). In 1993, the steel industry was able to increase prices for the first time since 1989, and manufacturers' shipments were at their highest level since 1981 (SNP Steel, 1995). In the oil industry the economic hardship was isolated to smaller firms so the total refinery output of finished products remained relatively stable throughout the period with slight increases in 1993 and 1994 (SNP Petroleum, 1995).

Table 3 (p.27) displays the manufacturer's value added (MVA) for each industry across the eight-year time period. The MVA is the estimated value of production within each industry. Due to the fact that the industries were not chosen with the intention of examining a profit-squeeze argument, they are more similar in economic performance than would be desirable for an examination of the profit-squeeze argument. However, there are some subtle differences. The oil industry appears to have performed at the highest level with continuously increasing profits except in 1998. The paper and steel industries were a little more erratic, but they generally performed well. The pulp industry's MVA appears to be cut by half from 1995 to 1996 and then again from 1996 to 1997, but both the pulp and paper industries seem to have experienced a spike in profits in 1995 and without that jump, the pulp industry also seems fairly stable. Thus, I expect that firms in the oil industry will commit the fewest violations and the fewest serious violations if a profit-squeeze argument is accurate.

**Table 3. Manufacturer's Value Added by Industry by Year**

INDUSTRY	YEAR	MVA	INDUSTRY	YEAR	MVA
Pulp	1993	1,711,100,000	Paper	1993	14,511,700,000
	1994	2,093,300,000		1994	15,077,200,000
	1995	4,223,000,000		1995	22,509,700,000
	1996	2,201,100,000		1996	18,848,000,000
	1997	1,507,468,000		1997	17,578,226,000
	1998	1,403,944,000		1998	17,795,562,000
	1999	1,442,824,000		1999	18,004,180,000
	2000	1,827,072,000		2000	19,063,360,000
Steel	1993	17,908,300,000	Oil	1993	18,710,300,000
	1994	20,743,800,000		1994	23,805,600,000
	1995	22,191,200,000		1995	23,978,100,000
	1996	22,111,900,000		1996	26,005,800,000
	1997	24,741,363,000		1997	30,878,456,000
	1998	23,733,366,000		1998	24,023,637,000
	1999	21,360,675,000		1999	31,516,328,000
	2000	14,353,827,000		2000	36,634,094,000

*Industrial Concentration*

The studies discussed in the literature review also demonstrated a relation between the concentration of an industry and corporate offending. As stated earlier, both high and low industry concentration may create the opportunity for illegal behavior depending on the type of behavior. I argued previously that low industry concentration would be most likely to affect opportunities for OSHA violations since a larger number of firms would place greater strain on the already overextended resources of OSHA. With OSHA inspectors spreading themselves thin throughout a highly populated industry, managers of firms will perceive a minimized threat of discovery and take more risks.

Prices in the petroleum refining industry are controlled by an oligopoly, meaning that due to the small number of suppliers accounting for a large amount of output, one

supplier's actions can greatly affect pricing in the market (Rosen, 1995). This oligopoly pricing is one of the key signs of high concentration. Prices tend to be more volatile in the pulp and paper industry absent true price leadership; however, there are significant barriers to entry in the pulp and paper industry, which keep the industry more concentrated than it would be otherwise. Barriers include extensive capital costs caused, in part, by environmental protection legislation and the limited number of sites in the U.S. suitable for integrated pulp and paper mill operations, which must be close to woodlands (Arpan et al., 1986). Oligopoly pricing collapsed in the steel industry in the early 1980s and a system of price-taking has been universal since 1995 in what is now a largely free steel market (Hall, 1997)<sup>11</sup>. These are signs that the steel industry is no longer very concentrated.

In fact, the Herfindahl-Hirschmann Index (HHI), which is the best measure of industry concentration, shows that none of the four industries in my sample are highly concentrated. In general, a market with an HHI below 1000 can be characterized as not concentrated, between 1000 and 1800 as moderately concentrated and above 1800 as highly concentrated (European Communities, 2003). As shown in Table 4 (p. 29), the pulp industry had an average HHI of 984 compared to 428 for paper, 439 for oil and 501 for steel. Once again, this is a limitation of using these industries for this particular study; ideally, the industries would vary more in their concentration levels. However, the pulp industry has the highest average HHI and reached a maximum of 1106 during the study period, which means that the pulp industry was at least moderately concentrated.

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<sup>11</sup> Price-taking systems are markets that take prices from other trading venues. Price-taking is basically the opposite of oligopoly pricing where the market sets the price. Instead, the market takes the price set by another market, like the suppliers; this typically occurs in a more competitive market (CESR, 2002).



This suggests that firms in the other three less concentrated industries may perceive a greater opportunity to offend and so should have more violations. Returning to Table 2 (p. 25), pulp did in fact have the lowest average number of total violations by far with 11.188.

**Table 4. Herfindahl-Hirschman Index by Industry from 1993-2000**

INDUSTRY	AVERAGE HHI	MINIMUM HHI	MAXIMUM HHI
Pulp	984	858	1106
Paper	428	392	467
Oil	438	425	441
Steel	505	498	551

*OSHA Regulations by Industry*

Presuming that regulatory standards remain stable, firms in regulated industries operate in a predictable legal environment. Firms operating under these conditions are able to anticipate and predict compliance costs more easily than firms in less regulated industries or industries where regulations are constantly changing. Furthermore, if regulations are believed to be fair and reasonable and are accepted and understood in the industry, the industry culture may reinforce the regulations as industry norms. It is important, therefore, to determine whether OSHA regulations were stable in each of the four industries examined here.

All four industries in this study are covered under the General Industry category, but this does not mean every standard listed in the General Industry category applies to all four industries. The basic regulations regarding walking and work surfaces, emergency and fire plans, ventilation, noise levels, hazardous materials, personal protective equipment, sanitation, first aid, electrical wiring, and portable tools apply to all industries. However, each industry has standards that apply specifically to that industry.

None of the regulations, though, seem more restrictive for any single industry in this sample. The pulp and paper industries have special regulations for the preparation of pulpwood using power saws and chippers, the chemical process of making pulp using sulfur, and bleaching rooms, machines, and chemicals (U.S. Department of Labor, 2004c). The petroleum refining industry has special regulations for the distillation process involved in producing gasoline and for the handling of the chemical by-products (U.S. Department of Labor, 2004d). Similarly, the regulations of the steel industry dictate the use of and standards for the blast furnaces and coke ovens involved in the conversion of iron to steel (U.S. Department of Labor, 2004d). Since none of the four industries seem more restricted than the others by OSHA policies, and since I do not have the data to examine whether any of the industries view the regulations as unfair, I cannot draw any conclusions about how differences or changes in the regulatory environment might affect illegal behavior of the firms in this sample.

#### *Prior Injuries and Illnesses by Industry*

The last industry characteristic I should mention is prior injuries and illnesses recorded for each industry. Studies analyzing the impact of OSHA inspections on injury rates have noted that plants with higher previous injury and illness rates generally receive more inspections (Cooke & Gautschi, 1981, Ruser & Smith, 1988, Ruser & Smith, 1990). In 1981, Fed OSHA decided to utilize mandatory employer injury and illness logs to determine which firms to inspect. If the injury and illness rate from a previous year exceeded a certain threshold, the establishment was inspected. While this practice was discontinued in 1988 (Ruser & Smith, 1990), current OSHA documents cite prior injury and illness rates as a way to determine general schedule inspections. Since OSHA policy

allows OSHA inspectors to use injury and illness records to target hazardous industries for inspection, it is useful to know if any of the industries in my sample are particularly hazardous. Table 5 (p. 31) shows the steel industry to be much more hazardous than the other industries. The steel industry has an average rate 5.25, almost five times higher than the paper industry, which has the next highest average rate at 1.61. This suggests that the steel industry is the most hazardous of the four industries and that it may be more likely to be targeted by OSHA inspectors.

**Table 5. Rate of Injuries and Illnesses by Industry from 1993-2000\***

INDUSTRY	RATE OF INJURIES & ILLNESSES	MINIMUM RATE OF INJURIES & ILLNESSES	MAXIMUM RATE OF INJURIES & ILLNESSES
Pulp	.08	.01	.31
Paper	1.61	.20	5.33
Oil	.99	.04	7.86
Steel	5.25	.42	15.19

\*Rate calculated by dividing average number of injuries and illnesses by average number of employees

The industry characteristics discussed above are important because they have been shown to affect the probability of corporate offending (Simpson, 1986, Clinard & Yeager, 1980, Keane, 1993, McKendall et al. 1999). The descriptions provided paint a picture of the similarities and differences between the four industries, which are illustrated in Table 6 (p.32). These differences allow for inferences of the effects that each characteristic should have on the illegal actions of the firms in this study. For instance, the steadily increasing profits in the oil industry leads me to think that firms in the oil industry will commit fewer violations than firms in the other three industries. Also, due to the lower concentration of the paper, steel, and oil industries, I would expect firms in the pulp industry to have fewer violations than the other three industries. As mentioned, the lower concentration makes it more difficult for regulatory agencies like

OSHA to monitor firms. Relating this to the revised rational choice theory mentioned above, managers in industries with low concentration will perceive less of a formal threat and commit more illegal actions. Since all four industries are subject to OSHA regulations and I cannot quantify the degree to which variation exists, I cannot predict an effect based on the amount of OSHA regulations. The steel industry appears to be the most hazardous in my sample, making it a prime target for more inspections so this should be kept in mind throughout the analysis. Following my hypotheses, the next section describes the data and methods that will be used for this analysis.

**Table 6. Industry Characteristics, 1993-2000**

INDUSTRY	PROFITABILITY	CONCENTRATION	INJURIES & ILLNESSES
Pulp	Stable	Moderate	Low
Paper	Stable	Low	Moderate
Oil	Mixed	Low	Moderate
Steel	Stable	Low	High

### Hypotheses

Managers are generally considered risk-averse and unwilling to jeopardize their future or that of their corporation (Paternoster & Simpson, 1993). Under normal operating conditions, then, they are usually deterred by formal and informal sanctions. However, when a firm is experiencing declining profits, formal and informal threats are minimized (Alexander & Cohen, 1996). Since OSHA fines are historically minor and uncertain due to the low frequency of inspections (Gleason & Barnum, 1976, Weil, 1996), a manager experiencing profit-squeeze might perceive OSHA violations as a safe way to reduce costs by ignoring OSHA regulations, which can require expensive safety equipment or new machinery.

This cost-benefit calculus could lead not only to more violations during times of financial distress but also to more serious violations of OSHA. Discussing antitrust violations, Simpson (1986) explained that under normal operating conditions (i.e., growth), discovery and punishment risks may outweigh the benefits of crime (i.e., monetary savings) and serious forms of criminality may be deterred. However, when a company is experiencing financial distress, it may undertake more serious and potentially costly illegal behaviors.

This argument seems relevant for OSHA violations as well as antitrust violations. According to OSHA policies, more serious violations can engender more severe penalties, including higher fines and possibly jail time (U.S. Department of Labor, 2002). Conversely, the benefits of ignoring more serious regulations are greater. While the benefits of more serious antitrust violations are greater profits, the benefits of more serious OSHA violations are greater savings. For instance, by not fixing or replacing dangerous machinery, the company saves more money than when it decides not to invest in safety regulation posters. Thus, companies that commit more serious safety and health violations can experience greater savings. Adding to this argument, it is possible that under circumstances of financial decline, there is a greater opportunity for firms to commit OSHA violations. Union employees are positioned to influence OSHA enforcement, and labor unions dedicate considerable resources to monitoring and improving safety and health conditions (Weil, 1991). In times of financial stress, labor unions may focus their efforts on preventing job cuts and maintaining livable wages and direct fewer resources to safety issues. With labor unions focusing on issues other than safety, managers of unionized firms may perceive a greater opportunity to violate more

serious OSHA regulations, like ignoring requirements for the replacement of dangerous and costly machinery. On the other hand, during these times of financial stress unionized firms may use their influence at OSHA to encourage inspections of nonunionized firms (Bartel & Thomas, 1985). Due to the influence unions have on OSHA enforcement, it is important to control for union membership. With these issues in mind, I plan to test whether profit-squeeze at the firm level increases OSHA violations by firms from the steel, petroleum, pulp, and paper industries. Following Simpson (1986), I also plan to examine whether profit-squeeze at the firm level will cause more serious OSHA violations by firms in the aforementioned industries. Hence, my first hypothesis:

H<sub>1</sub>: Firms experiencing profit-squeeze will commit more and more serious OSHA violations than economically healthy firms.

Also, studies have shown that industry characteristics may actually be stronger predictors of illegal corporate behavior (Simpson, 1987, Clinard & Yeager, 1980). For instance, studies have found that the broader economic environment, i.e., the financial status of the industry as a whole, affects corporate offending (McKendall et al., 1999, Staw & Szwajkowski, 1975, Simpson, 1987, Keane, 1993, Alexander & Cohen, 1996, Clinard & Yeager, 1980). Further, studies have shown that other industry level factors, like concentration, can create an opportunity for firms to commit more violations and more serious violations (Asch & Seneca, 1976, McKendall et al., 1999). Due to the lack of variation in my industry variables and analytic constraints, I am unable to test the direct effects of industry characteristics. However, I can include dummy variables for industry membership. Thus, I hypothesize:

H<sub>2</sub>: Controlling for industry, profit-squeeze at the firm-level will be attenuated.

Finally, prior criminal acts are one of the best predictors of future criminal acts. This finding has been replicated in both the corporate crime literature (Sutherland, 1983, Baucus & Near, 1991, Simpson & Koper, 1997) and the wider criminological literature (Gottfredson & Hirschi, 1990, Hirschi & Gottfredson, 2001, Agnew, 1991). This leads me to my final hypothesis:

H<sub>3</sub>: Firms with prior violations will commit more OSHA violations than firms without prior violations.

### **Chapter III - Sample and Methodology**

The data used in this study were collected for an NIJ funded project on environmental compliance (2001-IJ-CX-0020, Simpson & Garner, 2001). The original sample consisted of a universe of public companies within the four SIC industry codes collected using Ward's Business Directory (1995), Standard and Poor's Industrial Compustat, and Mergent Online, formerly Financial Information System (FIS) Online. The companies were then located in the Directory of Corporate Affiliations and all plants, mills, and subsidiaries owned by that corporation were included. These companies were then linked to EPA facility records. Additional facilities and companies were added using the Toxic Release Inventory database maintained by the EPA and from the Permit Compliance System database.

These procedures resulted in a total sample of 104 companies that own and operate facilities subject to OSHA regulations. Economic data, collected from Mergent Online, were unavailable for nine of these companies so they were eliminated from the sample. Economic data were also unavailable for four additional companies, which turned out to be subsidiaries of other companies in the sample; the violations of these four companies were counted as violations by the parent companies. Companies with fewer than three years of inspection/violation data also were eliminated from the sample. Finally, two companies were dropped from the sample because they were consistent outliers. For example, company #72 had a total violation rate of 20 compared to an average of 2.95, an egregious violation rate of 7.58 compared to an average of .33, and a serious violation rate of 11.63 compared to an average of 1.68. Similarly, company #95 had a total violation rate of 15.63 compared to the average of 2.95 and an egregious



violation rate of 15.5 compared to the average of .33. Dropping these companies resulted in a final sample of 72 companies.<sup>12</sup> Of these 72 companies, 24 operate in the paper industry, 18 operate in the oil industry, 15 operate in the steel industry, and 15 operate in the pulp industry.

### Dependent Variables

This study utilizes the violation data collected from the OSHA Management Information System (MIS), which is used by the agency to track enforcement and compliance and is available online. The violations include other, serious, repeat, willful, and unclassified as mentioned in the OSHA section above. OSHA violation data were collected at the facility level and include the reason for the inspection, the scope of the inspection, the type of inspection, the number and type of violations cited and the fines assessed. OSHA violations were collected for all violating facilities listed under the firm name in OSHA's Management Information System for the years 1990-2000. Although violations are facility violations, in this study, I aggregated the OSHA violations to the company level because the economic data were at the company level. Thus, all citations received by a company's facilities counted as violations by that company. The number of facilities owned by each company will be included as a rough proxy for the opportunity to commit violations. To analyze whether profit-squeeze leads to more OSHA violations, total violations was operationalized as a rate of violations per inspection to capture the opportunity for violations given an inspection. To determine whether profit-squeeze leads to more serious OSHA violations, I used three additional dependent variables. The most egregious violations available to OSHA inspectors are the repeat, willful and

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<sup>12</sup> Analysis was conducted including the outliers trimmed to within three standard deviations of the mean. The inclusion of the outliers did not consistently affect financial performance variables, and so the outliers were dropped for the analysis reported below.

unclassified violations; these are also the most rarely cited violations. Thus, these three violation types were combined and counted as the egregious violations in my data. The ‘other’ violations cited by OSHA inspectors count as the least egregious violations, and serious violations are considered more serious than ‘other’ violations but not as serious as egregious violations. These three variables also will be operationalized as a rate of violations per inspection. The distribution of violations and the rate of violations over time is displayed in Table 7 (p.38). The violations appear fairly distributed over time. Not surprisingly, there is a decline in total violations and an increase in egregious violations in the years 1995 and 1996. As discussed previously, OSHA experienced threatened budget cuts during this period and shifted its attention to more egregious violations, which monopolize resources (Siskind, 2002). Surprisingly, though, the fewest violations were cited from 1998-2000. This is unexpected since Siskind (2002) reported that a recovery in the number of inspections occurred beginning in 1997. In order to determine whether this change in OSHA inspections affects my results, I will run a second analysis and split the data into two four-year periods.

**Table 7. Chronological Distribution of Inspections, Violations and Rate of Violations\***

YEAR	INSPECTIONS	TOTAL VIOLATIONS (RATE OF VIOLATIONS)	EGREGIOUS VIOLATIONS (RATE OF EGREGIOUS VIOLATIONS)
1993	192	715 (4.60)	45 (.39)
1994	242	763 (3.47)	41 (.20)
1995	183	574 (3.70)	193 (1.85)
1996	153	431 (3.98)	117 (1.01)
1997	157	585 (3.32)	34 (.21)
1998	113	227 (1.87)	12 (.09)
1999	131	320 (2.55)	21 (.11)
2000	133	245 (2.07)	12 (.24)

\*Serious and other violations and rates are not shown because they followed the general pattern of total violations and rate of total violations.

## Independent Variables

### *Firm Level*

Economic data at the firm level were collected from Mergent Online for the years 1993-2000 and includes current assets, total assets, total liabilities, total stockholder's equity, total sales, and total net income. Following Clinard and Yeager (1980), I use three measures of financial performance at the firm level. Profitability was measured by dividing net income by the total sales of the firm. Efficiency was measured by dividing a firm's total sales by its assets, and liquidity was defined as "a firm's working capital (the difference between current assets and current liabilities) divided by total corporate assets" (Clinard & Yeager, 1980, p. 128). These three ratios measure different aspects of firm performance and are commonly used by corporate officials to assess firm performance (Clinard & Yeager, 1980). Also following Clinard and Yeager (1980), I include three variables measuring the eight-year trend in financial improvement or decline over the period 1993-2000. I created these variables by regressing each financial performance variable over time for each company; the coefficients from the regressions became the trend variables. Whereas profitability, efficiency, and liquidity allow me to determine whether a company with better financial performance commits fewer violations, these trend variables for profitability, efficiency, and liquidity allow me to determine whether a company experiencing increasing financial performance over the eight-year period commits fewer violations. In other words, these trend variables allow for a more direct test of the profit-squeeze and crime relationship. (These variables along with those discussed below are displayed in Table 8 (p.43)).

Prior violation data were collected from the OSHA MIS for the years 1990-1992. Prior violations were totaled for each company, and the data were used to create a dummy variable. In the analyses to follow, zero represents no violations and one represents one or more violations.

### *Industry Level Variables*

Originally, I intended to include variables to measure industry profitability and concentration; however, the averaging of the data over the eight-year period resulted in the loss of variation in these variables since I am only examining firms in four industries. Thus, I rely on dummy variables for industry membership. I used paper as the omitted category in the initial analyses, and then I tested for significant differences between the other industry groups.

### Control Variables

#### *Firm Level Variables*

The OSHA literature provides some information on control variables that are relevant to this study. For example, many of the studies provide characteristics of firms that are inspected more heavily by OSHA. Using these variables, I can attempt to control for the enforcement activity of OSHA. Many of these studies concluded that large firms are more likely to be inspected than small firms (Weil, 1996, Scholz & Gray, 1990, Gleason & Barnum, 1976, Weil, 1991). Further, Scherer et al. (1993) found that OSHA inspectors spent more time onsite during inspections in larger firms than in smaller ones, and inspectors cited more violations in larger firms than smaller firms. The authors concluded that larger firms were at a disadvantage when it came to probability of being inspected and cited. However, larger firms were able to negotiate better penalty

reductions than smaller firms, and so larger firms have the advantage when it comes to bargaining power and penalty amounts. Since larger firms tend to be inspected more than smaller firms, I controlled for the size of the company. Company size was measured as the average number of employees in the company for the eight-year study period. This measurement has been used in the corporate crime literature (McKendall, 1999, 2002) and in the OSHA literature (Ruser & Smith, 1990). Most studies of OSHA inspections measure firm size using number of employees because the nonrandom programmed inspections are primarily based on observable factors, such as the industry and employment size (Gray & Jones, 1991). The number of employees in a company was obtained from Mergent Online.

Union membership is another variable I included in my analysis in order to control for the enforcement activity of OSHA. As mentioned earlier, employees have the ability to initiate an inspection through a complaint and the ability to influence the outcome of the inspection by accompanying the inspector on the inspection (Weil, 1991). According to Weil (1991), employees of unionized firms tend to participate in the inspection process at much higher rates than employees of nonunionized firms. Consequently, Weil (1991) found that a higher number of violations and penalties were cited in unionized firms versus comparable nonunion establishments. Also, Bartel and Thomas (1985) found that OSHA inspectors targeted nonunion firms in order to impose costs on nonunion competitors of union firms. Therefore, I include the union membership measure in my analysis in order to try and capture the extra influence exerted by union members on OSHA enforcement. Union membership was collected from the OSHA MIS along with the rest of the violation data. However, this measure,

like the violations, is provided at the facility level. Thus, I aggregated this measure up to the company level by operationalizing it as the percentage of the company's inspected facilities that were unionized.

Another control variable I include in my analysis is for inspections conducted by Fed OSHA. As I mentioned, 21 states had their own state plans and were not inspected by Fed OSHA but by their own state inspectors. I include inspections conducted and violations cited by both state and Fed OSHA inspector and control for the difference using the percentage of inspections for each company that were conducted by Fed OSHA.

I also used the number of facilities owned by a firm as a control variable in my analysis. Including this variable in my data allowed me to control for the opportunity of a firm to violate an OSHA regulation. For example, it implies something different if company A has 10 facilities and 50 violations and company B has 2 facilities and 50 violations. This means that company A's facilities are generating about five violations each while company B's facilities are generating 25 violations each. Alternatively, if Company A has 250 violations instead of 50, then each facility would generate the same number of violations as in company B. I collected the number of facilities owned by a firm for each of the eight years during the study period (when available). I gathered the data using the companies' 10-K reports, which are available online from Mergent Online.

**Table 8. Descriptives of Variables, Averaged for Years 1993-2000**

VARIABLE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
Total violations (Total violations/inspections)	2.948	2.154	0	8.938
Egregious violations (Egregious violations/inspections)	0.328	1.052	0	7.667
Serious violations (Serious violations/inspections)	1.680	1.376	0	7.483
Other violations (Other violations/inspections)	0.912	0.877	0	3.667
Profitability (Net income/Total sales)	0.025	0.035	-0.067	0.113
Profitability Trend (Slope of Profitability over time)	0.001	0.018	-0.081	0.074
Efficiency (Total sales/Total assets)	1.048	0.439	0	2.709
Efficiency Trend (Slope of Efficiency over time)	0.016	0.082	-0.133	0.390
Liquidity ((Current assets – current liabilities)/Total assets)	0.079	0.085	-0.093	0.342
Liquidity Trend (Slope of Liquidity over time)	-0.003	0.018	-0.110	0.023
Prior violations (0=none, 1=one or more)	0.716	0.454	0	1
Firm size (Average number of employees)	19,142.31	18,413.89	441.875	82,833.33
Union membership (Percent of inspected facilities represented by a union)	0.870	0.235	0	1
Fed OSHA (Percent of inspected facilities covered by Federal OSHA)	0.487	0.378	0	1
Facilities (Number of facilities)	6.684	5.836	1	27.286
Pulp (1=pulp, 0=not pulp)	0.216	0.415	0	1
Steel (1=steel, 0=not steel)	0.203	0.405	0	1
Oil (1=oil, 0=not oil)	0.243	0.432	0	1

## Statistical Procedure

Since my dependent variables are calculated as rates, they are truncated at zero. Therefore, I employed a TOBIT regression model in my analysis. In order to adjust for heteroskedasticity problems in my data, I ended up using a variation of a TOBIT regression that allows for such adjustments. Like OLS, TOBIT regressions use maximum likelihood estimation. The difference is that with TOBIT, the likelihood function is composed of two parts: the observations where the variable is censored at zero, and the observations where the dependent variable is positive. Once the likelihood function is defined correctly, traditional techniques are used to maximize the likelihood function and to find the estimates for the coefficients (McKendall et al., 1999).

For the initial analysis, I averaged all eight years of data. The disadvantage of this is that I lost the variation in the industry variables and so I had to rely on the dummy variables for industry membership (paper is the omitted industry in the reported analyses). In order to test my second hypothesis, I ran the initial analysis without the dummy variables and then with the dummy variables to determine whether the significance of the financial performance variables was attenuated by controlling for industry. I also split the data into two four-year periods in order to determine whether the declines in OSHA enforcement that occurred in 1995-1996 and from 1998-2000 affected the results of the analysis with all eight years of data. This split will also allow me to test the robustness of my findings in the models for the full eight-year period and determine whether there are any short-term financial performance trends that could not be detected in the models for the full eight years.



I noted earlier that the pulp and paper industries are closely interconnected. Pulp facilities produce pulp, which is used in the production of paper. Further, the majority of facilities in these two industries operate as both pulp and paper facilities or as paper-only facilities (SNP Pulp and Paper, 1995). Therefore, I wanted to determine if the models provided a better fit with the data when the pulp and paper industries were combined. I performed a likelihood ratio test to determine if including pulp in the models provided an improvement over the models with pulp and paper combined as one industry. In all but one of the models, I rejected the null hypothesis and determined that adding pulp as a separate industry provided a significant improvement over combining the two industries. Thus, results are reported for the models with all four industries included, and I discuss the results from the analysis using the three industries only for the model (rate of egregious violations for years 1997-2000) where the null hypothesis of equivalence could not be rejected.

## Chapter IV - Results and Discussion

### Bivariate Results

The correlation coefficients for all the variables in the model are reported in Table 9 (p. 48). The results show that profitability is inversely related, though not significantly related, to total violations ( $r = -.040$ ) and egregious violations ( $r = -.181$ ) but positively related to serious violations ( $r = .035$ ) and other violations ( $r = .091$ ). Efficiency is inversely related to egregious violations ( $r = -.022$ ) positively related to total violations ( $r = .111$ ) serious violations ( $r = .046$ ) and other violations ( $r = .067$ ). Liquidity is inversely related to egregious violations ( $r = -.081$ ) but positively related to total violations ( $r = .070$ ), serious violations ( $r = .111$ ) and other violations ( $r = .112$ ). Priors are also positively, though not significantly, related to all violation types. Union membership is inversely related to total violations ( $r = -.095$ ), serious violations ( $r = -.212$ ) and other violations ( $r = -.087$ ) and positively related to egregious violations ( $r = .139$ ). None of the relationships between industry membership variables and violations are significant, but membership in the pulp industry is inversely related to all violation types except for serious violations while membership in the steel industry is inversely related to all violation types except for egregious violations. Finally, membership in the oil industry is inversely related to total and other violations but positively related to egregious and serious violations.

The correlations for number of facilities and size ( $r = .613$ ) were quite high and significant, but they are being used as controls and so not a huge cause for concern. However, the coefficients for efficiency and the dummy for oil ( $r = .563$ ) and liquidity and the dummy for steel ( $r = .655$ ) were also quite high and relevant to hypotheses so it is

important to note possible multicollinearity in my results concerning these four variables. To assess whether multicollinearity affects key independent variables of interest, I plan to run separate analyses for theoretically relevant sets of variables. Since bivariate results can be spurious, I now turn to multivariate analyses to investigate whether these reported relationships hold.

**Table 9. Correlation Matrix, Means and Standard Deviations of Variables (N=72) <sup>+</sup>**

	Profitability	Efficiency	Liquidity	Number of facilities	Size	Fed OSHA	Union	Pulp	Steel	Oil	Priors
Profitability	1										
Efficiency	-0.100	1									
Liquidity	-0.041	0.102	1								
Number of facilities	-0.013	-0.225	-0.283*	1							
Size	0.246*	-0.112	-0.509**	0.613**	1						
Fed OSHA	-0.269*	0.001	0.107	0.019	-0.062	1					
Union	-0.147	-0.164	-0.133	0.075	0.113	0.142	1				
Pulp	0.103	-0.245*	-0.135	0.107	0.180	-0.174	0.129	1			
Steel	-0.161	0.045	0.655**	-0.163	-0.285*	0.227	-0.024	-0.265*	1		
Oil	0.023	0.563**	-0.345*	-0.239*	0.072	0.007	-0.181	-0.298**	-0.286*	1	
Priors	-0.155	0.071	0.016	0.049	0.073	0.230*	0.040	-0.325**	0.168	0.147	1
Total violations	-0.040	0.111	0.070	-0.163	-0.221	0.230*	-0.095	-0.102	-0.094	-0.024	0.081
Egregious violations	-0.181	-0.022	-0.081	-0.126	-0.122	0.227	0.139	-0.102	0.134	0.131	0.165
Serious violations	0.035	0.046	0.111	-0.179	-0.205	0.220	-0.212	0.245	-0.131	0.006	0.020
Other violations	0.091	0.067	0.112	-0.064	-0.113	-0.008	-0.087	-0.022	-0.171	-0.195	0.020
Mean	0.024	1.048	0.079	6.684	19142.31	0.487	0.870	0.216	0.202	0.243	0.716
STD Dev.	0.035	0.439	0.085	5.836	18413.89	0.378	0.235	0.414	0.405	0.432	0.454

+Violation variables shown are calculated as violations per inspection

\*p<0.05

\*\*p<0.01

(Two-tail test)

## TOBIT Regression Results

The results of the models for all eight years of data are reported in Table 10 (p.50). The trend variables measuring financial improvement or decline over the eight-year period were dropped from these models because they were not significant, and I had concerns about the number of variables in my models given the number of cases in my sample.<sup>13</sup> TOBIT procedures do not produce an  $R^2$  statistic so I calculated a McFadden's pseudo  $R^2$ , which is calculated by dividing the constrained likelihood function by the unconstrained likelihood function and then subtracting the result from one. Compared to the standard  $R^2$ , the pseudo  $R^2$  significantly understates the amount of variance explained by the model (McKendall & Wagner, 1997). Thus, the pseudo  $R^2$  that are displayed in Table 10 appear small. TOBIT procedures produce a Wald chi-squared test that assesses whether the relationships in the model are attributable to chance; this is also reported in Table 10 (p. 50). The Wald chi-squared test was significant for all the models except for egregious violations, suggesting that the relationships in that model may be due to chance.

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<sup>13</sup> It could be that the trend variables are not significant in the full models because companies do not have long-term patterns of financial improvement or decline or long-term patterns do not influence decisions to violate regulations. Therefore, I include the trend variables in the models for the two four-year periods since companies may exhibit more short-terms patterns of financial improvement or decline that influence illegal behavior.

**Table 10. TOBIT Analysis, 1993-2000 (N=72)**

INDEPENDENT VARIABLE	RATE OF TOTAL VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF TOTAL OSHA VIOLATIONS (STD. BETA)	RATE OF EGREGIOUS OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF EGREGIOUS OSHA VIOLATIONS (STD. BETA)	RATE OF SERIOUS OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF SERIOUS OSHA VIOLATIONS (STD. BETA)	RATE OF OTHER OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF OTHER OSHA VIOLATIONS (STD. BETA)
Profitability	7.0102 (0.113)	5.684 (0.092)	-3.183 (0.105)	-1.632 (0.054)	6.694 (0.169)	5.539 (0.140)	4.864 (0.193)	4.520 (0.179)
Efficiency	0.740 (0.151)	1.605* (0.327)	-0.038 (0.016)	-0.138 (0.057)	0.669 (0.213)	1.249* (0.398)	0.405 <sup>+</sup> (0.202)	1.065** (0.533)
Liquidity	-1.741 (0.069)	-0.928 (0.037)	-4.453 (0.361)	-7.314 (0.592)	-0.511 (0.032)	0.728 (0.045)	2.139 (0.225)	2.215 (0.215)
Number of Facilities	0.012 (0.033)	-0.041 (0.111)	0.015 (0.084)	0.013 (0.070)	-0.009 (0.040)	-0.057* (0.244)	0.010 (0.066)	-0.024 (0.156)
Priors	0.123 (0.026)	0.338 (0.071)	1.052 (0.454)	0.840 <sup>+</sup> (0.362)	-0.059 (0.020)	0.056 (0.018)	0.104 (0.054)	0.298 (0.154)
Fed OSHA	1.341 <sup>+</sup> (0.235)	1.639* (0.287)	0.973 (0.349)	0.941 <sup>+</sup> (0.338)	1.018* (0.280)	1.258** (0.345)	0.125 (0.054)	0.347 (0.149)
Union	-0.0169 (0.002)	-0.498 (0.054)	1.020 (0.228)	1.079 <sup>+</sup> (0.241)	-0.670 (0.114)	-1.007 (0.172)	0.342 (0.092)	-0.026 (0.007)
Size	-0.00004* (0.365)	-0.00003* (0.287)	-0.00004 (0.621)	-0.00003 <sup>+</sup> (0.572)	-0.00002 <sup>+</sup> (0.268)	-0.00001 (0.135)	-0.00005 (0.105)	-0.000009 (0.019)
Pulp		-1.105 <sup>+</sup> (0.213)		-0.636 (0.251)		-1.192** (0.359)		-0.473 (0.224)
Steel		-2.083** (0.392)		0.827 (0.318)		-1.783** (0.524)		-1.255** (0.579)
Oil		-2.309** (0.463)		0.066 (0.027)		-1.765** (0.554)		-1.576** (0.776)
Pseudo R <sup>2</sup>	0.041	0.085	0.124	0.155	0.069	0.179	0.033	0.181
Wald chi <sup>2</sup>	20.31**	31.80**	7.81	9.19	21.75**	35.82**	7.72	38.43**

+p<0.1, \*p<0.05, \*\*p<0.01 (One-tail test)

The hypothesized relationship between firm profit-squeeze and crime is not truly tested in these full models since the data was aggregated and the financial trend variables, which measure whether a firm was experiencing declining profits over the eight-year period, are dropped. As stated before, these trend variables were dropped from the full models because they were not significant and I was concerned about the number of variables in the models given the small number of companies in my sample. However, the results can show whether firms with lower levels of profitability, efficiency, and liquidity commit more violations. The first model actually shows that efficiency was the only financial performance variable to significantly predict more total violations, and it is in the opposite direction than hypothesized; more efficient firms were significantly more likely to commit more total violations ( $p < 0.05$ ). Further, efficiency produces one of the stronger effects on total violations according to the standardized Beta (.327). Similarly, profitability is positive but insignificantly related to total OSHA violations. Only liquidity was in the hypothesized direction, but it was not significant. These data do not support my second hypothesis that controlling for industry would attenuate profit-squeeze at the firm level. None of the financial performance variables are significant in the model without industry dummy variables, and the impact of the variables on violations was not greatly affected by adding the dummy variables to the analysis except for the impact of efficiency, which actually increased from  $B = .151$  to  $B = .327$  when the dummy variables were added. However, industry variables are significant, and the standardized betas show that membership in the steel ( $B = .392$ ) and oil ( $B = .463$ ) industry produce the greatest effect on rate of total violations. Firms in the oil industry were significantly ( $p < 0.01$ ) less likely to commit OSHA violations than firms in the paper industry. I tested for

significant differences between the other groups, and firms in the oil industry were significantly less likely to commit violations than firms in the pulp industry as well. Firms in the pulp industry were significantly less likely to commit violations ( $p < 0.1$ ) than firms in the paper industry, but significantly more likely to commit violations ( $p < 0.1$ ) than firms in the oil industry, according to subsequent tests of significance between the industry groups. Also, firms in the steel industry were significantly less likely to commit total violations ( $p < 0.01$ ) compared to firms in the paper industry. Finally, regarding the last hypothesis, firms with prior violations were more likely, though not significantly more likely, to commit total OSHA violations. A quick look at the control variables shows that firms covered by Fed OSHA were significantly more likely to commit violations ( $p < 0.05$ ) and unionized firms were less likely, but not significantly so, to commit serious violations. Size and number of facilities had negative effects on violations, though only size was significant ( $p < 0.05$ ).

For the second model, it should be noted that the Wald chi-squared test showed the results could not be distinguished from relationships that would occur by chance, making these results less reliable than those from other models. With this in mind, these results should be interpreted cautiously. The coefficients for all three financial performance variables in this model are in the hypothesized direction, showing that more profitable and efficient firms and firms with more liquidity are less likely to commit egregious OSHA violations. While none of these variables are significant predictors of egregious violations, it is interesting to note that liquidity exerts the greatest effect on egregious violations, according to the standardized Beta (.592). The second hypothesis is also not supported by the results in this model. Once again, none of the financial



performance variables are significant in the model without dummy variables. The impact of profitability is reduced by half in this model, but the impact of both efficiency and liquidity increases when the dummy variables are added. While none of the dummies for industry membership are significant, the results show that firms in the oil industry are more likely than firms in the paper and pulp industry to commit egregious violations. Firms in the pulp industry committed the fewest egregious violations, although, like all of the industry variables, this finding was not significant. There is now evidence, though it is weak given the Wald chi-squared results for this model, that firms with prior violations are significantly more likely to commit egregious violations ( $p < 0.1$ ). Firms covered by Fed OSHA were, again, significantly more likely to commit violations ( $p < 0.1$ ). Interestingly, in this model, unionized firms were significantly more likely to commit egregious violations ( $p < 0.1$ ), although the size of this effect is modest with a standardized Beta of .241. In this model, priors had a larger impact on egregious violations than being covered by Fed OSHA and unionization but had a smaller impact than size; size ( $B = .572$ ) had the second largest impact on egregious violations. Larger firms were less likely to commit these types of offenses.

Contradicting the first hypothesis, the results from the third full model show that firms with greater efficiency commit more serious violations ( $p < 0.05$ ). And efficiency ( $B = .398$ ) had the greatest impact on serious violations with the exception of the industry membership variables. Once again, the second hypothesis was not supported; none of the financial performance variables are significant without the dummy variables. The only effect that is attenuated is that of profitability, but this is a very minimal change from  $B = .169$  to  $B = .140$ . Despite the lack of support for hypothesis two, the industry dummy

variables are significant and exerted the largest effect on serious violations according to the standardized Betas. Firms in the oil, steel, and pulp industries commit fewer serious violations than firms in the paper industry. Subsequent tests showed that the dummy for pulp was not significantly different from steel or oil. Finally, in support of the last hypothesis, firms with prior violations were more likely, though not significantly more likely, to commit serious violations. Firms covered by Fed OSHA were significantly more likely to commit serious violations ( $p < 0.01$ ), and this was once again one of the more important variables in the analysis according to the standardized coefficient. The union coefficient in this model returned to being negatively, but not significantly, related to violations.

The results of the final full model show that, once again, efficiency is positively related to violations; more efficient firms are significantly more likely to commit the least serious OSHA violations ( $p < 0.01$ ). The magnitude of this effect is high ( $B = .533$ ), although not as high as the effect of the industry membership variables. The data show no support for the second hypothesis. The only financial performance variable that is significant in the model without the industry dummy variables is efficiency, and the impact of efficiency increases when the dummy variables are added. The impact of both profitability and liquidity does decrease slightly, but neither variable is significant. Once again, the industry dummy variables are highly significant. Firms in the steel and oil industries are significantly less likely to commit other OSHA violations than firms in the paper industry ( $p < 0.01$ ). Further analysis showed that firms in the oil industry were also significantly less likely to commit other OSHA violations than firms in the pulp industry, but oil was not significantly different from steel. Subsequent significance tests showed

that pulp was significantly more likely to commit other violations than firms in the steel ( $p < 0.1$ ) and oil ( $p < 0.01$ ) industries. Membership in the oil industry had the largest impact on other violations with a standardized Beta of .776. Hypothesis three receives weak support; firms with prior violations are more likely, though not significantly more likely, to commit the least serious OSHA violations, and the effect of priors is not large according to the standardized Beta. Being covered by Fed OSHA is again positively related to violations and union members are again less likely to commit violations, although this time neither finding is significant nor do they exert a large impact on other violations.<sup>14</sup>

In summary, the results from the full models covering all eight years, showed little support for the research hypotheses. As mentioned previously, these models do not directly test the profit-squeeze and crime relationship because the data are aggregated and the trend variables are dropped from the models. However, the results indicate that, contrary to the rationale of a profit-squeeze and crime argument, firms with more efficiency appear significantly more likely to commit total, serious, and other OSHA violations. The second hypothesis also received no support, although the industry variables were significant in three of the four models. The final hypothesis, that firms with prior violations would commit more and more serious violations, was directionally supported in the four models, although the coefficient was only significant for egregious

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<sup>14</sup> Because the results from the multivariate analysis tended to differ from those in the bivariate analyses, I had concerns about multicollinearity. Thus, I ran the analysis with theoretically coherent measures analyzed together in smaller groups. On the whole, the coefficients remained in the same direction as reported in the full model. The exceptions were that profitability became negatively, although not significantly, related to total violations, priors became negatively related to serious violations, and being covered by Federal OSHA became negatively related to other violations. Aside from these few differences, the results were consistent with those reported.

violations. The most consistent and significant finding was that firms covered by Fed OSHA commit more and more serious violations.<sup>15</sup>

The results of the second analysis, which includes averaged data for each company for the first four years of the sample period, 1993-1996, are presented in Table 11 (p.57). In these models, I explore the robustness of the results from the full models, and I include the financial performance trend variables to determine whether there are short-term financial patterns of improvement or decline that affect corporate violations of OSHA. I expect to find that there are more short-term patterns in financial performance so the financial performance trend variables should be significant in these models. However, the addition of the trend variables makes the number of variables in my analysis (14) very high compared to the number of cases in my sample (60).<sup>16</sup> Thus, the analysis is exploratory and the results should be interpreted with that in mind. Table 11 (p.57) shows that the relationships in the regression for egregious violations are again likely attributable to chance.

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<sup>15</sup> To further explore these results, I ran these same models replacing Clinard and Yeager's (1980) measure of profitability with the one used by Keane (1993). Keane (1993) calculated profitability as net income divided by total assets. These results are not shown because they were almost identical to those reported above. The only difference was that union membership was significantly and negatively related to serious OSHA violations ( $p < 0.05$ ) and number of facilities was significantly and negatively related to other OSHA violations ( $p < 0.1$ )

<sup>16</sup> The sample size was reduced for the two four-year periods from 72 to 60 because there were several companies that either ceased to exist in the 1997-2000 period or companies that did not exist until the 1997-2000 period. Further, some companies received all of their violations in one period or the other and so were eliminated from the period in which no violations were received.

**Table 11. TOBIT Analysis, 1993-1996 (N=60) (+p<0.1, \*p<0.05, \*\*p<0.01) (One-tail test)**

INDEPENDENT VARIABLES	RATE OF TOTAL OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF TOTAL OSHA VIOLATIONS (STD. BETA)	RATE OF EGREGIOUS OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF EGREGIOUS OSHA VIOLATIONS (STD. BETA)	RATE OF SERIOUS OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF SERIOUS OSHA VIOLATIONS (STD. BETA)	RATE OF OTHER OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF OTHER OSHA VIOLATIONS (STD. BETA)
Profitability	15.073 (0.239)	13.885 (0.220)	1.114 (0.031)	0.669 (0.019)	12.649 (0.340)	11.625 (0.312)	0.760 (0.031)	0.667 (0.028)
Profitability Trend	9.153 (0.112)	4.970 (0.061)	-1.877 (0.041)	-3.248 (0.071)	12.148 (0.251)	9.717 (0.200)	-2.542 (0.081)	-4.595 (0.147)
Efficiency	-0.336 (0.054)	0.719 (0.115)	-0.952 (0.270)	-0.503 (0.142)	0.272 (0.073)	0.782 (0.211)	0.146 (0.061)	0.746* (0.311)
Efficiency Trend	5.204 (0.230)	7.687 (0.339)	6.212 (0.486)	6.198 (0.485)	-1.417 (0.106)	0.040 (0.003)	-1.130 (0.130)	0.341 (0.039)
Liquidity	5.706 (0.190)	8.150 (0.271)	0.456 (0.027)	-5.329 (0.315)	-0.323 (0.018)	2.896 (0.163)	1.986 (0.173)	2.590 (0.225)
Liquidity Trend	-26.280 (0.217)	-30.094 (0.249)	-13.828 (0.203)	-11.231 (0.165)	-6.541 (0.091)	-7.654 (0.107)	-5.738 (0.124)	-9.153 <sup>+</sup> (0.198)
Number of Facilities	-0.039 (0.073)	-0.161* (0.303)	-0.020 (0.068)	-0.058 (0.192)	-0.036 (0.113)	-0.102* (0.325)	0.008 (0.038)	-0.056 <sup>+</sup> (0.276)
Priors	-1.260 (0.188)	-0.804 (0.120)	1.521 <sup>+</sup> (0.402)	1.403 (0.371)	-0.860 (0.216)	-0.613 (0.154)	-0.668 (0.260)	-0.404 (0.157)
Fed OSHA	0.879 (0.119)	1.423 (0.193)	1.110 (0.266)	1.126 (0.270)	0.771 (0.176)	1.103 <sup>+</sup> (0.252)	-0.082 (0.029)	0.235 (0.083)
Union	-0.343 (0.034)	-1.419 (0.140)	1.381 (0.242)	1.493 (0.262)	-1.144 (0.191)	-1.656** (0.277)	-0.305 (0.079)	-0.944* (0.244)
Size	-0.000003 (0.018)	0.00002 (0.155)	-0.00002 (0.203)	-0.00002 (0.177)	-0.000004 (0.043)	-0.00001 (0.145)	.000003 (0.050)	-0.00002 <sup>+</sup> (0.267)
Pulp		-1.374 (0.194)		-1.052 (0.264)		-1.249* (0.298)		-0.306 (0.113)
Steel		-3.122** (0.463)		0.568 (0.150)		-2.291** (0.574)		-1.353** (0.524)
Oil		-3.671** (0.567)		-1.116 (0.306)		-2.040** (0.532)		-1.923** (0.775)
Pseudo R <sup>2</sup>	0.041	0.098	0.116	0.135	0.060	0.163	0.048	0.189
Wald chi <sup>2</sup>	10.16	24.66*	7.57	9.68	28.38**	43.87**	9.68	29.26**

As shown in Table 11 (p.57), the first hypothesis receives partial support. Only one financial trend variable is significant; firms experiencing an increase in liquidity over the four-year period have significantly fewer other violations ( $p < 0.1$ ), although the magnitude of this finding is not very strong ( $B = .198$ ). The liquidity trend variable is also negatively related to total, egregious, and serious violations. Although the effect is fairly strong in the first model ( $B = .249$ ), it is not significant or large in magnitude in any of the other models. The profitability trend variable is also in the hypothesized direction, although not significant, for egregious and other violations. However, as in the full models, more efficient firms are more likely to commit total and serious violations and significantly more likely to commit other violations ( $p < 0.05$ ) according to the results in Table 11 (p. 57). The magnitude of the effect of efficiency on other violations is moderate ( $B = .311$ ) although not as strong as the effect of the industry dummy variables. The second hypothesis, as in the full models, receives little support. The financial performance variables were not significant in the models without the dummy variables, and once again, the impact of the variables on violations was not consistent. For instance, the magnitude of all the financial performance variables, except for profitability and profitability trend, increases for total violations. Similarly, for egregious violations, the magnitude of all the financial performance variables except for profitability trend and liquidity decreases. The magnitude of the profitability variable is attenuated in all models by adding the dummy variables, while the magnitude of the liquidity variable is increased in all models. These very inconsistent results do not lend strong support to the second hypothesis. However, the industry membership variables for steel and oil are once again significant and exhibit the strongest effects in all four models according to the

standardized betas. Firms in the oil and steel industries are significantly less likely to commit total violations ( $p < 0.01$ ), serious violations ( $p < 0.01$ ) and other violations ( $p < 0.01$ ) than firms in the paper industry. Later analysis revealed that firms in the oil industry were also significantly less likely to commit total violations ( $p < 0.05$ ) and other violations ( $p < 0.01$ ) than firms in the pulp industry. Firms in the pulp industry were significantly less likely to violate serious violations ( $p < 0.05$ ) than firms in the paper industry, but were more likely to violate serious violations ( $p < 0.1$ ) than firms in the steel industry, according to subsequent tests of significance between industry groups. The data from these models also do not support the last hypothesis. Firms with priors actually committed fewer total, serious, and other violations, although these results were not significant. Priors were related to more egregious violations and the magnitude is one of the largest reported in that model ( $B = .371$ ), but this result also failed to gain significance. Being covered by Fed OSHA is still related to more violations but only significantly related to more serious violations. Firms with more facilities commit fewer total, serious, and other violations in these models, although this is only a moderate effect compared to other variables in the models. Finally, union membership is significantly and negatively related to serious and other violations, and according to the standardized Betas, these are moderate effects.

The models for the first four-years seem to support the general findings of the full models. Also, by including the financial performance trend variables, I was able to explore whether short-term patterns of financial performance affected OSHA violations. These data show that in the first four years, firms experiencing improved liquidity were less likely to commit other OSHA violations. However, the magnitude of this effect was

weak. Also, it should be noted again that the same concern I had about adding these trend variables to the full models is still present in these partial models so the analysis of these models should be considered exploratory and the results should be interpreted carefully.<sup>17</sup>

The Tobit results for the averaged data for the years 1997-2000 are displayed in Table 12 (p.61). I include the financial performance trend variables in this analysis as well. This analysis, like the one for the years 1993-1996, is exploratory; by adding the trend variables, I increase the number of variables in the analysis, which is a cause for concern given the sample size. Thus, the results should be interpreted with this in mind. In this model, it is the relationships in the regression for rate of serious violations that may be attributable to chance. The explained variance increased from the variance explained by the full models and the models for 1993-1996 with the exception of rate of serious violations, which suggests that the models do a better job of explaining the relationships in the last four years of data.

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<sup>17</sup> Once again, I reran these regressions using Keane's (1993) measure of profitability. Once again, the results were identical for serious and other violations. However, there were some differences for total violations and egregious violations. For total violations, profitability was significantly and positively related to violations ( $p < 0.1$ ). The trend for efficiency was also positively and significantly related to violations while the trend for liquidity was significantly and negatively related to violations. These changes add to the mixed support for the first hypothesis. For the egregious violations, the coefficients for priors ( $p < 0.05$ ) and Fed OSHA ( $p < 0.1$ ) gained significance.



**Table 12. TOBIT Analysis, 1997-2000 (N=60)**

INDEPENDENT VARIABLE	RATE OF TOTAL OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF TOTAL OSHA VIOLATIONS (STD. BETA)	RATE OF EGREGIOUS OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF EGREGIOUS OSHA VIOLATIONS (STD. BETA)	RATE OF SERIOUS OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF SERIOUS OSHA VIOLATIONS (STD. BETA)	RATE OF OTHER OSHA VIOLATIONS WITHOUT DUMMIES (STD. BETA)	RATE OF OTHER OSHA VIOLATIONS (STD. BETA)
Profitability	6.286 (0.070)	1.840 (0.021)	-2.100 (0.329)	-0.225 (0.035)	4.440 (0.062)	1.293 (0.018)	0.543 (0.025)	-1.042 (0.047)
Profitability Trend	17.072 (0.117)	6.930 (0.048)	7.153 (0.687)	6.962** (0.669)	2.653 (0.023)	-4.293 (0.037)	8.844 (0.246)	4.644 (0.129)
Efficiency	5.155 <sup>+</sup> (0.550)	7.130* (0.761)	0.660** (0.987)	0.689** (1.030)	3.641 (0.486)	5.028 <sup>+</sup> (0.671)	1.368* (0.591)	1.761** (0.761)
Efficiency Trend	-5.876 (0.032)	-7.180 (0.284)	-1.001* (0.075)	-0.858** (0.475)	-4.650 (0.031)	-5.588 (0.276)	0.307 (0.007)	-0.079 (0.013)
Liquidity	7.492 (0.145)	10.214 <sup>+</sup> (0.198)	1.281 (0.347)	-0.524 (0.142)	4.149 (0.100)	6.357 (0.154)	5.778 (0.453)	7.464 <sup>+</sup> (0.585)
Liquidity Trend	-23.167** (0.430)	-19.664* (0.365)	-2.143* (0.558)	-1.422 <sup>+</sup> (0.370)	-15.730* (0.365)	-13.375 <sup>+</sup> (0.310)	-8.777 <sup>+</sup> (0.660)	-8.124 <sup>+</sup> (0.611)
Number of Facilities	0.051 (0.067)	0.035 (0.046)	0.036** (0.661)	0.032* (5.843)	0.017 (0.028)	0.0004 (0.001)	0.033 (0.175)	0.015 (0.081)
Priors	1.186 (0.123)	1.995 <sup>+</sup> (0.207)	0.216 (0.313)	0.300* (0.436)	1.044 (0.135)	1.619 (0.210)	0.366 (0.154)	0.608 (0.255)
Fed OSHA	1.484 (0.138)	1.717 (0.159)	0.176 (0.228)	0.195 (0.253)	1.525 (0.177)	1.651 (0.191)	-0.342 (0.129)	-0.301 (0.113)
Union	2.494 (0.154)	2.140 (0.132)	0.740** (0.640)	0.673* (0.583)	1.622 (0.125)	1.356 (0.105)	1.222 (0.306)	1.020 (0.255)
Size	-0.00005 (0.222)	-0.00005* (0.249)	-0.00001** (0.832)	-0.00001** (0.790)	-0.00004 (0.219)	-0.00004 (0.231)	0.0000005 (0.009)	-0.000002 (0.039)
Pulp		-0.051 (0.005)		-----		-0.311 (0.037)		-0.388 (0.151)
Steel		-3.977* (0.345)		0.422* (0.513)		-2.997* (0.325)		-1.543* (0.542)
Oil		-3.675* (0.359)		-0.252 (0.344)		-2.697 <sup>+</sup> (0.329)		-1.051 (0.415)
Pseudo R <sup>2</sup>	0.095	0.126	0.534	0.407	0.084	0.108	0.132	0.207
Wald chi <sup>2</sup>	15.69	28.18*	66.68**	132.97**	9.51	13.71	24.19*	33.35**

+p<0.1, \*p<0.05, \*\*p<0.01 (One-tail test)

Unlike earlier analyses, these models show stronger economic relationships with offending. However, the findings are equivocal as to the direction of the relationship. In support of hypothesis one, the efficiency trend variable is significantly and negatively related to egregious violations ( $p < 0.01$ ), and the magnitude of this effect is moderate. The liquidity trend variable is negatively and significantly related to total ( $p < 0.05$ ), egregious ( $p < 0.1$ ), serious ( $p < 0.1$ ), and other violations ( $p < 0.1$ ); so firms with improving liquidity commit fewer of all types of OSHA violations. The magnitude of the effect of liquidity is moderately strong on total ( $B = .365$ ), egregious ( $B = .370$ ), and serious ( $B = .310$ ) violations, and it exerts a large effect on other OSHA violations ( $B = .611$ ). On the other hand, the profitability trend variable is not consistent with hypothesis one; it is positively and significantly related to egregious violations ( $p < 0.01$ ), and the magnitude of this effect is high according to the standardized Betas (.669). Also, efficiency is significantly and strongly positively related to all violations types and liquidity is significantly and positively related to total and other violations ( $p < 0.1$ ). The second hypothesis receives some support from these models. In the initial analysis without the industry dummy variables, the liquidity trend variables were significant, and the magnitude of the effect of these variables was higher than in the final models. For instance, for total violations, the liquidity trend variable was significant ( $p < 0.01$ ) and had a standardized Beta of .430 without the dummy variables; the effect diminished in the model with the dummy variables as seen in Table 12 (p. 61). Similarly, for egregious violations, the standardized beta for the liquidity trend variable was .558 without the dummy variables; this decreased to .370 in the model with the dummy variables. This attenuation of the effect of the liquidity trend variable with the addition of the industry

dummy variables provides some support for the second hypothesis. This support is tempered, though, by the fact the efficiency variable is also significant in most of the models, and the effect of efficiency actually increases each time the dummy variables are added. This same increase in magnitude occurs for the efficiency trend variable in the egregious violations model. Thus, this analysis shows stronger support for hypothesis two than previous analyses, but the support is mixed. The industry dummy variables for steel and oil were significant, although the magnitude of the effects were also lower than in prior analyses. Firms in the oil industry commit fewer total ( $p < 0.05$ ) and serious ( $p < 0.1$ ) violations than firms in the paper industry, and the later significance tests showed that firms in the oil industry also committed fewer total violations than firms in the pulp industry ( $p < 0.1$ ). While pulp is not significant in any of the models, subsequent significance tests revealed that firms in the pulp industry commit significantly more total violations than firms in the steel ( $p < 0.1$ ) and oil ( $p < 0.1$ ) industries and significantly more other violations than firms in the steel industry ( $p < 0.1$ ). In support of the final hypothesis, prior violations are positively and significantly related to total violations ( $p < 0.1$ ) and egregious violations ( $p < 0.05$ ). Size is negatively and positively related to total ( $p < 0.05$ ) and egregious ( $p < 0.01$ ) violations while number of facilities is significantly and positively related to egregious violations ( $p < 0.05$ ). Both size ( $B = .790$ ) and number of facilities ( $B = 5.843$ ) exert a large effect on egregious violations. Interestingly, union membership is positively related to all violation types and significantly related to egregious violations ( $p < 0.05$ ), and the magnitude of this effect on egregious violations is large (.583).

As mentioned for the first four-year period, the results from these models should be considered exploratory and interpreted with that in mind due to the small sample size. That said, the results for the final four years of data differed from the results of the earlier analyses. These models provide more support for the hypotheses. The results showed stronger support for a profit-squeeze argument at the firm level, although it is still mixed. These data also provided some support for the second hypothesis, which was not supported by earlier analyses. The third hypothesis also received support in these models. The relationship between violations and some of the control variables are in line with earlier analyses.<sup>18</sup>

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<sup>18</sup> I again reran the regressions using Keane's (1993) measure of profitability. For total violations, the profitability trend variable gains significance and is positively related to violations. For egregious violations, the liquidity trend variable loses its significance. These changes add to the mixed support for hypothesis one in these models. For other violations, the priors variable gains significance, providing added support for hypothesis three.

## Chapter V – Discussion and Conclusion

Overall, this research provided mixed support for a profit-squeeze and crime argument at the firm level. Aggregate analyses of all years and the separate analyses of the two four-year periods found that more efficient firms are more likely to commit violations. This finding is not consistent with a profit-squeeze and crime argument, but it does replicate findings by others who report that moderate to good financial performance is related to illegal behavior (Hill et al., 1992, Baucus & Near, 1991). In this analysis, though, the result could be a spurious one due to the efficiency measure. Efficiency indicates the sales generating ability of firm assets, but it is largely determined by the nature of production in different industries (Clinard & Yeager, 1980). In other words, certain industries strive for greater efficiency more than others. Thus, efficiency is highly correlated with the nature of certain industries. For this reason, Clinard and Yeager (1980) dropped efficiency from their final analysis. As seen in the bivariate results, efficiency was highly correlated with the dummy for the oil industry. Thus, the finding that more efficient firms are more likely to commit violations could be spurious.

The financial performance trend variables showed stronger support for the profit-squeeze argument. Profit-squeeze was related to violations in the analyses of the two four-year periods. This suggests that criminal outcomes do not result from long-term patterns of financial improvement or decline, but short-term patterns affect choices to commit illegal acts. The liquidity trend variable was negative and significant for other violations in the analysis for the years 1993-1996, and it was negative and significant for all violation types in the analysis for the years 1997-2000. Liquidity measures whether a firm is experiencing consistent operating losses; in this case, the data show that firms

experiencing operating growth commit fewer violations. Similarly, the efficiency trend was negative and significant for egregious violations in the analysis for the years 1997-2000. Clinard and Yeager (1980) note that while average efficiency is determined in large part by the nature of the industry, improved efficiency is desired by all industries, and is therefore, not tied to specific industries. This finding, then, is less suspicious than the findings regarding efficiency discussed above, and is more support for the profit-squeeze argument.

Support for a profit-squeeze argument is tempered, however, by the finding that firms with increasing profits committed more egregious OSHA violations between 1997-2000. According to Clinard & Yeager (1980), the profitability ratio is “frequently used as the ultimate test of management effectiveness” (p. 128); it basically shows how well managers are using assets to produce income. There are several ways of interpreting this finding. First, this finding could be a data artifact; it could be the result of some third variable not included in the analysis. Alternately, it could be that profits cause managers to become careless so that they pay less attention to regulatory details. Once managers are improving profits and experiencing success, they may feel they can disregard even the most serious regulations. Or, since I am unable to determine the causal order of this relationship, it could be that managers are creating improved profitability by violating egregious OSHA regulations. The more serious OSHA violations can include willfully choosing not to update dangerous and costly machinery. Therefore, by violating the most serious OSHA violations, managers can produce more savings, and hence, more income. Further, the fines for these violations, while larger than for less serious violations, are typically not high enough to outweigh the benefits. Thus, managers rationally weighing

the costs and benefits of egregious OSHA violations, may choose to violate regulations to continually improve profitability. This finding should be further investigated in a longitudinal analysis that could determine causal ordering.

Following Simpson (1986), I analyzed whether profit-squeeze at the firm and industry levels was related not only to more violations, but also to more serious violations of OSHA. Simpson (1986) found that firms with declining profits committed more serious anti-competitive behaviors. I hypothesized a similar relationship between profit-squeeze and OSHA violations because more serious OSHA violations can produce larger savings, which would be desirable during times of financial stress. Thus, I explored the profit-squeeze argument using four models, one for total violations, one for egregious violations, one for serious violations, and one for all other violations. In general, there was not a great deal of support for the profit-squeeze argument, including for more serious violations when I analyzed the data over the eight-year period. However, there is some evidence that economic performance may affect offending for shorter time periods (1997-2000), but these results are not replicated for the earlier block of time (1993-1996).

I also did not find reliable support for my second hypothesis that controlling for industry would attenuate firm-level economic effects. In the analysis for years 1997-2000 the liquidity trend variables were significant in the initial analysis without the dummy variables, and the magnitude of the effects did diminish for all violation types. However, the efficiency variable was in the opposite direction as predicted, and the impact of these variables actually increased upon adding the industry dummy variables to the analysis. Further, in the analysis of the full models and the analysis for years 1993-1996, the financial performance variables were not significant and the magnitudes of the

variables were not consistently attenuated. Thus, the support for the second hypothesis is not strong. Interestingly, though, the industry dummy variables were consistently significant and exerted the largest impact on violations. This suggests definite industry effects. Unfortunately due to analytical constraints, I was unable to explore which industry characteristics were affected violations. Drawing from the industry overview section above, the oil industry was the strongest economic performer during this time period with continually increasing profits. Results tended to show that firms in the oil industry committed fewer violations than firms in the pulp and paper industries. These tentative data should be followed with more rigorous tests in the future.

Another interesting finding at the industry level was that firms in the paper industry were much more likely to commit violations, especially serious and other violations, than firms in the other three industries. This could be a result of OSHA inspectors targeting the paper industry more heavily than the other industries, but this does not seem likely since the steel industry had the highest average rate of injuries and illnesses (5.25 compared to paper at 1.61) and it is known as a particularly hazardous injury. It might be, then, that the paper industry is actually more criminogenic than the other three industries. This should be explored more carefully in future research.

One of the contributions of this study was to control for prior violations in the analysis. I expected that firms with prior violations would commit more and more serious violations. Results did not indicate strong support for this hypothesis. This is surprising given the strong support for the hypothesis in the criminological literature (Gottfredson & Hirschi, 1990, Hirschi & Gottfredson, 2001, Agnew, 1991, Baucus & Near, 1991, Sutherland, 1983). My inability to find support for this hypothesis could be



due to the way I measured prior violations. In their study, Baucus & Near (1991) measured prior violations using three dummy variables, one for one or more violations, one for two or more violations, and one for three or more violations. They found that the dummy variable for three or more violations was the best predictor of future violations (Baucus & Near, 1991). Perhaps using a different measure would have produced different results. Another reason for the lack of support could be due to the truncation of the prior violation data. The prior violation data in this study only span the three years leading up to the study period. Gathering prior violations for a longer time period also may have produced different results.

Another contribution of this study was the inclusion of a control for OSHA enforcement behavior. Union membership was included in the analyses and was significantly associated with violations. The direction of the association, however, tended to change throughout the analyses. In the full models, union membership was related to fewer violations of OSHA, although these findings were generally not significant. In the analysis for the years 1993-1996, union membership was negatively and significantly related to serious and other violations, but in the analysis for the last four years, union membership was positively and significantly associated with more egregious violations. This changing direction of influence may be a data artifact, or it could be that union membership has a different influence on illegal behavior at different times. The strength of unions fluctuates over time as do the issues that concern union leaders and members. Perhaps from 1993-1996 unionized firms were safer work environments because unions were stronger and able to influence managers on safety issues, and OSHA inspectors targeted nonunion firms more to impose costs on nonunion

firms that were competing with union firms. But then in the last four years unions lost their strength to influence managers on safety issues, causing union firms to become less safe and increasing the safety complaints by union employees. While these results are not clear on the direction of the influence unions have on OSHA violations, they suggest that studies investigating the profit-squeeze and crime relationship using OSHA violations should pay attention to the role played by unionization in this relationship.

Another interesting finding in this analysis was the difference in the findings between the two four-year periods. The most relevant difference to this study is the stronger support for a profit-squeeze argument that can be found in the analysis of the last four years. Rather than picking up some difference in firm behavior between the two periods, I could be finding an OSHA enforcement effect. According to Siskind (2002), OSHA inspections were at the lowest in 1995 and 1996 due to threatened budget cuts and the reorganization of OSHA evaluation procedures. Thus, it is possible that differences in OSHA inspection behavior are causing the difference. There are no other obvious events that could be driving the difference in OSHA inspection behavior. However, it also could be, as mentioned previously, that companies experience short-term trends of financial improvement and decline that influence decisions to commit illegal acts. These data show fewer trends in the first four years than in the last four so it may be that firms were simply not experiencing general trends of growth or decline in the first four-year period. Future research should increase the sample period to see if these short-term patterns continue.

There were four major limitations to this study. First, the data were not collected specifically for this study; thus, the industries were more similar regarding key

characteristics than would have been ideal. The industries were very similar in concentration and appeared to be subject to similar OSHA regulations. Future research should replicate this study using more diverse industries in order to more accurately test the effect of industry characteristics on illegal corporate actions. Second, in this analysis, I averaged the eight-years of data, which resulted in the loss of the industry measures of profitability, concentration, and injuries and illnesses. Because I was only examining firms in four industries, averaging the data greatly reduced the variation in the industry measures. This prevented me from further exploring the industry effects and forced me to rely on dummy variables for industry membership. The third and perhaps greatest limitation of this study was the sample size. The small sample size limited my ability to include all the variables of interest in the full models, and even excluding the financial performance trend variables, I still included 12 variables in the analysis with only 72 cases. This likely created quite a few zero cells, thus reducing the power of my findings. Finally, because I analyzed the data using cross-sectional analysis rather than longitudinal analysis, my ability to address the causal order of the variables was restricted. Thus, it is not possible to conclude that declining or unstable financial performance causes firms to commit more OSHA violations. It could be that offenders suffer economic losses as a result of illegal activity. While this does not seem likely because OSHA penalties are typically minor and not large enough to cause serious financial strain, firms may suffer reputational damage that can ultimately affect economic prospects. Causal order should be addressed in future studies of the profit-squeeze and crime argument.

With these limitations in mind, this study found mixed support for a profit-squeeze argument at the firm level. However, the study did produce several notable

findings. First, short-term patterns of financial improvement or decline had a greater effect on violations of OSHA regulations. Firms with increasing liquidity committed fewer other violations in the years 1993-1996 and fewer total, egregious, serious, and other violations in the years 1997-2000. An increase in efficiency was related to fewer egregious violations in the years 1997-2000. Another interesting finding was that union membership was related to OSHA violations, although the direction of influence changed between the two four-year periods, with unionized firms committing fewer serious and other violations in the first four years and more egregious violations in the final four-year period. Given the influence that unions exert on OSHA enforcement behavior, future researchers should pay more attention to the possible link between unionization and OSHA violations. Are unionized firms subject to less scrutiny from authorities during certain time periods? Are union firms better policed internally? More research is needed to unravel this potentially important relationship.

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