Sending a Message: An Empirical Assessment of Responses to Punitive and Non-Punitive Compliance Messaging Strategies

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Regulators have long faced the challenge of enforcing extensive legal requirements with resources that are wildly inadequate to the task. Even in the most hospitable legal and political climate, it is inherently difficult for regulators to deploy sufficient resources to monitor and enforce compliance with broad statutory mandates and extensive bodies of rules. Legal and political hostility to regulation further diminishes regulators' capacity to enforce the law. In contexts where legal requirements far outstrip an agency's enforcement capacity, regulators must wrestle with the question of whether it is possible to persuade regulated individuals and entities to comply with law when they face vanishingly low odds of being the target of enforcement activity.

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The U.S. Environmental Protection Agency (EPA) faced this question in its attempts to motivate compliance with under-enforced rules that require building contractors to certify their adherence to lead paint safety measures. EPA staff partnered with the authors to address this question through a field experiment testing the relative efficacy of different messaging strategies to motivate contractors to comply. We compared the relative efficacy of punitive messaging against more positive and cooperative messaging strategies. Contrary to influential scholarship touting the compliance benefits of cooperative approaches to regulation, we found that the punitive, deterrence-based message produced the greatest compliance gains overall even though regulators devoted no new resources to enforcement. Our findings yield important insights for regulators trying to do more with less.

INTRODUCTION

Regulators operate in an increasingly hostile political environment. The U.S. Supreme Court is ramping up efforts to curtail the authority of administrative agencies through doctrinal moves such as the major questions

doctrine,[1] decreased deference,[2] and muscular hard-look review.[3] The second election of Donald Trump to the presidency has unleashed a torrent of anti-regulatory fervor, epitomized by the so-called Department of Government Efficiency (DOGE). This initiative, originally spearheaded by Elon Musk, was envisioned as "a lean team of small-government crusaders" who are "focused on delivering cost savings for taxpayers" and "liberat[ing] individuals and businesses from illicit regulations. . . ."[4] In its first six months of operation, DOGE made or proposed massive staffing and budget cuts across the federal government, with many directed at agencies that manage, protect, and preserve the natural environment.[5]

These are but the latest salvos in a long-running assault on the power of administrative agencies to regulate business.[6] For decades, agencies have faced the challenge of enforcing extensive regulatory requirements with resources that are wildly incommensurate with the task. For instance, EPA's lead renovation, repair, and painting (RRP) rule[7] regulates the lead safety practices of hundreds of thousands of renovation contractors estimated to perform eighteen million

1. West Virginia v. EPA, 597 U.S. 697, 724 (2022).

2. Loper Bright Enterprises v. Raimondo, 603 U.S. 369, 413 (2024).

3. Ohio v. EPA, 603 U.S. 279, 293-94 (2024).

4. Elon Musk & Vivek Ramaswamy, *The DOGE Plan to Reform Government*, WALL ST. J. (Nov. 20, 2024), https://www.wsj.com/opinion/musk-and-ramaswamy-the-doge-plan-to-reform-government-supreme-court-guidance-end-executive-power-grab-fa51c020.

5. *See* Ivan Pereira & Emily Chang, *Here Are All the Agencies that Elon Musk and DOGE Have Been Trying to Dismantle So Far*, ABC NEWS (Feb. 27, 2025), https://abcnews.go.com/Politics/elon-musks-government-dismantling-fight-stop/story?id=118576033 (cataloguing cuts made by DOGE to staff and funding at various federal agencies); *Federal Cuts Dominate March 2025 Total: 275,240 Announced Job Cuts, 216,670 from DOGE Actions*, CHALLENGER, GRAY, & CHRISTMAS (Apr. 3, 2025), https://www.challengergray.com/blog/federal-cuts-dominate-march-2025-total-275240-announced-job-cuts-216670-from-doge-actions (reporting that "DOGE actions have been attributed to 280,253 layoff plans of federal workers and contractors impacting 27 agencies"); Molly McCluskey, *Sierra Club and Partners Sue Elon Musk and DOGE Over Layoffs at National Parks*, SIERRA (Mar. 6, 2025), https://www.sierraclub.org/sierra/elon-musk-doge-sierra-club-partners-sue-over-mass-layoffs-national-parks (reporting "mass layoffs within federal agencies that oversee national parks . . . and other federally managed public lands"); Hayley Smith, *Musk Team Targets Nearly Two Dozen Environmental Offices for Closure in California*, L.A. TIMES (Mar. 18, 2025), https://www.latimes.com/environment/story/2025-03-18/doge-two-dozen-environmental-offices-closure-california (reporting the DOGE-recommended closure of California facilities occupied by various environmental protection agencies).

6. *See generally* Gillian E. Metzger, *Foreword: 1930s Redux: The Administrative State Under Siege*, 131 HARV. L. REV. 1 (2017) (describing the anti-administrativism driving Roberts Court jurisprudence curbing agencies' ability to regulate market activities); JEFFERSON DECKER, THE OTHER RIGHTS REVOLUTION: CONSERVATIVE LAWYERS AND THE REMAKING OF AMERICAN GOVERNMENT (2016) (discussing antipathy for regulation as a driving force behind the conservative legal movement); AMANDA HOLLIS-BRUSKY, IDEAS WITH CONSEQUENCES: THE FEDERALIST SOCIETY AND THE CONSERVATIVE COUNTERREVOLUTION (2015) (same); THOMAS O. MCGARITY, FREEDOM TO HARM: THE LASTING LEGACY OF THE LAISSEZ FAIRE REVIVAL (2013) (same); STEVEN M. TELES, THE RISE OF THE CONSERVATIVE LEGAL MOVEMENT: THE BATTLE FOR CONTROL OF THE LAW (2008) (same).

7. 40 C.F.R. §§ 745.80-.92 (2016).

covered projects annually at the time the rule was promulgated in 2008.[8] In regulatory analysis supporting the rule, the agency projected that it would need just sixteen people to enforce the law. One former EPA enforcement official highlighted the extraordinary understatement of this projection: "Nationwide. *Sixteen*. You don't need to know anything about enforcement to understand how insufficient that is."[9]

When agencies respond to political pressures for efficiency by cutting enforcement, they potentially undercut their regulatory programs. Why would a regulated individual or entity comply with a rule when faced with vanishingly low odds of being the target of an inspection or enforcement action? This was precisely the dilemma that faced EPA in implementing the RRP rule. The agency reached out to the research team to brainstorm and systematically evaluate strategies to address this dilemma. Lacking the ability to increase enforcement, we focused on how to persuade contractors to comply with the RRP rule. In collaboration with the Enforcement & Compliance Assurance Division of EPA Region IX (EPA Region IX), we conducted a field experiment testing the relative efficacy of several different compliance messaging strategies to motivate a sample of twenty thousand contractors in California to comply with the certification requirement of the RRP rule.

Randomized control trials (RCTs) are the gold standard for establishing causal relationships, including between policy interventions and policy outcomes.[10] In RCTs, researchers randomly assign each participant to a treatment group "to assess policy interventions while minimizing the impact of confounding variables."[11] RCTs conducted in the field, sometimes referred to as experimental field studies, incorporate this random assignment on the very population whose behavior the study seeks to understand (unlike lab experiments, which often recruit undergraduate students or others interested in micropayments as subjects and treat them with hypothetical scenarios).[12] However, experimental field studies have not been widely used to assess the

8. CYNTHIA GILES, NEXT GENERATION COMPLIANCE: ENVIRONMENTAL REGULATION FOR THE MODERN ERA 106 (2022). Giles is a former senior EPA enforcement official.

9. *Id.*

10. Robert L. Fischman & Lydia Barbash-Riley, *Empirical Environmental Scholarship*, 44 ECOLOGY L. Q. 767, 786 (2018).

11. *Id.*

12. *See id.* at 786 n.76. Our study was conducted on a segment of the population of contractors subject to the nationwide RRP certification requirement: RRP contractors in California. This geographic context may have distinctive features that could affect our study's generalizability to other states or regions, including higher home costs, higher-income homeowners, greater awareness of and concern about environmental hazards, and a particularly high prevalence of residential properties with lead-based paint. The direction of these effects is unclear and requires future research in other states or regions to determine. There is no reason to believe that the regulation of lead paint renovation contractors in California was more stringent than in other states. At the time the study was conducted, California did not have its own lead-safe certification program, and no state agency enforced EPA's Lead-Safe Certification requirement. Enforcement in California was consistent with national and regional priorities.

efficacy of environmental enforcement policy. Indeed, a 2018 review of empirical environmental legal scholarship found experimental treatments to be "completely absent" from the literature.[13] Joining a handful of recent experimental studies on environmental compliance,[14] our study makes an important contribution to the empirical literature on environmental enforcement and compliance. It also contributes to EPA's ongoing efforts to expand evidence-based policy making and program evaluation in compliance with the Foundations for Evidence-Based Policymaking Act of 2018.[15]

The study analyzes responses to letters sent from EPA Region IX to twenty thousand contractors in California seeking their compliance with the RRP rule's threshold requirement that contractors working with covered properties[16] obtain Lead-Safe Certification.[17] Drawing on various compliance theories discussed in Part I, we tested the efficacy of four alternative compliance messaging strategies: (1) providing information about the program and compliance assistance resources; (2) deterrence-based language highlighting the risk of inspection; (3) positive-incentives language identifying business opportunities created by certification; and (4) social norms activation language foregrounding contractors' roles in protecting the community from the dangers of lead paint. We were particularly interested in comparing the relative efficacy of punitive messaging against more positive and cooperative messaging approaches. We were unsure whether punitive messaging could motivate compliance in a domain where enforcement actions are uncommon. Moreover, decades of scholarship on regulatory reform and new governance tout the compliance benefits of positive market-based incentives and cooperative relationships between regulators and regulated entities—particularly in areas where regulators lack significant

13. *Id.* at 769. By contrast, the literature on tax compliance includes a significant number of experimental studies. *See, e.g.*, Leandra Lederman, *The Interplay Between Norms and Enforcement in Tax Compliance*, 64 OHIO STATE L. J. 1453, 1462 (2003) (drawing insights for tax enforcement policy from an extensive experimental literature).

14. *See generally, e.g.*, Esther Duflo et al., *Truth-Telling by Third-Party Auditors and the Response of Polluting Firms: Experimental Evidence from India*, 128 Q. J. ECONOMICS 1499 (2013); Dietrich Earnhart & Paul J. Ferraro, *The Effect of Peer Comparisons on Polluters: A Randomized Field Experiment Among Wastewater Dischargers*, 79 ENVT'L & RES. ECON. 627 (2020); Ann Kronrod et al., *Go Green! Should Environmental Messages Be So Assertive?*, 76 J. MARKETING 95 (2012).

15. The Foundations for Evidence-Based Policymaking Act of 2018 requires federal agencies to develop evidence to support policy making. 5 U.S.C. § 312. EPA has put substantial resources into developing evidence to assess program outcomes, support program improvement, and aid decision making. *See, e.g.*, *Evaluating EPA's Programs*, EPA, https://www.epa.gov/evaluate (last updated Dec. 23, 2025).

16. Properties covered by the RRP rule are homes, childcare facilities, and preschools built before 1978. *Lead Renovation, Repair and Painting Program*, EPA, https://www.epa.gov/lead/lead-renovation-repair-and-painting-program (last updated Oct. 15, 2025).

17. The RRP rule requires "all renovation, repair, and painting firms (including sole proprietorships) working in housing, or facilities where children are routinely present, built before 1978, to be certified." *Renovation, Repair and Painting Program: Firm Certification*, EPA, https://www.epa.gov/lead/renovation-repair-and-painting-program-firm-certification (last updated Dec. 23, 2025).

punitive enforcement resources.[18] Thus, we were surprised to find that the letter containing the deterrence-based message produced the greatest compliance gains overall.

This finding has important implications for under-resourced regulators struggling to enforce legal requirements. First, regulators should not abandon punitive tools in the face of pervasive rhetoric about the need for more cooperative approaches to enforcement. Second, carefully crafted messages can create the *perception* of heightened enforcement risk that well exceed the reality of the regulator's enforcement capacity. Without devoting any additional resources to RRP enforcement, EPA was able to create the perception of increased inspection risk for some contractors, thereby increasing compliance.

The Article proceeds as follows. Part I describes leading theories on the key drivers of compliance behavior, focusing on the distinction between deterrence-based enforcement and various types of new governance enforcement strategies. Part II provides an overview of our empirical context: EPA's RRP rule and the Lead-Safe Certification Program. Part III describes our study design and empirical methodology. Part IV details the hypotheses motivating each of our experimental treatments and presents the results of our study. We conclude with a discussion of the policy and normative implications of our findings in Part V.

I. THEORIES OF ENFORCEMENT AND COMPLIANCE: DETERRENCE AND NEW GOVERNANCE

There is a longstanding debate in environmental law scholarship and policy-making practice about the relative efficacy of different approaches to regulatory enforcement. One important dimension of this debate involves the extent to which environmental regulators should rely on punitive methods of enforcement versus more cooperative forms of engagement with regulated entities to achieve compliance with environmental laws. Punitive enforcement approaches are grounded in deterrence theory, which assumes that businesses will comply with regulations when the costs of noncompliance are greater than the benefits of noncompliance.[19] From this perspective, "[t]he task for enforcement agencies is to make penalties high enough and the probability of detection great enough that it becomes economically irrational for facilities to violate environmental requirements."[20]

Deterrence theory underlies the design of many environmental regulatory enforcement programs, but it has been widely criticized as inaccurate, infeasible, and even counterproductive. For instance, many have argued that the stylized

18. *See* Jody Freeman & Charles D. Kolstad, *Prescriptive Environmental Regulations Versus Market-Based Incentives*, *in* MOVING TO MARKETS IN ENVIRONMENTAL REGULATION: LESSONS FROM TWENTY YEARS OF EXPERIENCE 3, 4-5 (Jody Freeman & Charles D. Kolstad eds., 2006).

19. Clifford Rechtschaffen, *Deterrence vs. Cooperation and the Evolving Theory of Environmental Enforcement*, 71 S. CAL. L. REV. 1181, 1186-87 (1998).

20. *Id.* at 1187.

economic assumptions of deterrence theory do not effectively predict compliance behavior because they neglect other important motivators such as social norms or internal moral convictions.[21] Indeed, there is a long-running strand of environmental law scholarship suggesting "that 'economic sanctions do not play a major role in encouraging compliance' with environmental regulations."[22] Even if deterrence incentives do, in fact, shape compliance behavior as theorized, they can be tremendously costly to maintain in practice.[23] "Effective enforcement requires sufficient resources to investigate potential regulatory violations and pursue enforcement actions against those responsible for committing them. It is no secret that both EPA and the states in recent years have cut funding for environmental programs."[24] Furthermore, critics of deterrence-based enforcement regimes argue that they can undermine positive environmental outcomes because they inhibit creative solutions to complex environmental problems[25] or provoke backlash and resistance from regulated businesses and individuals.[26]

Such criticisms have led academics and policy makers to devise "a range of less intrusive regulatory interventions that capitalize[] on more flexible,

21. *See* NEIL GUNNINGHAM & DARREN SINCLAIR, LEADERS & LAGGARDS: NEXT GENERATION ENVIRONMENTAL REGULATION 165 (2002); Rechtschaffen, *supra* note 19, at 1190 ("[M]any of the current calls for reform attack the theoretical model of rigid deterrence-based enforcement.").

22. Robert L. Glicksman & Dietrich H. Earnhart, *The Comparative Effectiveness of Government Interventions on Environmental Performance in the Chemical Industry*, 26 STAN. ENVT'L. L. J. 317, 320 (2007) (quoting WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW 678 (2d ed. 1994)).

23. *See* Neil Gunningham & Cameron Holley, *Next-Generation Environmental Regulation: Law, Regulation, and Governance*, 12 ANN. REV. L. & SOC. SCI. 273, 276 (2016).

24. David L. Markell & Robert L. Glicksman, *Dynamic Governance in Theory and Application, Part I*, 58 ARIZ. L. REV. 563, 594, 598 (2016) ("Even more to the point, EPA officials told the [U.S. Government Accountability Office] that it has become increasingly difficult to rely primarily on its traditional approach of inspecting individual entities to increase compliance with the nation's environmental laws and regulations.").

25. *See* Gunningham & Holley, *supra* note 23, at 276 (noting that "[i]n broad terms, the more complex the environmental problem, the more obvious become the limitations" of deterrence-based regulation in addressing it).

26. *See, e.g.*, EUGENE BARDACH & ROBERT A. KAGAN, GOING BY THE BOOK: THE PROBLEM OF REGULATORY UNREASONABLENESS 26 (1982) (noting "much of the political backlash against regulation arises from the cumulation of individual experiences of site-level unreasonableness" by regulators rigidly and punitively enforcing regulatory requirements); JOHN BRAITHWAITE, TO PUNISH OR PERSUADE: ENFORCEMENT OF COAL MINE SAFETY 99 (1985) ("Every schoolteacher knows that in some circumstances a child who would have been alienated by punishment can be given a greatly enhanced will to behave by saying, 'That's not like you, Johnny Brown,' and then forgiving the transgression."); Rechtschaffen, *supra* note 19, at 1204 (noting that under the theory of cooperative regulation, if businesses "are found in violation of regulatory requirements, they should be treated like a partner, and they will respond positively to suggestions and advice about how to achieve compliance. If, however, the response to noncompliance is inflexible, sanction-oriented enforcement, regulated entities will become resentful and hostile. They will feel as though they have been treated unfairly and that their efforts to comply have gone unrecognized and unrewarded by regulators. The result will be resistance").

imaginative, and innovative forms of social control."[27] These approaches have been described variously as new governance,[28] smart regulation,[29] responsive regulation,[30] managerial regulation,[31] and enforced self-regulation.[32] In the environmental context, they fall under the rubric of the "new environmental governance" (NEG).[33] NEG "theories are bound by several common characteristics, including flexibility, participation, collaboration, learning, and adaptation."[34] As one commentator put it, this approach seeks to move beyond "the 'red lights' and stop signs" that characterized the first generation of prescriptive environmental law, toward "a broader structure of incentives and 'green lights' that would engage the public and the business world in environmental problem solving."[35] NEG utilizes a variety of tools to operationalize these theories in the enforcement context, including leveraging positive, market-based incentives and activating social norms to motivate compliance.[36]

Environmental enforcement policy has provided fertile ground for putting NEG theory into practice. State environmental regulators have long "championed a 'compliance first' strategy that emphasizes working cooperatively with violators to obtain compliance, and eschewing penalties in favor of persuasion."[37] EPA has integrated many NEG tools and theories into its policies and practices through a succession of reform initiatives. For instance, EPA was an early adopter of voluntary programs such as WasteWise and Performance Track that the agency touted as "free, voluntary, flexible" vehicles for regulated entities to set "feasible and cost-effective" environmental

27. Gunningham & Holley, *supra* note 23, at 276-77.

28. *See generally* Orly Lobel, *The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought*, 89 MINN. L. REV. 342 (2004).

29. *See generally* NEIL GUNNINGHAM ET AL., SMART REGULATION: DESIGNING ENVIRONMENTAL POLICY (1998). Smart regulation "involves government harnessing the capacities of markets, civil society, and other institutions to accomplish its policy goals more effectively, with greater social acceptance, and at less cost to the state." Gunningham & Holley, *supra* note 23, at 281.

30. *See generally* IAN AYRES & JOHN BRAITHWAITE, RESPONSIVE REGULATION (1992).

31. *See generally* Julie E. Cohen & Ari Ezra Waldman, *Introduction: Framing Regulatory Managerialism as an Object of Study and Strategic Displacement*, 86 L. & CONTEMP. PROBS. i (2023).

32. Neil Gunningham, *Regulatory Reform and Reflexive Regulation: Beyond Command and Control*, *in* REFLEXIVE GOVERNANCE FOR GLOBAL PUBLIC GOODS 85, 89 (Eric Brousseau et al. eds., 2012).

33. *See generally* CAMERON HOLLEY ET AL., THE NEW ENVIRONMENTAL GOVERNANCE (2012). "The NEG enterprise involves collaboration between a diversity of private, public, and nongovernment stakeholders who, acting together toward commonly agreed upon (or mutually negotiated) goals, hope to achieve far more collectively than they could individually." Gunningham & Holley, *supra* note 23, at 283.

34. Gunningham & Holley, *supra* note 23, at 283.

35. Daniel C. Esty, *Red Lights to Green Lights: From 20th Century Environmental Regulation to 21st Century Sustainability*, 47 ENVT'L L. 1, 1-2 (2017).

36. *See* Gunningham & Holley, *supra* note 23, at 283.

37. Rechtschaffen, *supra* note 19, at 1184.

compliance goals for themselves.[38] EPA's Audit Policy, adopted in 1995, offers penalty mitigation for self-reported violations, incentivizing companies to implement internal corporate compliance programs based on the premise that such self-regulatory programs can be "successful in preventing violations [and] improving environmental performance."[39] EPA's "Lean Government Initiative" adapted "Lean" production methods, originally developed to streamline industrial manufacturing processes, for application to the government sector.[40] According to EPA's *Lean Government Methods Guide*, Lean processes can help government agencies "improve the effectiveness, efficiency, and transparency of government programs and services in better, faster, and cheaper ways."[41]

EPA's most thoughtful and sustained effort to integrate new governance tools into its enforcement kit is the Next Generation Compliance initiative (Next Gen).[42] "Next Gen seeks to engage and empower non-governmental actors in the basic work of governance much more than has historically been the case at EPA."[43] For instance, in the compliance and enforcement domain, Next Gen contemplates that EPA will "rely more heavily on regulated parties' efforts to track their own compliance status and respond appropriately."[44] While EPA officials have insisted that Next Gen is meant to supplement—not displace—deterrence-based enforcement, some environmental advocates have expressed concern that it may undercut "the agency's commitment to traditional enforcement. . . ."[45]

A significant body of empirical research has tested the effect of various enforcement interventions—including Next Gen and other NEG initiatives—on

38. Michael W. Toffel & Jodi L. Short, *Coming Clean and Cleaning Up: Does Voluntary Self-Reporting Indicate Effective Self-Policing?*, 54 J. L. & ECON. 609, 639 n.29 (2011). The WasteWise and Performance Track programs provide positive incentives to encourage businesses and other regulated organizations to reduce pollution voluntarily. The programs facilitate sharing best practices and offer participants recognition and awards for particularly good performance. *See WasteWis*e, EPA, https://19january2017snapshot.epa.gov/smm/wastewise_.html (last updated Jan. 19, 2017); *National Environmental Performance Track*, EPA, https://archive.epa.gov/performancetrack/web/html/index.html (last updated Feb. 20, 2016).

39. Incentives for Self-Policing: Discovery, Disclosure, and Prevention of Violations, 60 Fed. Reg. 66706, 66712 (Dec. 22, 1995). This program is based, in part, on the work of commentators who "argue that traditional enforcement approaches should be modified to account for corporations' increasingly sophisticated internal regulatory schemes" which are, "in many cases, more comprehensive and effective than government enforcement efforts." Rechtschaffen, *supra* note 19, at 1198.

40. EPA, LEAN GOVERNMENT METHODS GUIDE 1 (2013), https://www.epa.gov/sites/default/files/2014-01/documents/lean-methods-guide.pdf.

41. *Id.*

42. *See* Robert L. Glicksman & David L. Markell, *Unraveling the Administrative State: Mechanism Choice, Key Actors, and Regulatory Tools*, 36 VA. ENVT'L L. J. 318, 323 (2018) (invoking new governance as the model for the Next Gen initiative).

43. *Id.* at 363.

44. *Id.* at 365.

45. David L. Markell & Robert L. Glicksman, *Next Generation Compliance*, 30 NAT. RES. & ENV'T 22, 25 (2016).

compliance outcomes.[46] But there is little empirical evidence presenting a head-to-head comparison of punitive, deterrence-based approaches against NEG approaches.[47] Our study fills this gap.

II. EMPIRICAL CONTEXT: THE RENOVATION, REPAIR, AND PAINTING RULE'S LEAD-SAFE CERTIFICATION PROGRAM

The context for our study is EPA's Lead-Safe Certification Program, a key component of the RRP rule.[48] Lead-based paint poses significant health risks and

46. *See generally* Dietrich Earnhart & Lana Friesen, *The Effect of Professional Social Norms on Corporate Environmental Performance*, RES. & ENERGY ECON., Dec. 2024, at 1 (finding that facilities' compliance outcomes are significantly influenced by descriptive social norms—the compliance practices of other facilities); Julia Brandes & Dietrich Earnhart, *The Influence of Internal Monitoring on Compliance with Effluent Limits*, 8 WATER ECON. & POL'Y, Apr. 2022, at 1 (demonstrating that increasing internal monitoring significantly improves facilities' compliance with wastewater discharge limits); Dietrich Earnhart & Paul Ferraro, *The Effect of Peer Comparisons on Polluters: A Randomized Field Experiment*, 79 ENVT'L & RES. ECON. 627 (2021) (finding that waste-discharging facilities significantly improved their compliance with discharge limits when they received a letter comparing discharges to those of peer facilities); Wayne B. Gray & Jay P. Shimshack, *The Effectiveness of Environmental Monitoring and Enforcement: A Review of the Empirical Evidence*, 5 REV. ENVT'L ECON. & POL'Y 3 (2011) (finding that environmental monitoring improves compliance by targeted contractors, generates substantial general deterrence, and reduces both violations and emissions); Cary Coglianese & Jennfer Nash, *Compliance Management Systems: Do They Make a Difference?*, *in* THE CAMBRIDGE HANDBOOK OF COMPLIANCE 571 (Benjamin van Rooij & D. Daniel Sokol eds., 2021) (finding that certain types of compliance management systems are associated with fewer compliance violations, but these effects are modest); Matthew S. Johnson et al., *Improving Regulatory Effectiveness Through Better Targeting: Evidence from OSHA*, 15 AM. ECON. J.: APPLIED ECON. 30 (2023) (assessing the effectiveness of the Occupational Safety and Health Administration's inspections in reducing workplace injuries through randomization and machine learning and demonstrating how alternative targeting policies could improve regulatory outcomes); Maria R. Ibanez & Michael W. Toffel, *How Scheduling Can Bias Quality Assessment: Evidence from Food Safety Inspections*, 66 MGMT. SCI. 2396 (2020) (examining how scheduling inspections affects inspector stringency and how operational decisions influence inspector behavior, with implications for high-stakes decision making in public health); David I. Levine et al., *Randomized Government Safety Inspections Reduce Worker Injuries with No Detectable Job Loss*, 336 SCI. 907 (2012) (examining the effect of randomized enforcement interventions on workplace compliance and injury rates through a natural field experiment); Jodi L. Short & Michael W. Toffel, *Making Self-Regulation More Than Merely Symbolic: The Critical Role of the Legal Environment*, 55 ADMIN. SCI. Q. 361 (2010) (finding that "self-regulation can be a useful tool for leveraging the normative motivations of regulated organizations but that it cannot replace traditional deterrence-based enforcement").

47. *But see* Zach Raff & Dietrich Earnhart, *Effect of Cooperative Enforcement Strategies on Wastewater Management*, 56 ECON. INQUIRY 1357, 1357 (2018) (finding interactions between cooperative and coercive enforcement approaches, such that the effectiveness of coercive approaches diminishes as the regulator's overall enforcement approach becomes more cooperative); Dietrich Earnhart & Robert L. Glicksman, *Extent of Cooperative Enforcement: Effect of the Regulator-Regulated Facility Relationship on Audit Frequency*, 5 STRATEGIC BEHAV. & ENV'T 111, 112, 119 (2015) (noting the paucity of empirical evidence comparing cooperative and punitive approaches to environmental enforcement and conducting a survey of regulated facilities to assess whether perceptions of their relationship with the regulator as cooperative or uncooperative influenced their frequency of self-auditing).

48. *Lead Renovation, Repair and Painting Program*, EPA, https://www.epa.gov/lead/lead-renovation-repair-and-painting-program (last updated Oct. 15, 2025).

has been a major public health concern in the United States for decades.[49] Exposure to lead can cause a wide range of harms, including developmental delays,[50] cognitive impairments, neurological effects,[51] cardiovascular issues, kidney damage,[52] and reproductive issues such as reduced fertility, miscarriage, and premature birth.[53] In response to these risks, both state governments and federal environmental regulators have launched various initiatives to regulate exposure to and handling of lead paint.[54] For instance, the federal government banned the use of lead-based paint in residential properties in 1978.[55] But lead-based paint remains in much housing stock built before 1978, and it is a primary source of lead exposure in residential settings.[56]

The risk of lead exposure is particularly high during the renovation and repair of residential properties containing lead paint.[57] Activities such as sanding, scraping, or demolition can release lead dust and chips into the air and onto surrounding surfaces.[58] Renovation often produces fine lead dust particles that can remain airborne for extended periods and easily penetrate the respiratory system.[59] Lead dust can spread throughout the property, contaminating a widespread area around the renovation site.[60] Renovation may expose previously encapsulated lead paint layers, increasing occupants' exposure levels.[61] These risks are exacerbated by contractors' improper work practices, including insufficient containment of lead within a confined workspace and inadequate cleanup.[62]

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49. Adejoke Christianah Olufemi et al., *Potential Health Risks of Lead Exposure from Early Life Through Later Life: Implications for Public Health Education*, INT'L J. ENVT'L RSCH. & PUB. HEALTH, Dec. 2022, at 1, 2.

50. *Lead Poisoning*, WORLD HEALTH ORG. (Sept. 27, 2024), https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health.

51. NICHOLAS REES & RICHARD FULLER, THE TOXIC TRUTH: CHILDREN'S EXPOSURE TO LEAD POLLUTION UNDERMINES A GENERATION OF FUTURE POTENTIAL 9 (2020), https://www.unicef.org/media/73246/file/The-toxic-truth-children%E2%80%99s-exposure-to-lead-pollution-2020.pdf.

52. *Id.* at 1.

53. *Learn About Lead*, EPA, https://www.epa.gov/lead/learn-about-lead#effects (last updated Dec. 31, 2025).

54. *See Enforcing Lead Laws and Regulations*, EPA, https://www.epa.gov/enforcement/enforcing-lead-laws-and-regulations (last updated Nov. 6, 2025).

55. *About Lead in Paint*, CTRS. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/lead-prevention/prevention/paint.html (last updated Mar. 26, 2025).

56. *Protect Your Family from Sources of Lead*, EPA, https://www.epa.gov/lead/protect-your-family-sources-lead (last updated Nov. 17, 2025).

57. *See Lead-Safe Renovations for DIYers*, EPA, https://www.epa.gov/lead/lead-safe-renovations-diyers (last updated Aug. 15, 2025).

58. *Id.*

59. EPA, EPA-740-R-09-002, LEAD SAFETY FOR RENOVATION, REPAIR, AND PAINTING 5-2 (2009), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100A90Z.PDF?Dockey=P100A90Z.PDF.

60. BATELLE, LEAD EXPOSURE ASSOCIATED WITH RENOVATION AND REMODELING ACTIVITIES 3-4 (2000), https://www.epa.gov/sites/default/files/documents/rrfinalsummaryreport.pdf.

61. LEAD SAFETY FOR RENOVATION, REPAIR, AND PAINTING, *supra* note 59, at 1-5.

62. *Id.* at 4-2.

To mitigate these risks and promote safe work practices, EPA's RRP rule requires contractors performing renovation, repair, and painting projects that disturb lead-based paint in homes, childcare facilities, and preschools built before 1978 to be certified and to follow specified work practices to prevent lead contamination.[63] This includes using containment methods, following proper cleanup procedures, and verifying cleanliness through testing.[64] The threshold requirement for contractors performing renovation, repair, or painting services on covered buildings is to obtain Lead-Safe Certification from EPA.[65]

Obtaining Lead-Safe Certification is straightforward. Contractors submit an application online in which they provide information about their business and the services they provide, attest that their employees are properly trained to handle lead-based paint jobs, and certify that a trained renovator will be assigned to all jobs involving lead-based paint.[66] Certified contractors are listed in the Federal Lead-Based Paint Program (FLPP) Database,[67] maintained by EPA and searchable by property owners who wish to locate certified contractors.[68] Despite the relative ease of compliance, only a tiny fraction of contractors licensed to engage in activities covered by the RRP rule have sought certification.[69]

EPA faces immense enforcement challenges in this space. Industry sources estimate that there are over half a million remodeling businesses in the United States,[70] but the agency's enforcement resources for the RRP program are extremely limited. According to a 2019 report by the EPA Inspector General, EPA conducted just over 1,100 lead-based paint inspections annually during the five-year period studied—less than 0.5 percent of the estimated universe of renovators.[71] Adding complexity, the renovation contractor market is not only vast but also diverse, ranging from publicly traded multinational companies such

63. *Lead-Safe Renovations for DIYers*, *supra* note 57.

64. *Id.*

65. *Id.*

66. *Renovation, Repair and Painting Program: Firm Certification*, EPA, https://www.epa.gov/lead/renovation-repair-and-painting-program-firm-certification (last updated Dec. 23, 2025).

67. *Federal Lead-Based Point Program (FLPP) Database*, DATA.GOV, https://catalog.data.gov/dataset/federal-lead-based-paint-program-flpp-database (last updated Apr. 9, 2024).

68. *Lead-Based Paint Professional Locator*, EPA, https://cdxapps.epa.gov/ocspp-oppt-lead/firm-location-search (last updated Dec. 9, 2024).

69. For example, roughly 3 percent (6,176 of the 190,748) of contractors in California licensed to engage in activities likely covered by RRP were actually certified under the RRP program, as described below.

70. Jack Flynn, *30+ Home Improvement Industry Statistics [2023]: Trends, Spending, and Growth*, ZIPPIA (Mar. 12, 2023), https://www.zippia.com/advice/home-improvement-industry-statistics.

71. EPA, OFF. OF INSPECTOR GEN., No. 19-P-0302 , EPA NOT EFFECTIVELY IMPLEMENTING THE LEAD-BASED PAINT RENOVATION, REPAIR AND PAINTING RULE 11 (2019), https://www.epa.gov/sites/default/files/2019-09/documents/_epaoig_20190909-19-p-0302.pdf. Cynthia Giles discusses how inadequate enforcement was baked into the economic analysis of the RRP rule, which assumed a universe of 320,000 renovators performing approximately eighteen million regulated projects annually and "estimated that 16 people would be needed to enforce the law. Nationwide. *Sixteen*. You don't need to know anything about enforcement to understand how insufficient that is." GILES, *supra* note 8, at 106.

as Balfour Beatty to day laborers with little more than painting supplies and a truck and everyone in between. It has been difficult for EPA to design an enforcement strategy that effectively reaches the many, varied players in the industry. Our study marshals competing theories of environmental compliance motivations and enforcement strategy to test which type of compliance messaging can produce the greatest compliance gains in this challenging context.

III. RESEARCH METHODS

To design the experiment, the authors worked closely with EPA Region IX staff, who ultimately conducted the study. EPA Region IX sent letters to twenty thousand contractors in California likely to be subject to the RRP rule—and thus required to be Lead-Safe Certified—but who did not have a current certification at the time we launched the study.[72] To create an appropriate sample for the experiment, we obtained the names, addresses, and license classifications of all 223,366 contractors licensed in California from the California Department of Consumer Affairs' Contractors State License Board (CSLB) database.[73]

Our target list of letter recipients included both contractors in California who had previously obtained Lead-Safe Certification but whose certifications had lapsed ("Expirees"), and contractors in California who had never previously obtained Lead-Safe Certification ("Never-Before-Certified"). With the assistance of contacts at EPA Region IX (which includes California), we identified 6,176 contractors in California with current Lead-Safe Certifications in the FLPP database and 5,889 Expirees in California by matching FLPP records of current and lapsed certifications with CSLB records of licensed contractors.[74] We then sought to determine the universe of contractors in the CSLB database that were Never-Before-Certified but who were likely subject to RRP certification requirements. We consulted with EPA Region IX program managers on the license classifications most likely to correspond to activities covered by the RRP rule. We also analyzed data on California contractors with current or expired FLPP certifications to determine which license classifications accounted for the bulk of the certifications. Based on these consultations and the knowledge we gathered on the characteristics of Expirees, we identified sixteen CSLB license classifications in which contractors would be especially likely to

72. This was the maximum sample size allowed by the agency's budget.

73. We downloaded the CSLB's Master License File on February 23, 2021, from the Contractors State License Board Public Data Portal. *Master List of California Licensed Contractors*, CONTRACTORS STATE LICENSE BD. PUB. DATA PORTAL, https://www.cslb.ca.gov/onlineservices/dataportal/ContractorList (last visited Jan. 15, 2025).

74. Our linking techniques included a combination of exact matching phone numbers and then manually confirming names, automated fuzzy matching names and addresses using Cortex software and R's *tm* text mining package, and a fully manual approach. Manual inspections of the matched contractors led us to identify a small number of duplicate records, which EPA suspected were likely created when contractors renewed their certification. Whenever we found duplicates, we kept the record corresponding to the contractors' most recent certification and dropped their earlier records. Doing so reduced matched counts from 7,212 to 5,988 unique Expirees.

perform activities subject to the RRP rule, such as "General Building Contractor" and "Painting and Decorating Contractor."[75] These sixteen classifications contained a total of 190,748 CSLB contractors. Excluding the 6,176 actively certified contractors (who were not targets of the letter campaign) resulted in a list of 184,617 CSLB contractors with lead-related license classifications, including 178,728 Never-Before-Certified contractors and 5,899 Expirees.[76]

From this population of 184,617 contractors, we constructed a randomized sample of twenty-five thousand (including all 5,899 Expirees): Twenty thousand received letters that contained one of four treatment messages and five thousand received no letter, serving as a control group. We created five samples of five thousand contractors[77] that were balanced across key dimensions. Specifically, we sought to ensure that each group had similar proportions of Expirees (with similar expiration years), as well as similar distributions of the sixteen lead-related license classifications and other independent variables and demographic characteristics discussed in more detail below.[78]

We then randomly assigned each group of five thousand contractors to one of the five experimental conditions: (1) Baseline Letter, (2) Deterrence Letter, (3) Market Incentives Letter, (4) Normative Letter, and (5) No Letter. The Baseline Letter provided information about the RRP rule and instructions on how to become certified (Appendix Figure A1).[79] The Deterrence Letter warned recipients that non-certified contractors are inspection priorities for EPA (Appendix Figure A2). The Market Incentives Letter highlighted expanded business opportunities from being Lead-Safe Certified by noting that certification is a condition of eligibility for Home Depot's recommended

75. The sixteen CSLB classifications we identified are as follows: B - General Building Contractor, C-2 - Insulation and Acoustical Contractor, C-6 - Cabinet, Millwork and Finish Carpentry Contractor, C-9 - Drywall Contractor, C-10 - Electrical Contractor, C-13 - Fencing Contractor, C-15 - Flooring and Floor Covering Contractors, C-16 - Fire Protection Contractor, C-17 - Glazing Contractor, C-20 - Warm-Air Heating, Ventilating and A/C Contractor, C-21 - Building Moving/Demolition Contractor, C-33 - Painting and Decorating Contractor, C-36 - Plumbing Contractor, C-39 - Roofing Contractor, C-54 - Ceramic and Mosaic Tile Contractor, and C-61 - Limited Specialty.

76. Table A1 in the Appendix reports the number of contractors in each of these sixteen license classifications.

77. We chose to divide the sample into five groups of five thousand based on an *a priori* power analysis we conducted to estimate the minimum required sample size per group. Assuming a baseline proportion of 0.30, given information provided by our EPA contacts on historical recertification rates, and an estimated effect size of approximately 0.03, informed by prior research (e.g., Michael Chirico et al., *Deterring Property Tax Delinquency in Philadelphia: An Experimental Evaluation of Nudge Strategies*, 72 NAT'L TAX J. 479 (2019)), we needed a per group sample size of at least 3,763 to detect differences with power = 0.8 and $\alpha = 0.05$.

78. We used Stata's *splitsample* command to divide the twenty-five thousand contractors into five groups of five thousand contractors—to create four treatment arms and one control arm—with similar proportions of Expirees and their expiration years and the sixteen lead-related classifications. Summary statistics for our matched sample of twenty-five thousand contractors used in our regression models are provided in Table 1. Correlations are reported in Appendix Table A1.

79. This letter was based on language EPA had employed in previous letters to contractors with expired Lead-Safe Certifications.

contractor list (Appendix Figure A3). Finally, the Normative Letter emphasized the moral importance of Lead-Safe Certification to protect the health of the community, customers, and employees (Appendix Figure A4). The theory underlying each of these treatments is elaborated in Part IV.A. Each letter was provided in English and Spanish.

EPA Region IX mailed the twenty thousand letters on agency stationery (letterhead and envelopes) on January 17, 2023, except for 131 letters that were mailed on February 17, 2023, due to a delay caused by a printing error.[80] EPA then provided us a list of the 736 contractors across our five groups that had become certified by May 17, 2023, four months after the letters were first sent. While our results include all certifications that occurred within the four-month window, we note that 75 percent of these certifications occurred within the first month after letter receipt. We selected the four-month window to provide contractors with sufficient time to achieve certification following receipt of the letter and to ensure sufficient proximity between letter receipt and certification to attribute causation to the letter.[81] These 736 newly certified contractors form the basis of our analysis.

IV. COMPARATIVE EFFECTIVENESS OF DIFFERENT COMPLIANCE MESSAGING

This Part presents the results of the study, which suggest NEG-inspired messaging is less effective at motivating compliance than its proponents argue, and deterrence-based messaging is more effective than its detractors believe. Subpart A elaborates on the theory underlying the treatment condition featured in each letter and Subpart B presents the results of our study. Note that our study contains two baselines for comparison: the No Letter Group and the Baseline Letter Group. We initially compare compliance outcomes for the Baseline Letter group with compliance outcomes for the No Letter group, based on the theory that sending a letter containing information about the RRP program will promote greater compliance than sending no letter at all. For the other three treatment conditions—deterrence, market incentives, and normative messaging—we

80. The 131 late letters were all sent to contractors in the Market Incentives Group, and all were revised to include the correct mailing date, February 17, 2023. For these 131 late letter recipients, we observed how many responded within the subsequent eighty-nine days (approximately three months) before the May 17 cutoff date when we closed our analysis window, rather than 120 days (approximately four months) for the rest of the sample. Among the contractors in the Market Incentives Group who were sent the letter on time (January 17), only 0.08 percent responded by becoming certified during the fourth month (90-120 days) after receiving the letter. Applying this "fourth month response rate" to the 131 late letter recipients, we surmise that only 0.1 (0.08 percent multiplied by 131) additional contractors would have become certified during the fourth month after receiving the letter (when we did not observe them). Thus, the combination of the low percentage of late letter recipients and the very low response rates during the fourth month among the rest of the sample lead us to believe the lateness issue has little bearing on our results.

81. Researchers and agency officials agreed on the four-month window based on their experience with letter campaign response times. Certification rates declined significantly after one month and continued to decline thereafter.

investigate whether these treatments produce a "Baseline-Plus" effect, achieving greater compliance gains compared to no letter than those achieved by the Baseline Letter. In our analysis, we compare the effects of these three treatments to evaluate the relative efficacy of the deterrence message versus the two NEG-inspired treatments (market incentives and normative messaging).

The results and analysis presented in Subpart B largely confirm our hypotheses about the Baseline Letters and Deterrence Letters but do not support our hypotheses about the Market Incentives Letters and Normative Letters. Summarized briefly, the Baseline Letter produced statistically significantly greater compliance than no letter for both Expirees and Never-Before-Certified contractors, and the Deterrence Letter produced statistically significantly greater compliance than the Baseline Letter—but only for Never-Before-Certified contractors. While the Market Incentives Letters and Normative Letters produced statistically significantly greater compliance than no letter for both Expirees and Never-Before-Certified contractors, they produced less than or similar compliance gains as the Baseline Letter. In particular, the Market Incentives Letter yielded significantly worse compliance than the Baseline Letter for both Expirees and Never-Before-Certified contractors. The Normative Letter yielded significantly worse compliance gains than the Baseline Letter for Expirees and similar (statistically indistinguishable) effects for Never-Before-Certified contractors.

A. Theory and Existing Research Motivating Letter Treatment Conditions

1. Baseline Letter Providing Information about Compliance with RRP

Much noncompliance can be attributed to a lack of knowledge about regulatory requirements, particularly in areas such as environmental law, where regulatory requirements can be extensive and complex:

> Awareness of what a given regulation requires is a prerequisite to compliance. It is axiomatic that if regulatees are not aware of a regulation, they will not comply with that regulation. . . . Even if the existence of a regulation is known, the requirements of the regulation may not be understood.[82]

Research has shown that compliance outcomes improve when the regulated community has a reasonably high level of awareness of the relevant rules[83] and when regulators provide clear, consistent, and actionable information about regulatory requirements.[84] However, studies have suggested that a regulatory

82. Søren C. Winter & Peter J. May, *Motivation for Compliance with Environmental Regulations*, 20 J. POL'Y ANALYSIS & MGMT. 675, 679 (2001).

83. *See id.* at 690.

84. *See, e.g.*, Peter J. May & Robert S. Wood, *At the Regulatory Frontlines: Inspectors' Enforcement Styles and Regulatory Compliance*, 13 J. PUB. ADMIN. RSCH. & THEORY 117, 131 (2003); Robyn Fairman & Charlotte Yapp, *Enforced Self-Regulation, Prescription, and Conceptions of Compliance within Small Businesses: The Impact of Enforcement*, 27 L. & POL'Y 491, 512 (2005).

enforcement strategy focused on information and compliance assistance can backfire—for instance, when it is directed at those who are not inclined to comply voluntarily,[85] or if it discourages compliance by well-intentioned actors concerned that others in their industry will get away with law-breaking.[86] These limitations can be overcome when information and compliance assistance are embedded within regulatory regimes that provide for punitive enforcement measures.[87]

In the renovation, repair, and painting industry, we expect that information about RRP regulatory and compliance requirements will be especially important because this space includes many small businesses and individuals who lack legal sophistication, who do not employ environmental compliance staff, and who are unlikely to receive ongoing advice from legal counsel. Our Baseline Letter provided key information about RRP certification requirements and offered compliance assistance resources.[88] The Baseline Letter also contained information about possible penalties for noncompliance but did not highlight this aspect of the program. This reference to the broader regulatory regime and the possibility of punitive enforcement should avoid the potentially negative effects of compliance assistance that other researchers have observed. Thus, we expected that contractors who received the Baseline Letter would be more likely to obtain certification than contractors who received no letter.

2. Treatment 1: Deterrence Letter

Deterrence theory holds that rational actors will comply with the law when the expected costs of violating the law exceed the expected benefits of violating the law.[89] From this perspective, "[t]he task for enforcement agencies is to make penalties high enough and the probability of detection great enough that it becomes economically irrational for facilities to violate environmental requirements."[90] Regulators have two primary mechanisms for raising the expected costs of violating the law: (1) increasing penalties for violations, or (2) increasing the probability that violations will be detected and penalized.[91] The

85. *See* Neil Gunningham, *Negotiated Non-Compliance: A Case Study of Regulatory Failure*, 9 L. & POL'Y 69, 84 (1987).

86. *See* Sidney A. Shapiro & Randy S. Rabinowitz, *Punishment Versus Cooperation in Regulatory Enforcement: A Case Study of OSHA*, 49 ADMIN. L. REV. 713, 722 (1997) ("A mix of anecdotal and empirical evidence warns that cooperative approaches can decrease compliance if agencies permit law breakers to go unpunished.").

87. *See, e.g.*, AYRES & BRAITHWAITE, *supra* note 30, at 19 (arguing that cooperative regulation is more effective when pursued against the backdrop of potential sanctions); Neil Gunningham, *Enforcing Environmental Regulation*, 23 J. ENVT'L L. 169, 201 (2011) (discussing the importance of integrating different regulatory strategies).

88. See Appendix Figure A1 for the full letter text.

89. *See generally* Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169 (1968).

90. Rechtschaffen, *supra* note 19, at 1187.

91. *Id.* at 1186-87.

penalties for violating the RRP rule are significant, particularly for small businesses and individual contractors. Performing covered renovation, repair, or painting services without valid Lead-Safe Certification may result in penalties of up to $40,576 per violation.[92] But this number on paper has had little deterrent effect because of EPA's limited inspection presence in the industry. There is broad consensus in the scholarly literature that deterrence effects are driven more by the probability that noncompliance will be detected by regulators than by the magnitude of the available penalties.[93] The upshot is that the size of the potential fine is irrelevant if regulated entities are confident that they will not get caught.[94]

Consistent with this understanding, prior research has shown that increasing the threat of inspection is an effective way to increase the deterrent effect of sanctions.[95] This research is generally based on observed inspection levels, finding that compliance tends to be better in more heavily inspected industries or regions.[96] However, because EPA Region IX did not have the budget to increase RRP inspections, we could not increase the *actual* probability of inspection. Instead, our Deterrence Letter sought to increase recipients' *perception* of the likelihood that they would be inspected. Research has shown that even when the *actual* probability of detection remains unchanged, changing *perceptions* of detection risk can change behavior.[97]

In the deterrence treatment arm, we added the following language to the Baseline Letter: "EPA prioritizes inspections at firms without current Lead-Safe Firm Certificates on file. Many of those inspected end up having to pay penalties."[98] This language accurately states EPA's inspection priorities. It does

92. Civil penalties for RRP rule violations are set forth in 15 U.S.C. § 2615(a)(1). The statutorily defined maximum penalty is adjusted for inflation under the Federal Civil Penalties Inflation Adjustment Act of 1990 (Pub. L. 101-410), as amended by the Debt Collection Improvement Act of 1996 (Pub. L. 104-134) and, most recently, the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015 (Pub. L. 114-74, Section 701). At the time EPA sent these letters the inflation-adjusted maximum penalty was $40,576 per violation. *See also EPA-RRP Lead-Based Paint Safety Certification*, CONTRACTORS STATE LICENSE SCHS, https://contractorslicensingschools.com/epa-rrp-certification (last visited Jan. 16, 2025).

93. *See, e.g.*, CESARE BECCARIA, ON CRIMES AND PUNISHMENTS (1764) (theorizing that a lower, more certain penalty is more effective than a higher, uncertain one); FRANKLIN E. ZIMRING & GORDON J. HAWKINS, DETERRENCE: THE LEGAL THREAT IN CRIME CONTROL (1973) (arguing that certainty of punishment is more important than severity of punishment in reducing crime); Daniel S. Nagin, *Deterrence in the Twenty-First Century*, 42 Crime & Justice 199, 199 (2013) (arguing that "evidence in support of the deterrent effect of the certainty of punishment is far more consistent than that for the severity of punishment," where certainty refers to the probability of getting caught); Dietrich Earnhart & Lana Friesen, *Certainty of Punishment Versus Severity of Punishment: Enforcement of Environmental Protection Laws*, 99 LAND ECON. 245, 245 (2023) (finding larger compliance gains from increases in enforcement certainty than enforcement severity when both are relatively high).

94. *See* Earnhart & Friesen, *supra* note 93, at 261.

95. Glicksman & Earnhart, *supra* note 22, at 340.

96. *Id.* at 335 (measuring the "threat" of inspection as the number of inspections performed in a given state or EPA region within a given calendar year).

97. Alex Raskolnikov, *Deterrence Theory: Key Findings and Challenges*, *in* THE CAMBRIDGE HANDBOOK OF COMPLIANCE 179, 185 (Benjamin van Rooij & D. Daniel Sokol eds., 2021).

98. See Appendix Figure A2 for the full letter text.

not reveal the likelihood that any particular uncertified contractor will be inspected. It simply aims to raise uncertified contractors' perception of detection risk. We expected that uncertified contractors receiving a Deterrence Letter informing them that EPA prioritizes inspections of uncertified contractors would be more likely to obtain certification than contractors who received the Baseline Letter.

3. Treatment 2: Market Incentives Letter

Deterrence theory has been critiqued as ineffective and potentially counter-productive. Under real-world regulatory constraints, it can be difficult to raise penalties and detection probabilities sufficiently to deter highly rewarding non-compliant behavior.[99] Moreover, attempts to aggressively penalize noncompliance can lead to backlash from regulated entities that might otherwise be inclined to comply.[100] "Critics charge that a cooperative approach to enforcement is the best way to achieve compliance and that sanction-oriented enforcement is counterproductive . . . Under this mind-set, persuasion works better than punishment; essentially, carrots are superior to sticks."[101] For these reasons, important strands of NEG theory advocate utilizing market incentives rather than penalties to motivate compliance.[102] Indeed, some have suggested that "the superiority of market-based instruments has developed into a virtual orthodoxy" in environmental law and policy.[103]

Our Market Incentives Letter tested the effect of informing contractors about economic benefits associated with Lead-Safe Certification. One significant benefit that certified contractors enjoy is access to renovation, repair, and painting business through big-box retailers such as Home Depot and Lowe's.[104] These retailers maintain lists of local authorized service providers to help customers with home improvement projects, and, importantly, require that contractors be EPA Lead-Safe Certified. Pursuant to a consent decree settling

99. Rechtschaffen, *supra* note 19, at 1192.

100. *Id.* at 1204.

101. *Id.* at 1203.

102. *See* Bradley C. Karkkainen, *Environmental Lawyering in the Age of Collaboration*, 2002 WIS. L. REV. 555, 561 (2002) (observing adjustments in the enforcement practices of EPA and state environmental regulators to incentivize voluntary compliance); Rechtschaffen, *supra* note 19, at 1203-1204; BARDACH & KAGAN, *supra* note 26, at 99-117; *see also* BRAITHWAITE, *supra* note 26, at 100.

103. Freeman & Kolstad, *supra* note 18, at 4. To be clear, some market-based instruments such as cap-and-trade systems depend on the robust use of deterrence-based enforcement methods. We refer here to market-based incentives designed to motivate compliance based on the positive benefits or business opportunities they create for businesses, such as sustainability certifications.

104. *See Corporate-Wide Settlement with Lowe's Protects Public from Lead Pollution During Home Renovations*, U.S. DEP'T OF JUST. (Apr. 17, 2014), https://www.justice.gov/opa/pr/corporate-wide-settlement-lowe-s-protects-public-lead-pollution-during-home-renovations (hereinafter *Lowe's Settlement*); *Home Depot to Pay $20,750,000 Penalty for Nationwide Failure to Follow Rules for Conducting Renovations Involving Lead Paint*, U.S. DEP'T OF JUST. (Dec. 17, 2020), https://www.justice.gov/opa/pr/home-depot-pay-20750000-penalty-nationwide-failure-follow-rules-conducting-renovations (hereinafter *Home Depot Penalty*).

enforcement actions with EPA, Home Depot and Lowe's adopted extensive compliance programs to ensure that all listed contractors have a valid Lead-Safe Certificate.[105] For instance, Home Depot maintains a web page encouraging customers to "[l]et us do it for you," where it links to a list of recommended contractors.[106] This site solicits applications from "outstanding local contractors" to become "Home Depot Pros" and informs potential applicants: "We follow EPA lead-safe work practices."[107] Pursuant to the consent decree with EPA, Home Depot maintains an electronic compliance system to screen contractors for Lead-Safe Certification.[108] Obtaining certification is the key that unlocks access to this potentially lucrative home improvement market for contractors.

Our Market Incentives Letter communicated these business benefits to contractors using the following language added to the Baseline Letter:

> Major retailer Home Depot recently adopted a company-wide policy to only hire contractors with valid Lead-Safe Certificates to perform renovation, repair and painting work on any housing built before 1978. To do this, Home Depot has developed an electronic compliance system to verify that the contractors it hires are properly certified.[109]

We chose to mention Home Depot rather than Lowe's in the Market Incentives Letter because Home Depot had more recently settled with EPA. We expected that contractors who received a letter informing them that Home Depot requires Lead-Safe Certification for its local authorized contractors would be more likely to obtain certification than contractors who received the Baseline Letter. In addition, to test possible variations in the salience of this message, we investigated whether its effect was moderated by contractors' proximity to Home Depot stores.

4. Treatment 3: Normative Letter

NEG theory on social norm activation provides another potential mechanism for motivating compliance with RRP requirements. Scholars have argued that regulators' frequent focus on penalties is misplaced and that the focus

105. *Lowe's Settlement*, *supra* note 104; *Home Depot Penalty*, *supra* note 104; *see also* Consent Decree at 7-17, United States v. Lowe's Home Ctrs. LLC, No. 3:14-cv-00449-DRH-SCW (S.D. Ill. Apr. 17, 2014).

106. *Home Services*, HOME DEPOT, https://www.homedepot.com/services/?mtc=SEM-BF-HSL-GGL-Multi-Multi-NA-Multi-NA-RSA-NA-HSL-NA-NA-BT3-NA-NA-NA-US&cm_mmc=SEM-BF-HSL-GGL-Multi-Multi-NA-Multi-NA-RSA-NA-HSL-NA-NA-BT3-NA-NA-NA-US-71700000108167873-58700008349618609-43700076821798740&gad_source=1&gclid=Cj0KCQjw8MG1BhCoARIsAHxSiQm72J3PI2HJrgglgANT83nIG076gWHa12i4yMxgF5gsv6M-Xkc2BcaAkyZEALw_wcB&gclsrc=aw.ds (last visited Jan. 15, 2025).

107. *Id.*

108. *Home Depot Settlement Information Sheet*, EPA, https://www.epa.gov/enforcement/home-depot-settlement-information-sheet (last updated Apr. 9, 2025).

109. See Appendix Figure A3 for the full letter text.

should be on triggering ingrained moral obligations:[110] "[T]he more sanctions can be kept in the background, the more regulation can be transacted through moral suasion, the more effective regulation will be."[111] Specifically relevant to our context, "[t]he norms analysis suggests that greater increases in compliance rates may result from describing the harms to human health and the environment. . . ."[112]

Empirical studies on regulatory moral suasion report mixed results on compliance outcomes. For instance, in the literature on tax compliance, several studies have tested the efficacy of normative messages informing taxpayers of the essential role of taxes in financing public goods and the importance of every taxpayer's contribution to the community's well-being. These studies variously find that such messages increase tax compliance,[113] decrease tax compliance,[114] or have no effect.[115] Indeed, researchers have found that moral messages can

110. Note that the moral-normative approach we describe here is different than behavioral interventions seeking to shape behavior based on *descriptive* norms. Descriptive norms aim to trigger conformity responses by providing information about high levels of the desired behavior in a relevant peer group. *See, e.g.*, Kenneth Gillingham & Tsvetan Tsvetanov, *Nudging Energy Efficiency Audits: Evidence from a Field Experiment*, 90 J. ENVT'L ECON. & MGMT. 303, 305 (2018) (attempting to motivate homeowners to participate in an energy audit program by informing them of uptake by other residents of the community). We declined to test this approach since compliance rates with Lead-Safe Certification requirements were very low, meaning that the descriptive norm is noncompliance.

111. AYRES & BRAITHWAITE, *supra* note 30, at 19.

112. Michael P. Vandenbergh, *Beyond Elegance: A Testable Typology of Social Norms in Corporate Environmental Compliance*, 22 STAN. ENVT'L L. J. 55, 59 (2003).

113. Michael Chirico et al., *An Experimental Evaluation of Notification Strategies to Increase Property Tax Compliance: Free-Riding in the City of Brotherly Love*, 30 TAX POL'Y & ECON. 129, 138-39, 151 (2016) (describing specific essential services provided by tax dollars and requesting delinquent taxpayers to "Please pay your taxes as soon as you can to help us pay for these essential services"); John Hasseldine et al., *Persuasive Communications: Tax Compliance Enforcement Strategies for Sole Proprietors*, 24 CONTEMP. ACCT. RSCH. 171, 178, 189 (2007) (distributing a message stating that "small mistakes by a lot of people can add up to a lot of lost tax and, therefore, less money available for public spending on things like hospitals, schools, and pensions"); Daniel E. Ortega & Pablo Sanguinetti, *Deterrence and Reciprocity Effects on Tax Compliance: Experimental Evidence from Venezuela* 12, 23 (CAF, Working Paper No. 2013/08, 2013) (highlighting the use of tax dollars for public goods such as police, basic infrastructure, public transportation, and waste management and stressing the importance for all citizens to comply with their tax obligations).

114. Barak Ariel, *Deterrence and Moral Persuasion Effects on Corporate Tax Compliance: Findings from a Randomized Controlled Trial*, 50 CRIMINOLOGY 27, 43-44, 56 (2012) (finding that the moral treatment arm of this study informing taxpayers how tax dollars are allocated to finance public goods and that their taxes were essential to this process resulted in an increase, rather than a decrease, in tax deductions, depriving the state of revenue to finance public goods).

115. Chirico et al., *supra* note 77, at 491-92 (providing tailored messages to taxpayers describing specific local amenities provided by tax dollars in their explicitly named neighborhood and deploying a message about the civic duty of each citizen to pay their fair share of taxes for community services); Marsha Blumenthal et al., *Do Normative Appeals Affect Tax Compliance? Evidence from a Controlled Experiment in Minnesota*, 54 NAT'L TAX J. 125, 129, 134 (2001) (describing how tax dollars are allocated among state services and stating that "when taxpayers do not pay what they owe, the entire community suffers"); Lucio Castro & Carlos Scartascini, *Tax Compliance and Enforcement in the Pampas Evidence from a Field Experiment*, 116 J. ECON. BEHAV. & ORG. 65, 74 (2015) (finding no average effect in response to information about specific services the government provides with tax dollars); STEPHEN COLEMAN, THE MINNESOTA INCOME TAX COMPLIANCE EXPERIMENT STATE TAX

provoke backlash from regulated entities and dampen compliance when they are deployed in contexts such as antitrust enforcement, where there is no clear social consensus on the moral valence of noncompliance.[116]

While the compliance track record for normative messages is decidedly mixed, we nevertheless believed that moral messaging was especially likely to be salient in our empirical context because lead paint safety precautions have a clear moral valence. Normative environmental enforcement tactics are those that "provide[] information about the consequences of a noncompliant act and the individual's responsibility for or ability to prevent those consequences."[117] Our Normative Letter sought to do just that with the following language:

> Exposure to lead paint can severely harm babies, slow children's learning and development, and harm adults by increasing blood pressure and damaging the brain, kidneys, and reproductive system. The health of your community, your customers and employees, and their families depends on you to have a Lead-Safe Firm Certificate that will help ensure that lead paint removal is handled safely.[118]

We expected that contractors who received a letter highlighting the normative dimensions of Lead-Safe Certification would be more likely to obtain certification than contractors who received the Baseline Letter.

B. Analysis and Results

We captured certification compliance outcomes four months after the letters were sent, with a total of 736 contractors across our five groups becoming newly certified during this time period. Rows 1 and 2 of Table 2 report the total number of contractors within each group and the number that became certified within each group, while row 3 reports certification rates (the ratio of the latter to the former value). The Deterrence Letter produced the greatest number of new certifications (238 new certifications, or 4.8 percent of the group's five thousand contractors), followed by the Baseline Letter (200, or 4.0 percent), the Normative Letter (163, or 3.3 percent), and the Market Incentives Letter (124, or 2.5 percent). All the letters produced dramatically higher compliance compared to the No Letter group, where only eleven contractors, or 0.2 percent, became

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RESULTS 5, 18 (1996), https://www.revenue.state.mn.us/sites/default/files/2011-11/research_reports_content_complnce.pdf (describing critical services provided by tax dollars and stating that "when taxpayers do not pay what they owe, the entire community suffers"); Ben S. Meiselman, *Ghostbusting in Detroit: Evidence on Nonfilers from a Controlled Field Experiment*, 158 J. PUB. ECON. 180, 183 (2017) ("Detroit's rising is at hand. The collection of taxes is essential to our success."); Ortega & Sanguinetti, *supra* note 113, at 12, 18 (highlighting the use of tax dollars for distributive social assistance programs for the poor and the elderly and improvements in public health services).

116. *See* Christine Parker, *The "Compliance" Trap: The Moral Message in Responsive Regulatory Enforcement*, 40 L. & SOC'Y REV. 591 (2006).

117. Vandenbergh, *supra* note 112, at 74.

118. See Appendix Figure A4 for the full letter text.

certified. The letters increased the likelihood of certification by a factor ranging from eleven to nearly twenty-two.

1. Comparing Certification Rates with Proportion Tests

We begin our statistical analysis by using "two-sample proportion tests" that examine whether differences in the response rates between two groups are statistically significant.[119] We can use this straightforward approach because we randomly assigned contractors to the various groups, ensuring that any confounding factors are equally distributed across the groups.[120] As robustness tests, we also estimated regression models that include control variables to account for the possibility that randomization did not equally distribute these confounding factors due to finite sample sizes.

We first focus on comparisons between the Baseline Letter and the No Letter groups. Starting with the subsample of contractors that had never been certified, we find that the group that received the Baseline Letter—and, in fact, all groups that received letters—were statistically significantly more likely to become certified than the No Letter group. For example, the 2.2 percent certification rate (85 of 3,849) among Never-Before-Certified contractors who received the Baseline Letter is statistically significantly higher (p-value (p) < 0.01) than the 0.1 percent certification rate (2 of 3,838) among the Never-Before-Certified contractors who received no letter (rows 4–7 of Table 2). Turning to the Expiree contractors, we similarly find that the group that received the Baseline Letter—and again, all groups that received letters—were statistically significantly more likely to become certified than the No Letter group. For example, the 10.0 percent certification rate (115 of 1,151) of Expirees who received the Baseline Letter is statistically significantly higher ($p < 0.01$) than the 0.8 percent certification rate (9 of 1,162) of the Expirees who received no letter (rows 9–12 of Table 2).

We now turn to comparing the groups that received alternative versions of the letter to those who received the Baseline Letter. Starting with the subsample of contractors that had never been certified, we find that only the Deterrence Letter yielded a statistically significantly higher ($p < 0.01$) certification rate (3.3 percent, or 127 of 3,849) than the Baseline Letter group's 2.2 percent certification rate. In contrast, among the Never-Been-Certified contractors, the

119. Two-sample proportion tests are akin to using two-sample t-tests that compare average values across two samples, except proportion tests are more appropriate when comparing proportions as we did here.

120. ANOVA was conducted to compare the five groups' means of each variable we sought to balance. These tests confirmed that the samples are balanced ($p > 0.10$) in terms of the distributions of their sixteen lead-related license classifications, number of Expirees and their expiration year, proximity to Home Depot stores, and county demographics (per capita income, racial composition, Hispanic composition) except for two variables where differences were substantively immaterial: group averages of closest Home Depot (miles) ranged from 5.2 to 5.8 miles, and white alone population percentage (county) ranged from 71.9 percent to 72.2 percent.

1.5 percent certification rate for the Market Incentives Letter is statistically significantly lower (worse) than the Baseline Letter group's certification rate ($p = 0.02$). The Normative Letter group's 1.9 percent certification rate is statistically indistinguishable from the Baseline Letter group's ($p = 0.35$).

As we turn to the Expirees, we point out that, within each group, the Expirees exhibited higher compliance rates than the Never-Been-Certified contractors (comparing rows 11 to 6 in Table 2). For the Expirees, we find that none of the other letters yielded a certification rate that exceeded the Baseline Letter group's 10.0 percent certification rate. The Deterrence Letter group's 9.6 percent certification rate is statistically indistinguishable from the Baseline Letter group's ($p = 0.75$). The Market Incentives Letter group's 5.7 percent certification rate, and the Normative Letter group's 7.6 percent certification rate are statistically significantly lower (worse) than the Baseline Letter group's ($p < 0.01$ and $p = 0.04$, respectively) for the Expirees.

2. Comparing Certification Rates Using Regression Analysis

As mentioned above, we used regression analysis as a robustness test to evaluate whether certification rates statistically differed between the groups of Never-Before-Certified contractors and Expiree contractors. This analysis controls for several factors that might also affect certification rates and for the possibility that our finite sample size might have precluded the randomization process from fully equalizing their distribution across the groups. All models predict whether a contractor will become certified as a function of a series of dummy variables indicating the five conditions (No Letter, Baseline Letter, Deterrence Letter, Normative Letter, Market Incentives Letter). All models also include the following controls to account for key demographics within each contractor's county. We include average per capita income by county (logged to compress outliers),[121] to control for the possibility that wealthier homeowners might exhibit greater demand for Lead-Safe Certified contractors. To control for variation in racial composition we include variables that estimate the proportion of the county's population that is (a) White, (b) Black, or (c) Hispanic, with the omitted category being other race categorizations tracked by the U.S. Census, which includes American Indian and Alaska Native alone, Asian alone, Native Hawaiian and Other Pacific Islander alone, and two or more races.[122] These

121. *See* U.S. CENSUS BUREAU, ANNUAL COUNTY RESIDENT POPULATION ESTIMATES BY AGE, SEX, RACE, AND HISPANIC ORIGIN: APRIL 1, 2020 TO JULY 1, 2021 (2022), https://www2.census.gov/programs-surveys/popest/technical-documentation/file-layouts/2020-2021/cc-est2021-alldata.pdf; https://www2.census.gov/programs-surveys/popest/datasets/2020-2021/counties/asrh (download "cc-est2021-all.csv" raw data file).

122. We obtained from the U.S. Census the proportion of county population in 2021 that was white alone (i.e., the only race indicated), Black alone, Hispanic, or other race categorizations (American Indian and Alaska Native alone, Asian alone, Native Hawaiian and Other Pacific Islander alone, and two or more races); the latter is the omitted (reference) category in our regression models. *See* CC-EST2019-ALLDATA-[ST-FIPS]: Annual County Resident Population Estimates by Age, Sex, Race,

variables account for the possibility that contractors' certification propensity might be influenced by the racial composition of their community. Finally, all models include sixteen dummy variables to control for each of the CSLB lead-related license classifications that correspond to each contractor.

We use logistic regression, a typical approach when the dependent variable is binary—as in our case, where our model is predicting a contractor's decision of whether to become certified. We estimate four models. Models 1 and 2 are estimated on the sample of the Never-Before-Certified contractors; Models 3 and 4 are estimated on the sample of Expirees. The omitted (reference) category is the No Letter group in Models 1 and 3 and the Baseline Letter group in Models 2 and 4. We report all regression results in Table 3.

Models 1 and 3 yield results that facilitate comparisons between the four groups that received letters and the No Letter group. Model 1 is estimated on the Never-Before-Certified contractors: The positive, statistically significant coefficients on all four group variables indicate that Never-Before-Certified contractors who received any of the letters were more likely to become certified than those in the No Letter reference group. Model 3 is estimated on the Expirees: The positive, statistically significant coefficients on all four group variables indicate that Expiree contractors who received any of the letters were more likely to become certified than those in the No Letter reference group.

Models 2 and 4 yield results that facilitate comparisons between the various types of letters. Model 2 is estimated on the Never-Before-Certified contractors. The results indicate that among these contractors the Deterrence Letter prompted a significantly higher likelihood of certification than the Baseline Letter, the Market Incentives Letter prompted a significantly lower likelihood than the Baseline Letter, and the Normative Letter prompted a statistically indistinguishable likelihood compared to the Baseline Letter (the reference group). Model 4 yields different effects for the Expirees: Those who received the Deterrence Letter were as likely to become certified as those who received the Baseline Letter, whereas Expirees who received the Market Incentives Letter or Normative Letter were less likely to become certified than those who received the Baseline Letter (the reference group).

In sum, these regressions yield the same inferences as the proportion tests described earlier, which is perhaps not surprising considering our field experiment relied on randomized assignment to groups. The addition of control variables should lead to only minor changes when estimating treatment effects.

We highlight the statistically significant coefficient on one control variable: per capita income. Contractors located in wealthier counties were statistically more likely to become certified; a one log point increase in average per capita

and Hispanic Origin: April 1, 2010 to July 1, 2019 [Release Date June 2020] in the *2021 National and State Population Estimates Press Kit*, U.S. CENSUS BUREAU (Dec. 21, 2021), https://www.census.gov/newsroom/press-kits/2021/2021-national-state-population-estimates.html.

income is associated with an increase in the propensity to become certified of 1.2 percentage points for Never-Before-Certified contractors and 2.3 percentage points for the Expirees. We find no differences in the likelihood of contractors to become certified across counties with varying racial compositions, after accounting for average county-level per capita income.

V. DISCUSSION AND CONCLUSION

The results of our field experiment, conducted in collaboration with staff at EPA Region IX, yield important insights for environmental enforcement policy. We detail below key implications of our findings and consider their possible relevance in other regulatory contexts. Future studies are necessary to assess the generalizability of our findings to different regions or regulatory contexts. EPA staff have expressed interest in repeating this study in other states, and at least one other agency has reached out to us to learn how they might conduct a similar study.

A. Environmental Enforcement Policy Implications

Foundational new governance scholarship argues that regulators "should be reluctant to push punishment to the foreground of day-to-day regulatory encounters."[123] However, in our empirical context, pushing punishment to the foreground was the most effective strategy for improving compliance rates. Importantly, our findings demonstrate that deterrence effects can be achieved by creating the *perception* of heightened enforcement risk even if the regulator lacks the resources to increase the actual probability of enforcement.[124] Without devoting any additional resources to RRP enforcement, EPA was able to create the perception of increased inspection risk for some contractors, leading to improved compliance.

On the one hand, this result is counterintuitive since the regulator's low enforcement presence makes it difficult to create the perception that there is any appreciable deterrence threat. On the other hand, the low enforcement presence might have lulled many contractors into the false belief that they are invisible to the regulator. The sudden realization upon receiving a letter that they are on the regulator's radar might have produced an outsized deterrent effect. The fact that the deterrence message prompted the biggest compliance gains among Never-Before-Certified contractors supports the latter inference. Additional research is necessary to confirm that "visibility realization" is a mechanism driving

123. AYRES & BRAITHWAITE, *supra* note 30, at 48-49.

124. This is consistent with research in another context showing that press releases publicizing the Occupational Safety and Health Administration's enforcement actions amplified deterrence effects without changing the probability of inspection. *See* Matthew S. Johnson, *Regulation by Shaming: Deterrence Effects of Publicizing Violations of Workplace Safety and Health Laws*, 110 AM. ECON. REV. 1866, 1866 (2020).

compliance gains from deterrence messaging in low-enforcement environments. If such a mechanism is indeed at work, there might be limitations to the effectiveness of deterrence messaging in such environments. Positive compliance effects may wane once regulated entities learn that, despite being visible to the regulator, they are unlikely to be the subject of enforcement activity.

Another important insight from our study is that targets of compliance messaging may respond differently depending on their past engagement with the regulatory regime. This suggests that regulators should consider tailoring different messages for regulated entities whose compliance has lapsed and regulated entities who have never been in compliance. In our sample, the Deterrence Letter yielded the highest certification rate for the Never-Before-Certified contractors, whereas the Baseline Letter yielded the highest certification rate for the Expirees. What could explain this disparity? As suggested above, it could be that contractors who have previously held certifications know that inspection is a remote possibility, even after certification has lapsed. It could be that previously certified contractors, who have already demonstrated a willingness to comply, need no more than a reminder to come back into compliance. Importantly, the deterrence message did not dampen Expirees' motivation to comply—they were just as likely to renew their certifications in response to the Deterrence Letter as in response to the Baseline Letter's reminder. This should lessen concerns that deterrence-based strategies might "undermine the good will of actors when they are motivated by a sense of responsibility."[125]

Across all control and treatment letters, Expirees came into compliance at significantly higher rates than Never-Before-Certified contractors. This finding could be explained by: (1) over-inclusive targeting of Never-Before-Certified contractors, (2) regulatory "stickiness" that places contractors on a path to keep complying once they start complying, or (3) some combination of both. While we endeavored to target Never-Before-Certified contractors who do work covered by the RRP rule, it is possible that our sample of Never-Before-Certified contractors included some portion of contractors whose work is not, in fact, covered. If we sent letters to contractors who are not covered by the rule, we would not expect them to come into compliance, thus dampening compliance rates in this population.

At the same time, it is possible that past certification carries a degree of stickiness once a contractor obtains it. It could be that Expirees have experienced the benefits of compliance, for instance, with customers who value lead-safe practices. Expirees may recognize that the burdens of compliance are small, or they might have already adopted internal programs to facilitate compliance with documentation and other requirements. Such experiences with the regulatory

125. AYRES & BRAITHWAITE, *supra* note 30, at 19.

regime might make Expirees especially likely to come back into compliance. Unfortunately, our data do not allow us to observe targeting imprecision or stickiness, only their aggregate impact, so we cannot say anything definitive about their separate contributions to our findings. We suggest that regulators bear both in mind when designing future outreach campaigns.

The higher uptake by Expirees might tempt regulators to focus scarce resources on this population. Indeed, previous EPA compliance letter campaigns for the RRP program exclusively targeted Expirees. While there are advantages to this approach, we think it has important drawbacks. First, doing so might disincentivize contractors from ever signing up in the first place if regulators focus their enforcement attention solely on the population of contractors that become certified at some point in time. Second, selecting a target sample based solely on compliance rates sacrifices potentially significant compliance gains that could be achieved by targeting Never-Before-Certified contractors, since this population dwarfs the population of Expirees. For example, in our deterrence treatment arm, although Expirees became certified at nearly triple the rate of Never-Before-Certified contractors (9.6 percent versus 3.3 percent), a smaller total number of Expirees than Never-Before-Certified contractors (111 versus 127) came into compliance. Moreover, if there is some degree of stickiness to certification once it is achieved, this could amplify the compliance effects of bringing newly certified contractors into the fold.

We were surprised at the limited success of our Market Incentives Letter and Normative Letter. While they produced statistically significantly greater compliance than no letter (for both Expirees and Never-Before-Certified contractors), they produced less than or similar compliance gains as the Baseline Letter. In particular, the Market Incentives Letter yielded significantly *worse* compliance than the Baseline Letter for both Expirees and Never-Before-Certified contractors. This result was not moderated by contractors' proximity to their nearest Home Depot.[126] It is possible that the specific incentive we highlighted—eligibility for the Home Depot recommended contractors' list—was not salient to the contractors we contacted. This could be because they did not consider the Home Depot list to be an important source of business, they already knew about this contingent benefit and had baked that into their decision not to comply, or they interpreted this letter as some kind of solicitation and

126. Using the entire twenty-five thousand contractor sample, we predicted certification based on four dummies indicating the groups observations were assigned to (with the fifth group being the omitted category), a dummy indicating observations that were Expirees, the interaction term Positive letter X Closest Home Depot, and the following controls: Closest Home Depot, Per capita income (county) logged, White alone population percent (county), Black alone population percent (county), Hispanic population percent (county), and a series of CSLB license classification dummies. The non-significant coefficient on Positive letter X Closest Home Depot ($b = -0.008$, $SE = 0.12$, $p > 0.10$) provides no evidence that the influence of the Market Incentives Letter, highlighting that certification was necessary to become a Home Depot recommended contractor, varied based on the distance between contractors and their nearest Home Depot location.

discounted it. It would be useful to run future experiments to test the efficacy of different positive incentive messages that might be more salient to contractors.

The Normative Letter yielded different results for Expirees and Never-Before-Certified contractors: For Expirees, it resulted in significantly worse compliance than the Baseline Letter, while for Never-Before-Certified contractors, it produced similar (statistically indistinguishable) effects. This prompts us to wonder whether Expirees, who had previously shown a willingness to comply, might have been offended by receiving a letter suggesting that they could be morally culpable for lead-based harms to their communities. Some Expirees might have felt that their original certification gave them the knowledge and tools needed to perform lead-based work safely and that re-certification, although legally required, would not provide any material benefit to the health and safety of the community. Research has found that moral messages deployed by regulators to elicit compliance can instead provoke backlash from regulated entities when moral opprobrium is directed at behavior that is not clearly understood to be immoral.[127] While exposing vulnerable populations to lead paint through unsafe practices is widely understood to be immoral, the procedural requirements of the RRP rule—obtaining certification "on paper" and complying with record-keeping requirements—might not be. This finding suggests that regulators enforcing regulatory regimes that advance substantive health and safety goals through procedural requirements should approach moral compliance messaging with caution.

Finally, our finding that contractors in wealthier communities were significantly more likely to obtain certification raises environmental justice concerns. Research has shown that children in households with low incomes face a higher risk of elevated blood lead levels along with the attendant health and developmental harms of lead exposure.[128] Contractors' worse compliance with lead paint regulations in lower-income communities exacerbates these risks and harms, and it has the potential to widen the lead exposure gap between lower-income and wealthier communities. This finding may not be surprising given that wealthier homeowners are likely to have greater awareness of lead paint dangers and ability to pay for more expensive lead-safe construction practices than lower-income homeowners.[129] But it highlights the challenges facing regulators who seek to design more effective campaigns to encourage safe work practices in lower-income communities and the potential value of incorporating environmental justice analysis into enforcement policy.[130]

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127. Parker, *supra* note 116, at 592-93.

128. James L. Pirkle et al., *Exposure of the U.S. Population to Lead, 1991-1994*, 106 ENVT'L HEALTH PERSPS. 745, 745 (1998).

129. Prior research has demonstrated tradeoffs between income and demand for safety. *See, e.g.*, W. Kip Viscusi & Joseph E. Aldy, *The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World*, 27 J. RISK & UNCERTAINTY 5, 7 (2003).

130. For instance, under the administration of President Joe Biden, EPA Region IX entered a Memorandum of Understanding with the California Environmental Protection Agency to increase

To be sure, while some of our letters produced significant improvements in RRP certification compliance rates, the absolute percentage of compliant contractors across all treatments was low. Compliance rates could be dampened by over-inclusive targeting that led us to send letters to Never-Before-Certified contractors who do not perform RRP-covered work or to Expirees who no longer perform such work. But even if we allow for significant mis-targeting, the compliance rates are stubbornly low. For instance, if all Expirees in our sample were still doing covered work, their overall compliance rate would have been less than 7 percent.[131] If one assumes that half of the Expirees were no longer doing the work that once compelled them to seek certification, the compliance rate would still be less than 14 percent.[132]

This suggests the need to develop innovative compliance strategies that look beyond traditional enforcement practices. Cynthia Giles, a former high-level enforcement official at EPA, has written about the futility of "force-fitting"[133] enforcement on the back end of poorly designed rules that "create opportunities to evade, obfuscate, or ignore" regulatory requirements.[134] She argues:

> Enforcement serves an essential role in holding violators accountable . . . But a handful of enforcers will never be able to ensure general compliance at millions of facilities. We will only be able to protect the public from serious harms if we write environmental rules with compliance built in.[135]

B. Implications Beyond RRP

While our study was conducted in a particular context and our findings reflect the distinctive features of that context, we discuss here some considerations bearing on the applicability of our findings to other contexts.

First, our empirical context was characterized by EPA's extremely limited enforcement footprint (sixteen inspectors to monitor eighteen million covered

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inspections and strengthen enforcement in communities historically overburdened by pollution. *U.S. EPA, CalEPA Launch Joint Effort to Strengthen Environmental Enforcement in Communities Overburdened by Pollution*, EPA, https://www.epa.gov/newsreleases/us-epa-calepa-launch-joint-effort-strengthen-environmental-enforcement-communities (last updated Aug. 22, 2023). This initiative, along with other EPA environmental justice programs, were eliminated by the second Trump administration. EPA, OFF. OF ENF'T & COMPLIANCE ASSURANCE, IMPLEMENTING NATIONAL ENFORCEMENT AND COMPLIANCE INITIATIVES CONSISTENTLY WITH EXECUTIVE ORDERS AND AGENCY PRIORITIES 2-4 (2025), https://www.epa.gov/system/files/documents/2025-03/implementingneciscons istentlywitheosandagencypriorities.pdf.

131. The percentage is calculated using the sums of rows 9 and 10 of Table 2: 392 of the 5,816 expirees = 6.7 percent.

132. 392 of half of the 5,816 expirees = 13.5 percent.

133. GILES, *supra* note 8, at 1-2.

134. *Id.* at 1.

135. *Id.* at 13. Giles advocates designing rules in a way that makes "compliance the default": "[R]egulations that work block[] the exits and smooth[] the path toward compliance" using "an array of structural provisions." *Id.* at 13-14.

projects annually). In this respect, the RRP program is hardly unique. Other agencies face comparable enforcement challenges. For instance, the Federal Occupational Safety and Health Administration has "approximately 1,850 inspectors responsible for the health and safety of 130 million workers, employed at more than 8 million worksites around the nation—which translates to about one compliance officer for every 70,000 workers."[136] Agencies at all levels of government face acute budget and staffing shortages.[137] Our findings suggest ways that agencies can leverage their limited enforcement resources to improve compliance rates. Agencies with more enforcement resources might be even more successful at creating the perception of increased detection probability and, crucially, might be better able to sustain those perceptions over time.

Second, the regulated population in our context is significantly comprised of individuals and small businesses that likely lack the ongoing advice of legal counsel and compliance professionals. These businesses may respond differently to deterrence threats—particularly unsubstantiated deterrence threats—than would large and highly regulated companies with sophisticated risk analytics capabilities.

Third, our empirical context is best described as a *regulatory* regime, in which the primary tools of enforcement are inspections and sanctions. Some agencies have broader enforcement toolkits that include not only inspections and sanctions, but also structural barriers to market entry—for instance, drug and device approval by the Food and Drug Administration or registration requirements for companies listed on U.S. securities exchanges administered by the Securities and Exchange Commission. Structural tools such as licensing and registration give these agencies compliance leverage that EPA lacks in the RRP context. EPA cannot bar contractors from the renovation, repair, and painting market until they obtain Lead-Safe Certification; it can only conduct back-end enforcement action against those that fail to comply. How would our findings about deterrence messaging translate across these different contexts? On the one hand, if deterrence messaging works for a regulator with more limited enforcement tools, like EPA, it might be even more effective when deployed by regulators with more robust enforcement toolkits. On the other hand, deterrence messaging about inspections and fines might be less salient in licensing and registration regimes where much more than fines are at stake, particularly if

136. *Commonly Used Statistics*, OCCUPATIONAL SAFETY & HEALTH ADMIN., https://www.osha.gov/data/commonstats (last visited Jan. 15, 2025).

137. *See, e.g.*, Jory Heckman, *IRS Watchdog Warns of Tax Filing Challenges Next Year After Agency Cuts 25% of Workforce*, FED. NEWS NETWORK (June 25, 2025), https://federalnewsnetwork.com/workforce/2025/06/irs-watchdog-warns-of-tax-filing-challenges-next-year-after-agency-cuts-25-of-workforce; Jim Wappes, *Local Health Departments Face Rising Workforce Strains, Report Says*, CTR. FOR INFECTIOUS DISEASE & POL'Y RSCH. (July 3, 2025), https://www.cidrap.umn.edu/public-health/local-health-departments-face-rising-workforce-strains-report-says.

regulators in those contexts are reluctant to make existential threats about withdrawing license approvals or registrations.

While we can only speculate about the generalizability of our results to other contexts, we hope that our study prompts discussion about appropriate comparators and analogies, and we encourage future research to assess the broader applicability of our findings. We hope that this project inspires such research by demonstrating its contribution both to policy makers and to the scholarly literature.

Research of this nature is particularly important in the face of unrelenting calls to increase government efficiency. Rigorous empirical studies evaluating policy alternatives can help agencies determine how to allocate limited resources in ways that efficiently and effectively serve their statutorily mandated missions. Academic researchers are typically willing to conduct these studies for free. Our hope is that this cost-effective, empirically informed path to meaningful efficiency gains replaces the shrill and empty political rhetoric of government efficiency.

APPENDIX

Table 1: Summary statistics of the balanced sample

Variable	Mean	SD	Min	Max
Newly certified	0.03	0.17	0	1
Expiree (Prior FLPP certified but now expired)	0.23	0.42	0	1
Market Incentives Letter (treatment arm)	0.20	0.40	0	1
Normative Letter (treatment arm)	0.20	0.40	0	1
Deterrence Letter (treatment arm)	0.20	0.40	0	1
Baseline Letter (treatment arm)	0.20	0.40	0	1
No Letter (control arm)	0.20	0.40	0	1
Per capita income (county), logged	11.14	0.30	10.60	11.89
White population by county (percent)	0.72	0.11	0.48	0.93
Black population by county (percent)	0.06	0.03	0.00	0.15
Other race categories population by county (percent)	0.22	0.10	0.07	0.47
Hispanic population by county (percent)	0.37	0.14	0.08	0.86
License Classifications:				
Class B: General Building Contractor	0.67	0.47	0	1
Class C-2 - Insulation and Acoustical Contractor	0.01	0.07	0	1
Class C-6 - Cabinet, Millwork and Finish Carpentry Contractor	0.01	0.11	0	1
Class C-9 - Drywall Contractor	0.01	0.10	0	1
Class C-10 - Electrical Contractor	0.06	0.23	0	1
Class C-13 - Fencing Contractor	0.00	0.04	0	1
Class C-15 - Flooring and Floor Covering Contractors	0.03	0.18	0	1
Class C-16 - Fire Protection	0.01	0.08	0	1
Class C-17 - Glazing Contractor	0.03	0.18	0	1
Class C-20 - Warm-Air Heating, Ventilating and A/C Contractor	0.03	0.18	0	1
Class C-21 - Building Moving/Demolition Contractor	0.01	0.11	0	1
Class C-33 - Painting and Decorating Contractor	0.21	0.41	0	1
Class C-36 - Plumbing Contractor	0.07	0.26	0	1
Class C-39 - Roofing Contractor	0.02	0.14	0	1
Class C-54 - Ceramic and Mosaic Tile Contractor	0.02	0.13	0	1
Class C-61 - Limited Specialty	0.05	0.22	0	1

N= 25,000 observations

Table 2. Certification rates within each matched sample group, by prior experience with certification

	Group:	No Letter	Baseline Letter	Market Incentives Letter	Normative Letter	Deterrence Letter
(1)	**Total number of contractors in the group**	5,000	5,000	5,000	5,000	5,000
(2)	Number in group that became certified	11	200	124	163	238
(3)	Certification rate: Percentage in group that became certified	0.2%	4.0%	2.5%	3.3%	4.8%
	Never-Before-Certified Contractors					
(4)	Number in group	3,838	3,849	3,838	3,810	3,849
(5)	Number in group that became certified	2	85	58	72	127
(6)	Certification rate: Percentage in group that became certified	0.1%	2.2%	1.5%	1.9%	3.3%
(7)	Comparison to No Letter group (see note)		Higher ($p < 0.01$)	Higher ($p < 0.01$)	Higher ($p < 0.01$)	Higher ($p < 0.01$)
(8)	Comparison to Baseline Letter group (see note)			Lower ($p = 0.02$)	Similar ($p = 0.35$)	Higher ($p < 0.01$)
	Expiree Contractors					
(9)	Number in group	1,162	1,151	1,162	1,190	1,151
(10)	Number in group that became certified	9	115	66	91	111
(11)	Certification rate: Percentage in group that became certified	0.8%	10.0%	5.7%	7.6%	9.6%
(12)	Comparison to No Letter group (see note)		Higher ($p < 0.01$)	Higher ($p < 0.01$)	Higher ($p < 0.01$)	Higher ($p < 0.01$)
(13)	Comparison to Baseline Letter group (see note)			Lower ($p < 0.01$)	Lower ($p = 0.04$)	Similar ($p = 0.75$)

Note: Comparisons reflect results of two sample proportion tests that compare the two certification rates. “Higher” denotes statistically significantly higher, “Lower” denotes statistically significantly lower, and “Similar” denotes statistically indistinguishable.

Table 3. Logistic Regression Results

Sample:	Never-Before-Certified Contractors				Expiree Contractors			
Reference group:	No Letter		Baseline Letter		No Letter		Baseline Letter	
	(1a) Logit	(1b) AME	(2a) Logit	(2b) AME	(3a) Logit	(3b) AME	(4a) Logit	(4b) AME
No Letter group	(Reference)		-3.762***	-0.066	(Reference)		-2.680***	-0.164
			-0.501				-0.427	
Baseline Letter group	3.762***	0.066	(Reference)		2.680***	0.164	(Reference)	
	-0.501				-0.427			
Deterrence Letter group	4.177***	0.073	0.415***	0.007	2.637***	0.161	-0.043	-0.003
	-0.553		-0.152		-0.393		-0.131	
Normative Letter group	3.606***	0.063	-0.156	-0.003	2.368***	0.145	-0.312**	-0.019
	-0.53		-0.172		-0.412		-0.138	
Market Incentives Letter group	3.376***	0.059	-0.386**	-0.007	2.053***	0.126	-0.626***	-0.038
	-0.559		-0.171		-0.434		-0.126	
Per capita personal income by county (log)	0.660***	0.012	0.660***	0.012	0.382*	0.023	0.382*	0.023
	-0.181		-0.181		-0.231		-0.231	
White population by county (percent)	0.74	0.013	0.74	0.013	-0.849	-0.052	-0.849	-0.052
	-0.707		-0.707		-0.713		-0.713	
Black population by county (percent)	2.343	0.041	2.343	0.041	0.618	0.038	0.618	0.038
	-2.035		-2.035		-2.029		-2.029	
Hispanic population by county (percent)	-0.494	-0.009	-0.494	-0.009	-0.035	-0.002	-0.035	-0.002
	-0.358		-0.358		-0.339		-0.339	
CSLB license classifications (see note)	Included		Included		Included		Included	
N (observations)	19,184	19,184	19,184		5,806		5,806	
Sample mean of the dependent variable	0.018		0.018		0.068		0.068	

Note: "AME" denotes average marginal effects. Parentheses contain robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. All models include a suite of dummy variables denoting each of the following CSLB license classifications: Class B: General Building Contractor; Class C-2: Insulation and Acoustical Contractor; Class C-6: Cabinet, Millwork and Finish Carpentry Contractor; Class C-9: Drywall Contractor; Class C-10: Electrical Contractor; Class C-13: Fencing Contractor; Class C-15: Flooring and Floor Covering Contractors; Class C-16: Fire Protection; Class C-17: Glazing Contractor; Class C-20: Warm-Air Heating, Ventilating and Air-Conditioning Contractor; Class C-21: Building Moving/Demolition Contractor; Class C-33: Painting and Decorating Contractor; Class C-36: Plumbing Contractor; Class C-39: Roofing Contractor; Class C-54: Ceramic and Mosaic Tile Contractor; Class C-61: Limited Specialty. The estimation sample of Models 3 and 4 is 5,806 rather than all 5,816 Expirees because none of the ten in Class 13 became certified, and thus logistic regression drops them from the estimation sample because the Class 13 dummy variable "perfectly predicts failure." The omitted race category is other race categorizations' population by county (percent), which includes American Indian and Alaska Native alone, Asian alone, Native Hawaiian and Other Pacific Islander alone, and two or more races.

Figure A1: Baseline Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX
75 Hawthorne Street
San Francisco, CA 94105

FIRM Name
Street address
City, State, Zip

Subject: Lead Based Paint Compliance January 15, 2023

Dear Business Owner:

Based on a recent review of your business, we believe you may be out of compliance with the U.S. Environmental Protection Agency's (EPA) Lead Renovation, Repair and Painting ("RRP") Rule. EPA believes that, within the past three years, your firm may have either performed or made an offer to perform work that is regulated under these rules. You must be certified by EPA as a Lead-Safe Certified Firm if you perform or offer to perform work on pre-1978 buildings that disturbs painted surfaces and these buildings have not been tested by a certified lead abatement firm to rule out the presence of lead paint. Performance of covered renovation, repair, or painting services without a valid Lead-Safe Firm Certificate may result in penalties of up to $40,576 per violation.

This letter is intended to provide you with compliance assistance only and is not an enforcement action. To correct this issue and ensure compliance with the RRP firm certification requirements, please apply for a Lead-Safe Firm Certificate as soon as possible by visiting https://www.epa.gov/lead/getcertified.

More information about the RRP requirements (Toxic Substances Control Act (TSCA) and federal regulations under 40 C.F.R. Part 745, Subpart E) and how to comply with them is available from the following resources:

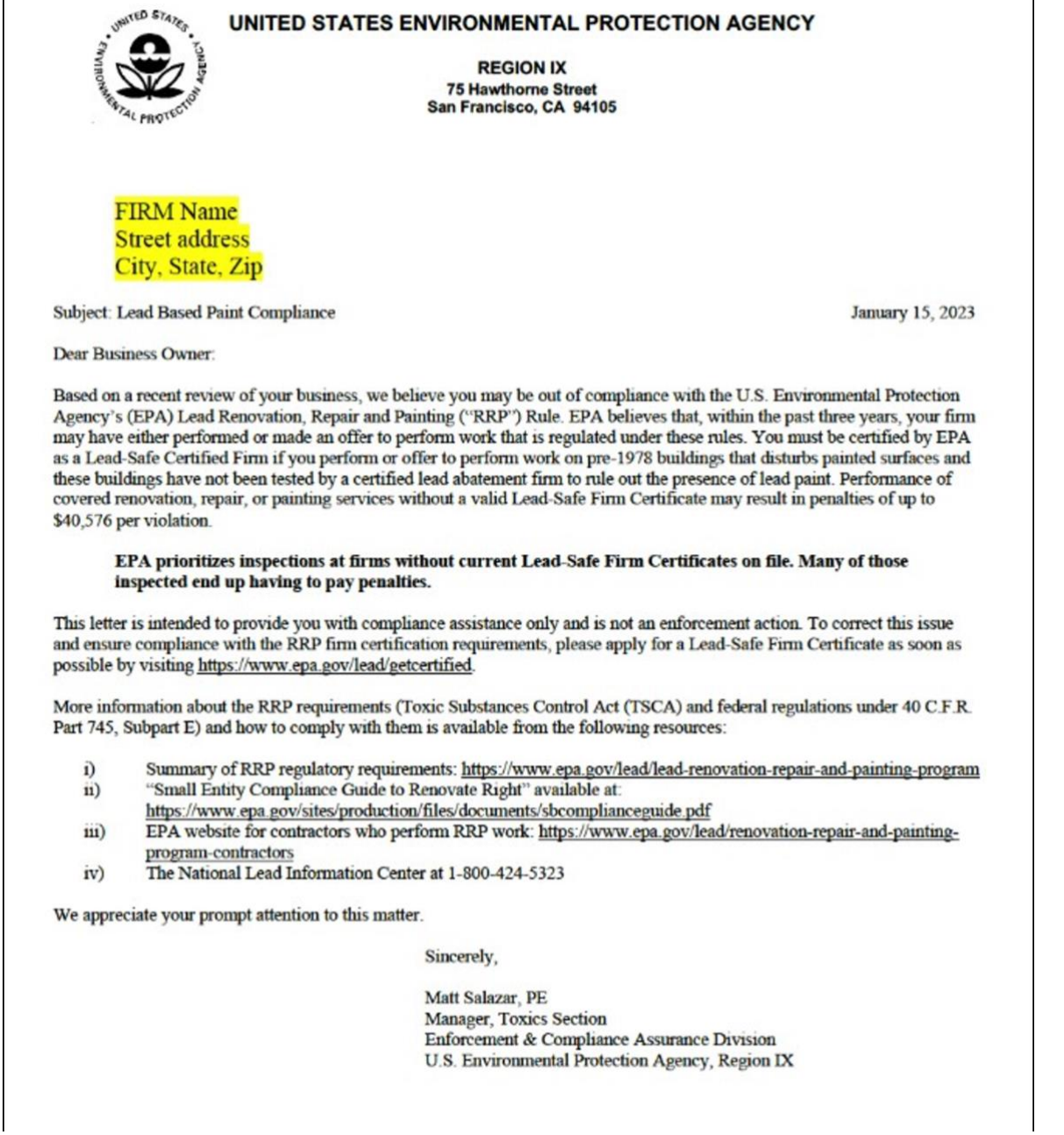
i) Summary of RRP regulatory requirements: https://www.epa.gov/lead/lead-renovation-repair-and-painting-program
ii) "Small Entity Compliance Guide to Renovate Right" available at: https://www.epa.gov/sites/production/files/documents/sbcomplianceguide.pdf
iii) EPA website for contractors who perform RRP work: https://www.epa.gov/lead/renovation-repair-and-painting-program-contractors
iv) The National Lead Information Center at 1-800-424-5323

We appreciate your prompt attention to this matter.

Sincerely,

Matt Salazar, PE
Manager, Toxics Section
Enforcement & Compliance Assurance Division
U.S. Environmental Protection Agency, Region IX

Figure A2: Deterrence Letter



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX
75 Hawthorne Street
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EPA prioritizes inspections at firms without current Lead-Safe Firm Certificates on file. Many of those inspected end up having to pay penalties.

This letter is intended to provide you with compliance assistance only and is not an enforcement action. To correct this issue and ensure compliance with the RRP firm certification requirements, please apply for a Lead-Safe Firm Certificate as soon as possible by visiting https://www.epa.gov/lead/getcertified.

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We appreciate your prompt attention to this matter.

Sincerely,

Matt Salazar, PE
Manager, Toxics Section
Enforcement & Compliance Assurance Division
U.S. Environmental Protection Agency, Region IX

Figure A3: Market Incentives Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX
75 Hawthorne Street
San Francisco, CA 94105

FIRM Name
Street address
City, State, Zip

Subject: Lead Based Paint Compliance January 15, 2023

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Major retailer Home Depot recently adopted a company-wide policy to only hire contractors with valid Lead-Safe Firm Certificates to perform renovation, repair, and painting work on any housing built before 1978. To do this, Home Depot has developed an electronic compliance system to verify that the contractors it hires are properly certified.

This letter is intended to provide you with compliance assistance only and is not an enforcement action. To correct this issue and ensure compliance with the RRP firm certification requirements, please apply for a Lead-Safe Firm Certificate as soon as possible by visiting https://www.epa.gov/lead/getcertified.

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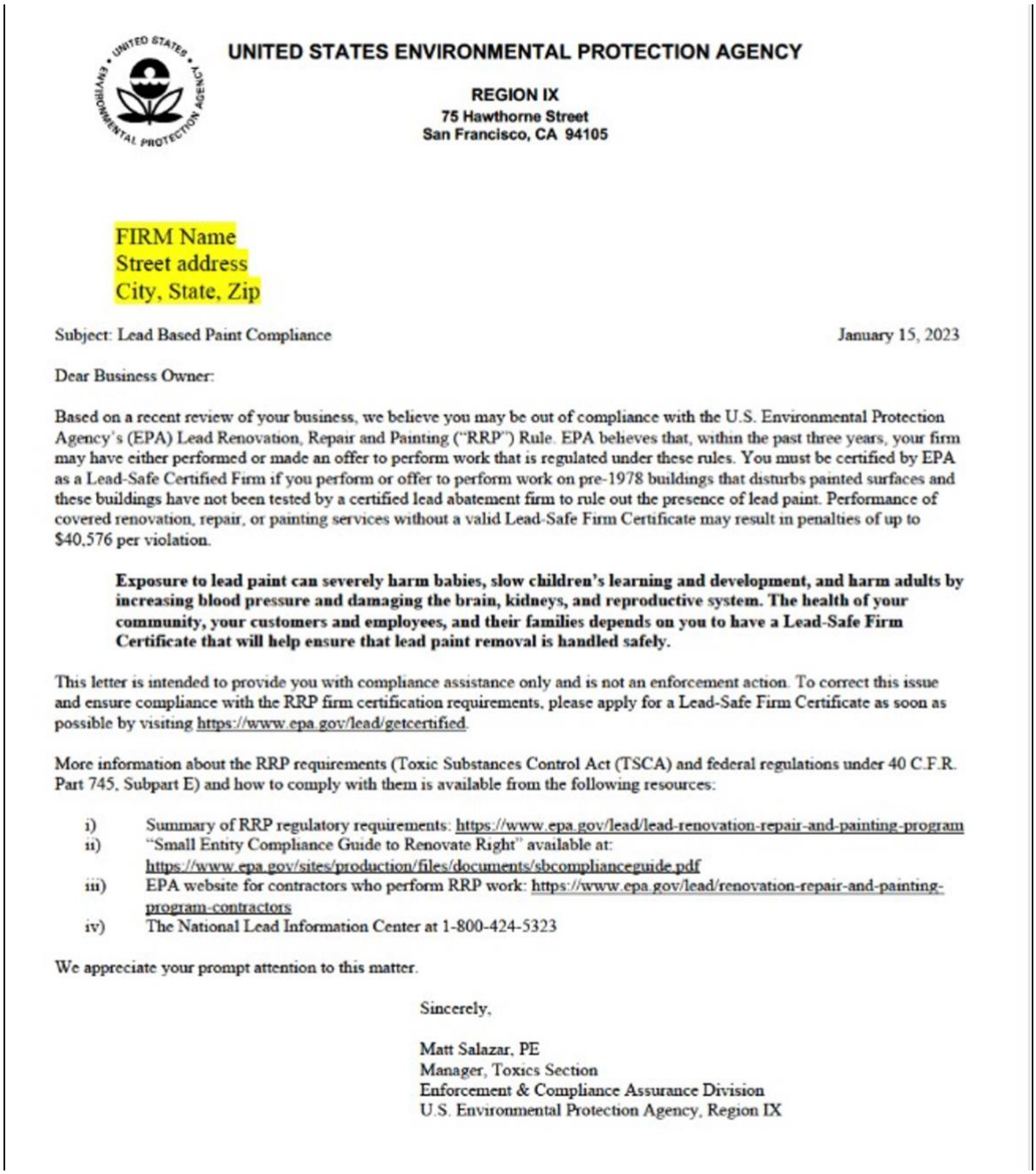
iv) The National Lead Information Center at 1-800-424-5323

We appreciate your prompt attention to this matter.

Sincerely,

Matt Salazar, PE
Manager, Toxics Section
Enforcement & Compliance Assurance Division
U.S. Environmental Protection Agency, Region IX

Figure A4: Normative Letter



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX
75 Hawthorne Street
San Francisco, CA 94105

FIRM Name
Street address
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Subject: Lead Based Paint Compliance January 15, 2023

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Exposure to lead paint can severely harm babies, slow children's learning and development, and harm adults by increasing blood pressure and damaging the brain, kidneys, and reproductive system. The health of your community, your customers and employees, and their families depends on you to have a Lead-Safe Firm Certificate that will help ensure that lead paint removal is handled safely.

This letter is intended to provide you with compliance assistance only and is not an enforcement action. To correct this issue and ensure compliance with the RRP firm certification requirements, please apply for a Lead-Safe Firm Certificate as soon as possible by visiting https://www.epa.gov/lead/getcertified.

More information about the RRP requirements (Toxic Substances Control Act (TSCA) and federal regulations under 40 C.F.R. Part 745, Subpart E) and how to comply with them is available from the following resources:

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iv) The National Lead Information Center at 1-800-424-5323

We appreciate your prompt attention to this matter.

Sincerely,

Matt Salazar, PE
Manager, Toxics Section
Enforcement & Compliance Assurance Division
U.S. Environmental Protection Agency, Region IX

Table A1. Correlations

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Newly certified	1.00										
2	Expiree (Prior FLPP certified but now expired)	0.12	1.00									
3	Market Incentives Letter (treatment arm)	-0.01	0.00	1.00								
4	Normative Letter (treatment arm)	0.01	0.01	-0.25	1.00							
5	Deterrence Letter (treatment arm)	0.05	0.00	-0.25	-0.25	1.00						
6	Baseline Letter (treatment arm)	0.03	0.00	-0.25	-0.25	-0.25	1.00					
7	No Letter (control arm)	-0.08	0.00	-0.25	-0.25	-0.25	-0.25	1.00				
8	Per capita income (county), logged	0.04	0.09	0.01	0.00	0.00	-0.01	0.00	1.00			
9	White population by county (percent)	-0.03	-0.05	-0.01	0.01	-0.01	0.01	0.00	-0.56	1.00		
10	Black population by county (percent)	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	-0.19	-0.46	1.00	
11	Hispanic population by county (percent)	-0.02	-0.06	-0.02	0.01	0.01	0.00	0.00	-0.53	0.22	0.34	1.00