



The Effects of Regulated Facilities' Perceptions About the Effectiveness of Government Interventions on Environmental Compliance



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ARTICLE INFO

Article history:

Received 1 August 2016

Received in revised form 7 June 2017

Accepted 12 June 2017

Available online 12 August 2017

JEL Classification:

D22

K32

Q53

Q58

Keywords:

Environmental enforcement

Compliance

Perceptions

Wastewater

ABSTRACT

Our study explores the effects of regulatory monitoring and enforcement activities on facilities' compliance with environmental regulatory laws. In particular, our study examines regulated facilities' perceptions of the effectiveness of monitoring and enforcement efforts for inducing compliance and the influence of these perceptions on facilities' responses to actual inspections and enforcement actions. No previous study explores this influence. For our conceptual analysis, we extend standard deterrence theory by incorporating the behavioral dimension of intrinsic motivation. For our empirical analysis, we examine chemical manufacturing facilities permitted under the Clean Water Act during the years 2002 to 2004. Using an original survey, we collect data on facilities' perceptions. We then compare responses to government interventions between facilities that perceive enforcement as effective and those that do not. For facilities perceiving enforcement as effective, increased deterrence of any type generates little gain. In contrast, for those facilities who perceive enforcement as ineffective, increased deterrence from inspections improves compliance with the Clean Water Act.

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1. Introduction

Many studies explore the effects of regulatory monitoring and enforcement activities on the subsequent behavior of facilities constrained by regulatory laws. These regulatory activities are effective if they prompt facilities to improve their compliance with laws. From the standard theory of deterrence (Becker, 1968), regulatory monitoring and enforcement activities prompt subsequent improvements in compliance by deterring non-compliance through increases in either the certainty of punishment, severity of punishment, or both. However, many studies identify alternative, non-monetary motivations for complying with regulatory laws.¹ As the most prominent alternative motivation, regulated facilities may be intrinsically motivated to comply with regulatory laws. Intrinsic motivation involves many dimensions, such as external references, e.g., adhering to professional norms, and internal references, e.g., adhering to one's own self-identity as law abiding or cooperative.

Our study extends the standard theory of deterrence by incorporating these additional motivations into our conceptual framework. Using this framework, we explore regulated facilities' perceptions of the effectiveness of regulatory monitoring and enforcement efforts for inducing compliance with regulatory laws. In particular, our study explores the influence of these perceptions on facilities' responses to regulatory inspections and enforcement actions conducted at a given facility ("specific deterrence") or other similar facilities ("general deterrence").

No previous study explores this dimension of regulatory monitoring and enforcement. As the closest topic, various studies explore regulated facilities' perceptions of the fairness of environmental protection laws (Lazarus, 1997; Lazarus, 1993; Tarlock, 1992; Hsu, 2004; Schroeder, 1993; Zinn, 2002; Wiener, 1999). For example, environmental regulation can be perceived by regulated entities as "unfair" partially because it does not provide flexible means of compliance (Zinn, 2002). Within this literature, surprisingly few studies explore the issue of enforcement fairness within the realm of compliance with environmental protection laws (Rechtschaffen, 1998; Kagan, 1994; Costle, 1982; White, 1996). Earnhart et al. (2016) explores the link from the perceived fairness of environmental enforcement on regulated facilities' compliance with effluent limits, finding that greater fairness undermines the extent of compliance; specifically, facilities who perceive that their regulators treat them fairly "always" comply less with their effluent limits than

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¹ Gneezy et al. (2011) and Bowles and Polania-Reyes (2012) provide recent surveys.

facilities who perceive that their regulators only treat them fairly “sometimes”.

Another literature explores regulated facilities' responses to regulatory monitoring and enforcement (e.g., Earnhart, 2004a; Earnhart, 2009; Earnhart and Segerson, 2012). Gray and Shimshack (2011) survey the evidence regarding environmental enforcement, concluding that both monitoring and enforcement improve compliance, proving generally effective deterrents.

None of these previous studies explores the role played by the perception of enforcement effectiveness. In fact, because these studies adopt the standard theory of deterrence, there is no role for factors other than pecuniary (extrinsic) motivations. Yet evidence suggests that non-monetary or intrinsic motivations may be relevant even for regulated firms. For example, several studies demonstrate the importance of enforcement style. Short and Toffel (2010) find that explicit threats can reduce compliance with environmental regulations, while both Winter and May (2001) and Earnhart and Glicksman (2015) demonstrate that coercive enforcement styles can be counter-productive. These findings are consistent with aggressive enforcement styles crowding out the intrinsic motivation to comply or cooperate with regulators. To explore the different paths through which perceptions of effectiveness might influence compliance decisions, we develop a general conceptual framework that includes both standard monetary incentives and behavioral factors such as intrinsic motivation.

Beyond these scholarly contributions, our study's results possess policy implications. As long as perceptions influence the effects of government interventions on environmental compliance, policymakers – the EPA and state environmental protection agencies – should incorporate this insight into their enforcement of environmental protection laws.

For our empirical analysis, we examine the Clean Water Act, which restricts discharges from point sources, such as industrial factories, by imposing discharge limits through issued permits. Environmental protection agencies induce compliance with these discharge limits by conducting inspections and taking enforcement actions. As our sample, we examine chemical manufacturing facilities permitted under the National Pollutant Discharge Elimination System (NPDES) during the years 2002 to 2004.

Using an original survey of these facilities, we collect data on facilities' self-reported perceptions of the effectiveness of regulatory monitoring and enforcement activities. One survey question asks whether the respondent believes that inspections effectively induce chemical facilities to comply with discharge limits; a second question asks whether the respondent believes that monetary fines effectively induce chemical facilities to comply. For each question, respondents chose from four categories: definitely not, probably not, probably yes, and definitely yes. We construct two perception indicators by contrasting “yes” categories and “not” categories.

Our empirical analysis interacts these perception indicators with standard measures of inspection- and enforcement-related deterrence to assess whether facilities that perceive regulatory monitoring and enforcement activities as effective respond differently to actual monitoring and enforcement activities conducted against the individual facility or similar facilities. We investigate both specific and general deterrence and state and federal inspections.

We find that, on average, federal inspection-related general deterrence is the only effective means of improving the extent of compliance. However, when we estimate the effects separately for those who perceive enforcement to be effective and those who do not, our conclusions differ substantially. For facilities that perceive enforcement to be effective, increased deterrence of any type generates little gain, with only federal inspection-related general deterrence (marginally) significantly affecting the extent of compliance. For managers who already perceive enforcement to be effective, increased deterrence does not change the extent of compliance. The effects on those who perceive enforcement to be ineffective are very different. In particular, the actual experience

of being inspected (specific deterrence) by a state agency proves effective, while greater state inspection-related general deterrence does not. Greater general deterrence from federal inspections is also effective. Our results reveal that a complex set of motivations influence the compliance decisions of environmental managers.

2. Regulatory Context

Our empirical analysis examines the wastewater discharged by U.S. chemical manufacturing facilities regulated under the U.S. Clean Water Act's NPDES system between 2003 and 2004. Environmental protection agencies issue facility-specific permits to facilities regulated as point sources. These permits identify the pollutant-specific discharge limits with which facilities must comply. Due to considerations over local ambient water quality, wastewater discharge limits vary across facilities and time regardless of sector.

NPDES permits require regulated facilities to monitor and self-report their discharges on a regular basis.² By comparing these reported discharges to permitted discharges, we calculate the “discharge ratio”, which measures the extent of compliance.

To induce compliance with discharge limits, the EPA and state agencies periodically inspect facilities and take enforcement actions as needed. Nearly all states possess “primacy” to implement the NPDES system. These authorized state agencies are primarily responsible for monitoring and enforcement. However, the EPA retains authority to monitor and sanction facilities. Inspections are a key component of environmental agencies' efforts to collect evidence for enforcement (Wasserman, 1984), maintain a regulatory presence (EPA, 1990), and offer technical assistance as opportunities arise. Federal and state agencies use a mixture of informal enforcement actions (e.g., warning letters) and formal enforcement actions (e.g., fines). Our analysis considers both federal and state inspections and all types of federal enforcement actions: fines, other formal enforcement actions, and informal enforcement actions.

Our empirical analysis focuses on chemical manufacturing facilities permitted under the U.S. Clean Water Act during the years 2002 to 2004. This focus on a single sector is consistent with other empirical studies of industrial pollution (e.g., Laplante and Rilstone, 1996; Barla, 2007; Earnhart, 2009; Earnhart and Harrington, 2014).³

3. Conceptual Framework

This section offers a simple conceptual framework for heuristically deriving competing hypotheses, which our empirical analysis tests. Our framework incorporates three motivations for complying with environmental protection laws: extrinsic motivation, intrinsic motivation, and social signaling (Ariely et al., 2009; Gneezy et al., 2011; Bowles and Polania-Reyes, 2012).

Hypothesis H1A. Increases in either the inspection frequency or fine magnitude are effective at improving compliance.

Compliance involves both benefits and costs. The manager of a regulated facility chooses the extent of compliance to maximize the net

² Intentional non-reporting or misreporting should not undermine our use of these data. Only a very small fraction of the observations lack discharge data. In addition, intentional misreporting is punishable by large criminal sanctions, including incarceration, imposed directly on individual employees (Shimshack and Ward, 2005). Lastly, according to Bandyopadhyay and Horowitz (2006), the EPA does not perceive misreporting as a widespread problem (EPA, 1999b).

³ The chosen sector is important. First, it generates a large amount of wastewater, with four of the 10 most polluting sub-sectors operating in the chemical manufacturing sector (EPA, 2011). Second, the EPA has demonstrated a strong interest in this sector: the EPA authored two studies on this sector in the 1990s (EPA, 1999a; EPA, 1997) and regarded two sub-sectors (industrial organics and chemical preparations) as priority sectors during a portion of the study period. Nevertheless, we acknowledge that the chemical industry is not necessarily representative of all industrial sectors.

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