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The determinants of federal and state enforcement of workplace safety regulations: OSHA inspections 1990–2010

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Abstract We explore the determinants of inspection outcomes across 1.6 million Occupational Safety and Health Agency (OSHA) audits from 1990 through 2010. We find that discretion in enforcement differs in state and federally conducted inspections. State agencies are more sensitive to local economic conditions, finding fewer standard violations and fewer serious violations as unemployment increases. Larger companies receive greater lenience in multiple dimensions. Inspector issued fines and final fines, after negotiated reductions, are both smaller during Republican presidencies. Quantile regression analysis reveals that Presidential and Congressional party affiliations have their greatest impact on the largest negotiated reductions in fines.

Keywords Regulation · Enforcement · Occupational safety · Decentralization

JEL Classification K23 · H73 · I18

1 Introduction

Research in market regulation, and the Occupational Safety and Health Agency (OSHA) in particular, tends to focus on the merits of the laws that regulators enforce (Arrow et al. 1996; Viscusi 1996; Gawande and Bohara 2005; Viscusi et al. 2005) and

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the empirically measurable outcomes that are associated with the regulatory activity (Gray and Jones 1991a,b; Gray and Scholz 1993; Scholz and Gray 1997; Weil 1996; Helland 1998; Gray and Mendeloff 2005; Shimshack and Ward 2005; Bradbury 2006; Hahn and Tetlock 2008; Gray and Shimshack 2011). Less understood is the importance of who is enforcing those laws and how they are enforced (Scholz 1986; Atlas 2007; Kim 2008).¹ While the manner of legally prescribed enforcement—rules versus discretion—is a well-researched debate, how the two interact and affect the outcomes of enforcement mechanisms often remains murky (Reiss 1984; Makowsky and Stratmann 2009).

Using a dataset of over 1.6 million inspections by the OSHA from 1990 through 2010, we are able to explore the determinants of inspection outcomes. The especially high weighting of OSHA laws towards agency (and agent) discretion (Sunstein 2008) makes OSHA inspections an excellent opportunity to explore the determinants of discretionary regulatory enforcement. Further, OSHA is one of several regulatory bodies that embody a doctrine of “partial preemption” (Scicchitano and Hedge 1993; Bradbury 2006; Atlas 2007). Under this doctrine, once the federal regulatory body approves a state program, responsibility for enforcement is ceded to the state, leaving the federal agency to oversee the state agency. The result is a split OSHA enforcement regime with offices of the federal agency conducting inspections in 25 states, and state agencies conducting inspections in the remaining 25 (in four out of these 25 states, the state agency plans cover public sector employment only).

This split offers the opportunity to observe how decentralized regulation affects agent and agency discretion.² The geographic variety and range over 21 years allows investigation into political determinants of inspection outcomes, with particular attention given to the decision to issue “warnings” by inspectors, the size of the fines levied, and the ability of firms to negotiate reductions in fines levied upon them.

There is an abundant literature that focuses on the outcomes of regulations. In particular, earlier OSHA data has been used to show that inspections increase rates of compliance (Gray and Jones 1991a), that imposing penalties reduces workplace accidents in the following years (Gray and Scholz 1993), and that state-administered OSHA programs are associated with fewer workplace fatalities than states regulated at the federal level (Bradbury 2006). Our paper contributes to this literature, focusing on the determinants of enforcement outcomes and agent discretion. Similar to Bradbury, we look at differences between federal versus state controlled inspections, but differ in that we focus on the determinants of individual inspection outcomes, in terms of violations, penalties issued, and negotiated fine reductions rather than its subsequent effect on aggregate workplace health and safety. Political, economic, and institutional conditions are relevant environmental factors in regulatory enforcement (Scholz 1991; Kim 2008). Scholz and Wei (1986) investigate the influence of political interest groups and economic variables like unemployment on the actions of OSHA. While Scholz

¹ For a discussion of the administrative stages between legislation and enforcement, see Croley (1998).

² Scholz and Wei (1986) address this specific question and use aggregate inspection outcome data from 1976 to 1983 to explore the determinants of the total number of inspections and violations across states. They focus on the determinants of violation citations, but do not speak to agency discretion after the initial assessment has been made.

and Wei focus on aggregate enforcement measures, our unit of observation is the individual inspection. Focusing on individual inspections allows us to both control for firm characteristics and to investigate their interaction with the political and institutional environment.

Discretion enters into the enforcement process at multiple steps. Each of these discretionary moments presents its own unique opportunity for incentives beyond worker and public safety to enter into the inspecting agent's decision making. We track each step of the assessment process, including the finding of violations, the decision to issue a fine, the amount of the fine assessed, and post-inspection negotiation of reductions of assessed fines. We find patterns of discretionary enforcement that are distinctly different in state and federally conducted inspections. While state agency inspections have a similar probability of finding a firm in violation than federal inspections, the fines they do issue are, *ceteris paribus*, smaller than the fines issued by federal inspectors.

We find that the executive branch exerts greater influence than congress over inspection outcomes in both federal and state agencies. This influence, however, differs across state and federally conducted inspections. Fines issued are smaller under Republican presidencies. This effect is observed for both, state and federal inspections. Union shops are more likely to pass their inspection, but when they are found in violation they are more likely to receive a fine. Firms employing unionized workers are issued larger initial fines by inspectors. Larger companies on average receive larger fines. Quantile regression analysis reveals that political conditions have their greatest impact on the largest negotiated reductions in fines.

2 Institutional background

OSHA was established by the Occupational Safety and Health Act of 1970 as an executive agency within the Department of Labor. OSHA is responsible for rulemaking, adjudication, and penalty assessment, with the expressed aim to assure workers "safe and healthful working conditions."³ OSHA covers most private sector employers and workers in all 50 states, the District of Columbia, and other U.S. jurisdictions. To these ends, onsite inspections are the principal means by which the agency enforces compliance with existing rules. As of 2010, this responsibility extends to over 7 million workplaces in the United States. To address this responsibility, OSHA employs over 2,200 agents⁴ to conduct an average of 27,250 site visits per year.⁵ Each visit can result in multiple inspections per site so that the average number of inspections is about 60,000 per year.

Since OSHA began operations in 1971, it "aimed to decentralize federal programs by extending greater control to states and local governments (Agency 2011)." By 1976,

³ See Occupational Safety and Health Act, 29 U.S.C. 651–678 (1976).

⁴ Total number of inspectors includes 64 inspectors in Puerto Rico and the Virgin Islands (cited from AFL-CIO OSHA records in U.S. Department of Labor, OSHA. Summary of Federal CSHO Totals by State FY 2010 and Summary of State Safety and Health Compliance Staffing, FY 2010.).

⁵ This number includes federal and state inspections of private companies only.

24 of the 56 states and territories had established OSHA-approved programs. As of 2008, 25 states had their own programs.

These state-run programs must be at least as effective as the Federal OSHA program. State and local government workers are not covered by Federal OSHA, but they do have protections in states that operate their own programs. Figure 1 presents an overview of federal and state run programs. In Connecticut, Illinois, New Jersey, New York and the Virgin Islands state run programs cover public sector (state and local government) workers only whereas Federal OSHA covers private sector workers in these jurisdictions.⁶ Bradbury (2006) examines the comparative effectiveness in promoting workplace safety of state versus federal OSHA offices.

OSHA cannot inspect all 7 million workplaces it covers each year. The agency seeks to focus its inspection resources on the most hazardous workplaces in the following order of priority: *imminent danger situations, fatalities and catastrophes, complaints, referrals* (tips from employees, media, etc.), *follow-ups*, and *lastly-programmed inspections*. See Appendices 1 and 2 for more details from the OSHA Inspections Fact Sheet (2011).

OSHA inspections, as conducted by both federal and state agency offices, follow a narrowly proscribed protocol that, after initiation, is uniform across agencies and subject. The onsite process begins with a compliance officer researching the inspection history of the worksite, the site operations, and the regulatory standards that are most likely to apply. After arriving on site and presenting credentials, the officer will conduct an opening conference with the employer or the available management representative and explain the selection process for the inspection and its scope. Management and employees both have the opportunity to select a representative to accompany the officer during the inspection.

After the opening conference, the compliance officer and the representatives will walk through the portions of the workplace covered by the inspection. The compliance officer will also review worksite injury and illness records. During the “walkaround”, compliance officers have the option to point out apparent violations that can be corrected immediately. “While the law requires that these hazards must still be cited, *prompt correction is a sign of good faith on the part of the employer.*” (Agency 2011 [emphasis added]).

After the walkaround, the compliance officer will hold a closing conference with the employer and the employee representatives, and present courses of action the employer may take following the inspection. These options include an informal conference with OSHA or the formal contesting of the issued citations and proposed penalties.

OSHA must issue a citation and proposed penalty within six months of the violation’s occurrence. Citations describe OSHA requirements allegedly violated, list any proposed penalties and give a deadline for correcting the alleged hazards. Violations are categorized as other-than-serious, serious, willful, repeated and failure to abate. Penalties may range up to \$7,000 for each serious violation and up to \$70,000 for each willful or repeated violation. *Penalties may be reduced based on an employer’s good faith, inspection history, and size of business.*

⁶ Compare <http://www.osha.gov/dcsp/osp/index.html>

For serious violations, OSHA may also reduce the proposed penalty based on the gravity of the alleged violation. No good faith adjustment will be made for alleged willful violations. - (Agency 2011 [emphasis added])

2.1 Appeals

When OSHA issues a citation to an employer, it also offers the employer an opportunity for an informal conference with the OSHA Area Director to discuss citations, penalties, abatement dates or any other information pertinent to the inspection. The agency and the employer may work out a settlement agreement to resolve the matter and to eliminate the hazard. OSHA's primary goal is correcting hazards and maintaining compliance rather than issuing citations or collecting penalties. Alternatively, employers have 15 working days after receipt of citations and proposed penalties to formally contest the alleged violations and/or penalties by sending a written notice to the Area Director. OSHA forwards the contest to the Occupational Safety and Health Review Commission for independent review. Alternatively, citations, penalties and abatement dates that are not challenged by the employer or settled become a final order of the Occupational Safety and Health Review Commission. (OSHA 2011)

OSHA directors and inspectors are employees of the Department of Labor. The hierarchy of authority, however, takes very different paths in state versus federal offices. State offices are largely independent entities. Further, the connections to local and state politics, business, and communities are considerably richer in state agencies. While federal OSHA offices are part of the bureaucracy of the Executive branch of the federal government, the state agencies are only overseen by it. Their independence is considerable, and as such, their incentives are more likely to include sympathies with the labor population they are protecting and the constituency businesses they are inspecting. That said, OSHA remains a federal regulatory agency whose overseers are appointed by the President. As such, any investigation of the effect of politics on discretionary enforcement begins with the concurrent administration.

2.2 Data

A simple first metric of enforcement levels is the number of inspections conducted and the dollar value of initial penalties assessed. We examine the records of 2,081,666 OSHA inspections of privately owned and publicly traded firms from 1990 to 2010. We include in our analysis data on unemployment, inspection motivations, union representation, and the local representative in congress based on the reported zip code of the inspection site. Inclusion of these data results in 1,618,254 complete observations over 21 years. Of these inspections, 40 % were federally conducted; the remaining 60 % were state inspections. In addition, 684,372 inspections resulted in violations, and of those violations 578,382 resulted in fines being issued. Of those companies that were fined, 365,469 could negotiate a penalty reduction. In our sample we see a steady, if modestly increasing number of inspections each year after a drop in 1995 to 1996 and steady initial penalties after an initial increase. In year 2010 we observe

a sharp drop in both, the number of inspections and the total penalties. There are no immediately obvious, discernible differences across administrations (see Fig. 2).

We present summary statistics of all subsamples in Table 1 of Appendix 3. We describe the variables in more detail in the model section.

3 Modeling the determinants OSHA inspection outcomes

We hypothesize that the discretionary enforcement decisions by OSHA inspectors will be influenced by their institutional affiliation, political conditions, and sympathy for local economic conditions. While inspectors face standard employee incentives to carry out enforcement duties, their superiors are themselves agents of principals appointed by the executive branch (Moe 1982). Political influence is not necessarily limited to the executive branch, however. A variety of legislative mechanisms have been identified as potential means for congressional influence in regulatory actions and enforcement (Bawn 1995; Ferejohn and Shipan 1990; Shughart et al. 1986; Weingast and Moran 1983). We also expect economic conditions to influence inspection discretion, likely through a combination of political influence and personal sympathy for the economic actors being inspected. In their informal interviews of OSHA officials, Scholz and Wei (1986) found that officials of all levels “expressed concern about contributing to unemployment when times are bad and seemed inclined to give firms more leeway when the business cycle was down.”

More to this point, we expect differing levels of influence between local congressional politics and Presidential politics. Given the status of the executive branch as overseer of the federal bureaucracy, we hypothesize that presidential politics will have greater influence over the culture of OSHA inspection outcomes, including strictness of enforcement (finding violations) and leniency with those found in violation (the frequency of warnings and the size of fines). Conversely, we expect that congressional politics will play a greater role in the negotiated reductions in fines, as the interests of local businesses falls squarely under the header of “constituent services” (Baron 1994).

Inspections vary in terms of agency (state vs. federal), initial motivation (Incident, Complaint, Programmed, etc.), and whether advanced notice was given. An inspection can result in three possible outcomes: a pass, a warning, or a citation with a penalty. In the event that the site does not pass inspection, a number of results are recorded, including the number of violations found and the number of employees potentially exposed to the violations. To test the determinants of the results of individual inspection i , of employer j , conducted in congressional district c and state k , during year t we propose the following regression models:

- (1) $Y_{ijckt} = \beta_0 + \beta_1 Agency_{kt} + \beta_2 Inspection_{ijckt} + \beta_3 Politics_{ct} + \beta_4 Employer_j + \beta_5 Unemployment_{kt} + \beta_6 CPS-State_{kt} (+\beta_7 State_k) + \beta_8 Year_t + \beta_9 Lags_{ijck,t-1} + \varepsilon_{ijckt}$, where Y_{ijckt} is $Violation_{ijckt}$ (1/0) and
- (2) $Y_{ijkt} = \beta_0 + \beta_1 Agency_{kt} + \beta_2 Inspection_{ijckt} + \beta_3 Inspection Results_i + \beta_4 Politics_{ct} + \beta_5 Employer_j + \beta_6 Unemployment_{kt} + \beta_7 CPS-State_{kt} (+\beta_8 State_k) + \beta_9 Year_t + \varepsilon_{ijckt}$, where Y_{ijckt} is either $Fine_{ijckt}$ (1/0), $\ln(\$Initial Penalty_{ijckt})$, or $PenaltyReduction\%_{ijckt}$.

3.1 Dependent variables

The first dependent variable $Violation_{ijckt}$ is an indicator variable equal to one whenever the inspection results in a violation. From Table 1 in Appendix 3 we can see that 65 % of all inspections result in a violation. Whenever the dependent variables are 1/0 indicator variables, we estimate a logit⁷ model and report marginal effects in the regression tables.

Indicator variable $Fine_{ijkt}$ records whether an initial penalty is issued (=1) or a warning (=0). The amount of the initial fine is recorded in $\$InitialPenalty_{ijkt}$. Inspections that resulted in a positive penalty carried a conditional average fine of \$4,433 and a median fine of \$1,625 (measured in 1997 dollars). Given the skewness of the distribution of fines we use a log transformation in our regression models.

$PenaltyReduction\%_{ijkt}$ measures the difference in the initial versus final penalty in percent of the initial penalty. The average penalty drop was about 26 % over the entire sample period, reducing the median fine to \$1,034. Figure 3 plots initial penalties as well as percentage drops from initial to current penalties over time by state versus federal inspections. The figure clearly indicates that overall penalties are larger when the inspection was conducted by a federal agency. Similarly, the percentage decreases from initial to current penalty from federal inspections are larger than percentage drops in penalties from state inspections.⁸

3.2 Independent variables

$Agency_{kt}$ is a dummy variable indicating whether the inspection was conducted by an office of the federal agency (=0) or an independent state agency (=1). $Inspection_{ijckt}$ is a vector of variables describing the type of inspection conducted. This includes whether the inspection was programmed (planned in advance, 57 % of all inspections) and whether the employer was given advanced notice of the inspection (0.7 % of all inspections). The $Violation_{ijckt}$ model also includes $Lags_{ijck,t-1}$, controlling for whether the site was inspected and whether the site was in violation in the previous year. Models of the subsequent stages include the dummy for $RepeatOffender_j$, which equals 1 if the firm was found in violation at any point in its current OSHA inspection history.

$Politics_{ct}$, is a vector of variables related to politics which includes indicator variables for the party membership of the current President (equaling 1 if Republican, 0 otherwise), the party membership of the congressmen from the local con-

⁷ The motivation for using a logit model instead of a probit is simply the logit model's greater propensity for converging in our specifications with the largest number of observations. Results from the two are largely indistinguishable when both converge, as are estimates of subsamples when they fail to converge with the full set.

⁸ We use a subsample (two-part) OLS procedure for estimating the determinants of whether firms receive a fine and the dollar amount of subsequent fines. We also estimated a Heckman selection model and found no significant differences in the results. Furthermore, there is no *a priori* reason to believe that selection effects will be strong, nor is there a natural variable to employ as an exclusion restriction. For these reasons we believe two-part OLS to be the preferred model (Leung and Yu 1996; Puhani2000).

gressional district, the congressman's rank within their party⁹, and whether his/her party is currently the majority party in the House of Representatives. In the specifications for $Fine_{ijckt}(1/0)$, $\ln(\$Initial\ Penalty_{ijckt})$, and $Penalty\ Reduction\%_{ijckt}$, it also includes interaction variables with $Agency_{kt}$ and with the number of potentially exposed employees. Additionally, we include a fourth specification that includes triple interaction terms between $Agency_{kt}$, the number of potentially exposed employees, and Presidential party membership or congressman's party membership.

Employer_j includes dummy variables for the SIC code of the employer's industrial classification and for whether its employees are unionized (19 % of all inspections). Industry dummies include mining, agriculture, manufacturing, wholesale, retail, office work, services and hospitality, transportation and communication, and public administration. Union membership can affect inspection outcomes through multiple mechanisms. OSHA (and other regulatory) laws permit citizens to file complaints, and eventually sue, acting in their right to supplement enforcement activities (Scicchitano and Hedge 1993). Unions can support these "private enforcement" mechanisms (Weil 1992). Unions are also prominent actors on the political landscape. We anticipate that the union status will interact with political conditions as a determinant of inspection outcomes.

$Unemployment_{kt}$ measures the unemployment rate in state k at time t as reported by the Bureau of Labor Statistics. We include fixed effects for year in all model specifications. Standard errors are clustered by state.

The vector **Inspection Results_i** includes recorded data associated with violations found at the inspected site. This includes the number of violations found in the inspection and the number of employees potentially exposed to the violating hazard. The average number of violations per inspection is 4.9. Each violation has an "employees potentially exposed" count associated with it. In our analysis, we use the largest exposure count associated with a violation found during the inspection as our measure of "employees exposed." On average the number of exposed employees is 49 conditional on an inspection resulting in a violation.¹⁰

Depending on the exact model specification, the **Inspection Results_i** vector can also include the initial penalty assessed, an indicator variable for whether any violations were labeled "Serious", an indicator for violations labeled "Willful", and the average violation *Gravity*, which indicates the level of potential harm to workers and ranges from 1 to 10, assigned by the inspecting agent to all found violations.

It is likely optimal to use state fixed effects whenever possible, however, $Agency_{kt}$ is largely invariable across the set inspections that our data encompasses, with only one state changing its policy by starting a state run agency during our coverage period (the rest created their state agencies in the 1970s). Given this near perfect collinearity, and the importance of the agency status (federal or state) to our study, we felt it

⁹ The "rank within party" variable orders the members of a congressional committee based on the Resolution that appointed the members. Highest ranking members have the lowest number. The chair and ranking member always have a rank of 1 within their party.

¹⁰ We tested for the possibility of spillover effects (Shimshack and Ward 2005) using a lagged dummy variable that indicated if an inspection had occurred at any site within the firm's zip code in the previous year. This indicator was not significant in any of the tested specifications.

prudent to include three different specifications for each dependent variable. The first includes state and year fixed effects, but does not include the $Agency_{kt}$ dummy. This serves both to optimally identify the other key variable coefficients and to serve as a reference point for the other specifications. The second does include the $Agency_{kt}$ dummy, but only uses year fixed effects. In general, we see very little discrepancy between the first and second specifications. The third includes both the $Agency_{kt}$ dummy and interactions between $Agency_{kt}$ and other key variables, again forgoing state fixed effects. We believe that these three specifications, side by side, provide a very detailed description of these interaction results.

CPS-State variables include the average age per state, the state population percentage with high school diplomas, the state population percentage with college degrees, the percent of the state's African American population, the percent of the state's Hispanic population, and median state income.

4 Results

4.1 Inspection findings

Table 2 in Appendix 3 contains the results of a logit model estimating the probability that an inspection results in a violation being found. Reported point estimates are average marginal effects. Column 1 includes state fixed effects and excludes the state agency dummy ($Agency_{kt}$). Columns 2 and 3 do not include state fixed effects, but do include $Agency_{kt}$ (column 2) and $Agency_{kt}$ interactions with key explanatory variables (column 3).

We find that $Agency_{kt}$ by itself is not a statistically significant determinant of whether a firm is found in violation. However, several other explanatory variables are significant as is their interaction term with $Agency_{kt}$. In column 1 we see that a 1 % increase in the unemployment rate correlates to a 1.6 percentage point decrease in the probability of being found in violation. In column 3, however, we see that this correlation is only identified in inspections conducted by state agencies, as the $Agency_{kt} * Unemployment$ interaction is statistically significant while the coefficient on $Unemployment$ ceases to be significant. This evidence of greater sympathy for local businesses by state inspectors when economic conditions are bad corroborates similar findings by [Scholz and Wei \(1986\)](#).

Unsurprisingly, advance notice of the inspection results in higher passing rates from both federal and state agencies. Standard intuition suggests that advance notice will give an inspection site time to prepare for the worker safety inspection which will reduce its probability of failing the inspection (column 1–3). The cumulative reduction in the probability of failing the inspection, however, is three times larger with state agencies than with federal agencies. Similarly, the probability of being found in violation decreases if the firm was inspected in the prior year and increases if the firm was found in violation. The importance of both experience ($Inspection_{t-1}$) and firm reputation ($Violation_{t-1}$) are in the same vein as findings regarding the importance of both firm and regulatory reputation in environmental regulation ([Shimshack and Ward 2005](#); [Gray and Shimshack 2011](#)). Unionization of employees at the inspected site correlates with lower violation discovery rates from both federal and state inspectors,

but again the cumulative effect is roughly four times as high for state inspectors (column 3). This result differs from Weil (1992) who finds more cited violations in union than non-union construction firms.

With further regard to the identification of violations, we see a sharp departure of state agencies from federal agencies in the political explanatory variables. The probability of federal inspectors finding a violation are 6 percentage points higher during Republican presidential administrations, while with state inspectors it is only 2 percentage points higher (column 3). With regards to the party affiliation of the local congressman, both federal and state agencies are both less likely to find a violation in Republican congressional districts. This effect is slightly muted when the local congressman is in the majority party or has less committee status.

4.2 Fines and warnings

When an inspector finds a firm in violation of OSHA laws, he or she has the option to issue a fine or a warning. A warning carries no financial penalty, but is formally recorded. In the event of a violation being found, the inspected firm has the option to contest the violation. This second stage of the inspection process, the decision whether to issue a warning instead of a financial penalty, is one of the strongest opportunities for discretion available to the individual agent. Table 3 in Appendix 3 contains estimation results regarding the probabilities that inspectors issue a fine (=1) or a warning (=0). We use data on 684,372 violations with 578,382 of them resulting in a fine. Column 1 includes state fixed effects and excludes the state agency dummy ($Agency_{kt}$). Columns 2, 3, and 4 do not include state fixed effects, but do include $Agency_{kt}$ (column 2) and $Agency_{kt}$ interactions with key explanatory variables (column 3), including triple interactions (column 4).

Similar to the results on the estimated probability of being found in violation, we find no baseline difference between state and federal agency discretion in the issuing of warnings (Table 3 of Appendix 3). They did, however, respond differentially to a number of the other explanatory variables. A 1 % increase in the unemployment rate correlates to a 0.5 percentage point increase in the probability of receiving a fine from a state agency. In addition, state agencies are less likely to issue a fine during programmed (pre-planned) inspections, while federal agencies are more likely to issue a fine during such inspections (columns 3 and 4). As stated in the previous section, unionized sites have a lower probability of being found in violation. However, once a site is found in violation, then the presence of a unionized workforce results in higher fines issued. The number of identified violations, whether the firm is a repeat offender, a larger assigned gravity index, and identification of violations as “Serious” and “Willful” all increase the probability of fines from both federal inspections and state inspections, with some discrepancies in magnitude. Both agency types are more likely to issue fines when the number of exposed employees is larger, but the marginal effect of a one log-point increase in employees exposed is three times as big for state agencies (column 3). While the number of the exposed employees is a factor in inspector decision making, it also serves as a proxy for the size of the firm being inspected, which has potentially important interactions with political conditions.

The impact of political conditions on agent discretion again differs across agencies. Federal agencies are 7.1 percentage points less likely to issue a fine during a Republican administration than in a Democratic one, while state agencies are 9.3 percentage points less likely to issue a fine (column 3). The interaction of $President_t$ and the number of exposed employees is significant in columns 1 and 2, but ceases to be significant in column 3. When we add the $Agency_{kt} \times President_t \times Employees Exposed$ triple interaction in column 4, however, we see that the baseline effect of $Employees Exposed$ is the only one that remains statistically significant. In contrast, however, the inclusion of an $Agency_{kt} \times Congressman_t \times Employees Exposed$ triple interaction reveals that larger firms are more likely to receive a fine from state agencies when the local congressman is a member of the Republican party.

4.3 Penalties and penalty reductions

In Table 4 of Appendix 3, columns 1–4, we use OLS to regress the logged amount of initial fines.¹¹ After an initial fine is issued, the sanctioned firm has the option to pursue a series of hearings to reduce the dollar amount of the fine. We find that state agencies initially issue much smaller fines than federal agencies (Table 4 of Appendix 3, column 2). This result is consistent with our initial observation in Fig. 3, panel 2. The $Agency_{kt}$ dummy, however, is not significant in columns 3 or 4, as the difference between the agencies is picked up by the various interaction terms throughout the model specifications.

Programmed (expected) inspections result in lower fines (columns 1–4). Inspections that are announced in advance lead to higher initial fines, and still higher current fines, in a manner punishing firms for sloppiness despite being given the opportunity to clean up their act. The more employees are exposed to a violation, the higher the fine. Serious violations, repeat offenders, and willful offenders face higher fines, as dictated by OSHA law. Fines also increase with the assessed gravity of the violation. Firms employing unionized labor forces can expect approximately 32 % larger initial fines from violations (Table 4 of Appendix 3, columns 1–4).¹²

A Republican president correlates to 55 % smaller initial fines from federal agents and 68 % smaller fines from state agents (column 3), not accounting for the number of employees exposed. The magnitude of the reduction in fine size associated with a Republican effect is augmented by the size of the firm. A one standard deviation increase in the number of employees exposed correlates to an additional 5 % drop in the size of the fine during a Republican presidential administration (columns 3 and 4).

The reductions of the initial fine that are negotiated after the fact, characterized as a percent reduction in the fine, are modeled in Table 5 of Appendix 3. We find evidence that state agencies, on average, grant smaller reductions, though this finding is marginally significant across our set of specifications. The percentage reduction is increasing with the size of the initial fine, indicating a tendency towards after the

¹¹ We use a logarithmic transformation of initial fines because of the high degree of skewness in the data.

¹² All semi log marginal effects of dummy variables are calculated as the effect of going from a 0 to 1, or simply $\exp(\beta) - 1$.

fact lenience by both federal and state agencies. While programmed inspections lead to larger penalty reductions, advance notice reduces the penalty reductions, as does identification as serious, willful, repeat offense, or greater gravity of offense. Similarly, negotiated reductions are decreasing with the number of instances or the number of exposed. Given the discretion available to agencies in negotiated reductions and the opportunity for *ex post* involvement, we are particularly interested in the political independent variables. Negotiated reductions are smaller under Republican Presidents (column 2), though this effect is mitigated to a small degree as the number of exposed employees (and, in turn, the size of the firm) increases (column 3). The party or status of local congressman, on its own, does not have any significant effect on fine reductions (column 2), but we do observe a significant increase in the size of reductions in the interaction of $Congressman_t \times Employees Exposed$. The size of the effect is relatively small, correlating to a full percentage point fine reduction for only the very largest firms. Even when coefficients are statistically significant, they are trivial in magnitude. This favors the hypothesis that, at least in the case of OSHA, political actors are able to influence outcomes through direct federal supervision, but not through indirect congressional oversight.

We estimated a number of alternative specifications to check the robustness of our findings.¹³ First we address the possibility that the results are being driven by a small number of very large firms by running identical regression models on different subsamples of the data.¹⁴ Specifically, we created two subsamples: inspections of firms with 20 or fewer workers were exposed and firms with 10 or fewer workers were exposed. This produces a more homogenous set of inspection sites that—to some extent—controls for unobserved heterogeneity due to size effects. Second, we dropped the *Gravity* control, which allowed for about 15 % more observations. Again, none of the results qualitatively changed, and given our preference for controlling for the severity of violations as finely as possible, we prefer to include *Gravity* in our main specifications. Finally, we include various forms of clustering into our analysis following Peterson (2009) and find that our results are robust to whether the regressions are clustered by state only or by state and time concurrently.

4.4 Quantile regression analysis

Given the skewed distribution of fine dollar amounts, it stands to reason that the impact of key determinants need not happen in the center of the distribution. Quantile regressions of the percentage reduction in fines reveal that the impacts of political and institutional variables differ significantly across the outcome distributions. In Fig. 4 we examine the coefficients on the key institutional and political variables from our quantile regression (QR) model of negotiated percentage reductions of penalties, measured as a fraction of the original fine. The control variables are identical to those used

¹³ Tables with the results from these alternative specifications can be found in the Technical appendix, available from the authors by request.

¹⁴ The possibility of a small number of large firms driving the results is to be expected, given that firm size is Zipf-distributed (Axtell 2001).

in Table 5 of Appendix 3, column 4. We report standard errors and t statistics that are asymptotically valid under heteroskedasticity and misspecification (Angrist et al. 2006; Machado et al. 2012). Unfortunately, standard errors are not clustered by state¹⁵ as they are in the OLS specifications. Given the considerably smaller standard errors produced by the quantile regressions without clustering, we opt to take the conservative approach to interpreting the results and emphasize only coefficient estimations that significantly exceed the 95 % confidence intervals of the original OLS results (included in each of the Fig. 4 panels as dashed horizontal lines). Roughly 40 % of fines are not reduced, and as such we omit the regressions below the 40 % quantile in Fig. 4.

The most pronounced deviation from the OLS result is observed in the upper quintile of panel [2] of Fig. 4. The largest fine reductions granted are as much as 10 percentage points larger during Republican Presidential administrations. This is especially notable given that the average fine reduction (estimated via OLS) and median fine reduction (estimated by QR) are estimated to be *smaller* during Republican administrations.

While the interaction of state agency and Republican President does not deviate significantly from the OLS confidence interval, the interaction of state agency and Republican Congressman does. Much like in panel [2], we see a strong positive coefficient in the upper tail of the distribution, indicating that the largest fine reductions granted by state agencies are as much as 4 percentage points larger when the local Congressman is a member of the Republican party, notable given that the OLS estimate is not significantly different from zero. Taken together, the results in panel [2] and panel [6] suggest that the party of the President affects the largest fine reductions granted by federal and state agencies, while the party of the local Congressman only affects the largest fine reductions granted by state agencies. These results suggest the true impact of political conditions is only felt in the negotiating of the largest reductions in the fines assessed by OSHA agents. To this end, local congressman would appear to have less influence at the negotiating table when the agency is part of the federal bureaucracy. Conversely, the influence of the executive branch is universally conveyed through its oversight of both federal and state agencies.

5 Conclusions

The regulatory laws governing OSHA allow for significant discretionary decision-making on the part of OSHA officers and inspecting agents in the field. In our analysis of 21 years of individual inspection records, we find that this discretionary decision making is influenced by a variety of factors, including type of inspection (federal vs. state controlled), presidential and congressional party affiliation, local economic conditions, and union representation. Whether this discretion results in better or worse safety and economic outcomes is beyond the scope of this paper. It does however, point to the importance of carefully considering who is conducting enforcement activities

¹⁵ All of our attempts to use cluster errors via bootstrapping failed to converge. The use of errors robust to heteroskedasticity and misspecification increase the reliability of the results, but it is reasonable to expect that errors will be correlated within each state's governing agency.

and how much discretion they are to be afforded when writing future regulatory law. The potential gap between *de jure* and *de facto* regulatory regimes is likely to be non-trivial.

Our quantile regression results point towards the importance of events in the distributional tails, particularly when discussing what, for firms, are rare but potentially devastating events. The role of party affiliation, while it does reveal itself in the standard OLS analysis, is better understood in the quantile regression modeling. The bulk of the effect of the current presidential administration's and the local congressman's party affiliation is on the largest negotiated reductions in fines. This result is not surprising. Lobbying efforts, donations, and the spending of previously accumulated political capital are more likely to find their marginal benefit exceeding their marginal cost only when we are discussing the largest reductions in fines. A reduction of a couple hundred dollars is unlikely to merit such investments.

Our results find state agencies making considerable efforts to enforce OSHA laws, but doing so in a way that perhaps minimizes the impact on the local economy. We can see this in their reduced propensity to find violations during inspections when unemployment is higher, while issuing larger and more frequent fines to firms whose violations merited sanctions, even during tougher economic times. The motivation for state governments to take on the burden of regulatory enforcement through policies of "partial preemption" may simply be the notion that their agents will better take on the role of caretakers of their local economy.

On a final note, we observe a tendency of state agencies to issue smaller fines up front, but also reduce them less later on. While perhaps offering less showmanship and intimidation of future transgressors in the announcement of large fines, it also likely results in fewer hearings and challenges on the part of firms, removing a layer from the bureaucracy of enforcement and the costly employment of legal professionals and regulatory consultants on the part of sanctioned firms.

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Appendix

Appendix 1: OSHA inspection prioritization

1. *Imminent danger situations* hazards that could cause death or serious physical harm—receive top priority. Compliance officers will ask employers to correct these hazards immediately—or remove endangered employees.
2. *Fatalities and catastrophes* incidents that involve a death or the hospitalization of three or more employees—come next. Employers must report such catastrophes to OSHA within 8 h.

3. *Complaints* allegations of hazards or violations also receive a high priority. Employees may request anonymity when they file complaints.
4. *Referrals* of hazard information from other federal, state or local agencies, individuals, organizations or the media receive consideration for inspection.
5. *Follow-ups* checks for abatement of violations cited during previous inspections—are also conducted by the agency in certain circumstances.
6. *Planned or programmed investigations* inspections aimed at specific high-hazard industries or individual workplaces that have experienced high rates of injuries and illnesses—also receive priority. (Osha Inspections Fact Sheet).

Appendix 2: OSHA inspection protocol

Preparation Before conducting an inspection, OSHA compliance officers research the inspection history of a worksite using various data sources, review the operations and processes in use and the standards most likely to apply. They gather appropriate personal protective equipment and testing instruments to measure potential hazards.

Presentation of credentials The onsite inspection begins with the presentation of the compliance officer's credentials, which include both a photograph and a serial number.

Opening conference The compliance officer will explain why OSHA selected the workplace for inspection and describe the scope of the inspection, walkaround procedures, employee representation and employee interviews. The employer then selects a representative to accompany the compliance officer during the inspection. An authorized representative of the employees, if any, also has the right to go along. In any case, the compliance officer will consult privately with a reasonable number of employees during the inspection.

Walkaround Following the opening conference, the compliance officer and the representatives will walk through the portions of the workplace covered by the inspection, inspecting for hazards that could lead to employee injury or illness. The compliance officer will also review worksite injury and illness records and posting of the official OSHA poster. During the walkaround, compliance officers may point out some apparent violations that can be corrected immediately. While the law requires that these hazards must still be cited, prompt correction is a sign of good faith on the part of the employer. Compliance officers try to minimize work interruptions during the inspection and will keep confidential any trade secrets they observe.

Closing conference After the walkaround, the compliance officer holds a closing conference with the employer and the employee representatives to discuss the findings. The compliance officer discusses possible courses of action an employer may take following an inspection, which could include an informal conference with OSHA or contesting citations and proposed penalties. The compliance officer also discusses consultation and employee rights.

Results OSHA must issue a citation and proposed penalty within 6 months of the violation's occurrence. Citations describe OSHA requirements allegedly violated, list any proposed penalties and give a deadline for correcting the alleged hazards. Violations are categorized as other-than-serious, serious, willful, repeated and failure to abate. Penalties may range up to \$7,000 for each serious violation and up to \$70,000

for each willful or repeated violation. Penalties may be reduced based on an employer's good faith, inspection history, and size of business. For serious violations, OSHA may also reduce the proposed penalty based on the gravity of the alleged violation. No good faith adjustment will be made for alleged willful violations.

Appeals When OSHA issues a citation to an employer, it also offers the employer an opportunity for an informal conference with the OSHA Area Director to discuss citations, penalties, abatement dates or any other information pertinent to the inspection. The agency and the employer may work out a settlement agreement to resolve the matter and to eliminate the hazard. OSHA's primary goal is correcting hazards and maintaining compliance rather than issuing citations or collecting penalties. Alternatively, employers have 15 working days after receipt of citations and proposed penalties to formally contest the alleged violations and/or penalties by sending a written notice to the Area Director. OSHA forwards the contest to the Occupational Safety and Health Review Commission for independent review. Alternatively, citations, penalties and abatement dates that are not challenged by the employer or settled become a final order of the Occupational Safety and Health Review Commission. (OSHA Inspections Fact Sheet).

Appendix 3: tables and figures

See Appendix Tables 1, 2, 3, 4, 5, 6 and 7.

Table 1 Summary statistics by inspection

Variable	Full sample	Violations	Penalties	Reductions
Violations (1/0)	0.655 (0.475)			
State Agency Ψ (1/0)	0.599 (0.490)	0.373 (0.484)	0.331 (0.471)	0.237 (0.425)
Unemployment	5.811 (1.806)	5.724 (1.674)	5.722 (1.694)	5.557 (1.619)
Programmed (1/0)	0.575 (0.494)	0.558 (0.497)	0.543 (0.498)	0.530 (0.499)
Adv. Notice (1/0)	0.007 (0.084)	0.008 (0.087)	0.008 (0.090)	0.009 (0.093)
Union (1/0)	0.194 (0.395)	0.196 (0.397)	0.193 (0.395)	0.210 (0.407)
President (1 = Repub.)	0.526 (0.499)	0.462 (0.499)	0.468 (0.499)	0.492 (0.500)
Congressman (1 = Repub.)	0.474 (0.499)	0.476 (0.499)	0.476 (0.499)	0.485 (0.500)
Majority Congressman	1.587 (0.958)	1.576 (0.939)	1.579 (0.933)	1.586 (0.932)
Party Rank	12.222 (8.565)	12.463 (8.615)	12.448 (8.617)	12.409 (8.667)

Table 1 continued

Variable	Full sample	Violations	Penalties	Reductions
Agriculture SIC	0.027 (0.162)	0.015 (0.122)	0.014 (0.117)	0.011 (0.103)
Mining SIC	0.008 (0.086)	0.004 (0.065)	0.005 (0.068)	0.004 (0.064)
Manufacturing SIC	0.241 (0.426)	0.275 (0.447)	0.285 (0.451)	0.313 (0.464)
Transportation/Communication SIC	0.041 (0.198)	0.035 (0.185)	0.034 (0.180)	0.035 (0.180)
Wholesale SIC	0.030 (0.171)	0.027 (0.163)	0.027 (0.163)	0.028 (0.164)
Retail SIC	0.080 (0.271)	0.066 (0.248)	0.062 (0.241)	0.059 (0.235)
Office SIC	0.008 (0.086)	0.005 (0.068)	0.004 (0.065)	0.004 (0.059)
Services SIC	0.088 (0.283)	0.076 (0.265)	0.070 (0.256)	0.069 (0.253)
Fine (1/0)		0.845 (0.362)		
Employees Exposed		48.750 (302.291)	52.254 (321.300)	61.180 (321.181)
Serious (1/0)		0.755 (0.430)	0.885 (0.319)	0.904 (0.295)
Repeat Offender (1/0)		0.045 (0.208)	0.054 (0.225)	0.053 (0.224)
Willful (1/0)		0.007 (0.086)	0.009 (0.093)	0.010 (0.102)
Gravity (1–10)		2.818 (2.787)	3.157 (2.875)	3.456 (2.895)
Penalty Contested (1/0)			0.110 (0.313)	
CPS: State Average Age	34.906 (1.616)	35.067 (1.651)	35.101 (1.680)	35.170 (1.685)
CPS: State % High School	0.389 (0.040)	0.391 (0.039)	0.389 (0.040)	0.386 (0.039)
CPS: State % No College	0.629 (0.051)	0.642 (0.049)	0.639 (0.049)	0.638 (0.048)
CPS: State % Black	0.113 (0.083)	0.126 (0.085)	0.126 (0.083)	0.129 (0.080)
CPS: State % Hispanic	0.114 (0.110)	0.104 (0.102)	0.106 (0.103)	0.101 (0.097)

Table 1 continued

Variable	Full sample	Violations	Penalties	Reductions
CPS: State Median Income (in 1999\$)	46.659 (6.163)	45.927 (6.567)	46.190 (6.637)	46.719 (6.911)
\$Initial Penalty			4,433 (47,588)	
\$Current Penalty			2,666 (44,322)	
\$Penalty Drop			1,767 (12,377)	2,795 (15,477)
Observations	1,616,254	684,372	578,382	365,469

Standard deviations in parentheses. Summary statistics are presented separate for all inspections, inspections that result in violations, violations that result in penalties, and penalty cases that result in penalty reductions

Table 2 Violation (1/0)—logit regressions

	(1)	(2)	(3)
State Agency (Ψ)		-0.005 (0.013)	0.040 (0.045)
Unemployment	-0.016*** (0.006)	0.000 (0.007)	0.008 (0.006)
Ψ * Unemployment			-0.012*** (0.004)
Programmed	0.028 (0.019)	0.028 (0.019)	-0.028** (0.013)
Ψ * Programmed			0.096*** (0.031)
Adv. Notice	-0.088** (0.038)	-0.092** (0.037)	-0.063*** (0.010)
Ψ * Adv. Notice			-0.130* (0.079)
Union	-0.050*** (0.014)	-0.052*** (0.013)	-0.019** (0.008)
Ψ * Union			-0.060*** (0.017)
President (1 = Repub.)	-0.053 (0.035)	0.033 (0.041)	0.061* (0.036)
Ψ * President			-0.040*** (0.014)
Congressman (1 = Repub.)	-0.010* (0.006)	-0.018*** (0.005)	-0.013** (0.007)
Ψ * Congressman			-0.008 (0.010)

Table 2 continued

	(1)	(2)	(3)
Majority Congressman	0.001 (0.001)	0.001 (0.001)	0.004 (0.002)
Ψ * Majority			-0.004 (0.003)
Party Rank	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Ψ * Party Rank			0.001* (0.000)
State Average Age	-0.006 (0.006)	0.004 (0.006)	0.003 (0.006)
State % High School	-0.433 (0.313)	-0.110 (0.403)	-0.111 (0.382)
State % No College	-0.009 (0.312)	-0.443* (0.249)	-0.428* (0.238)
State % Black	-0.155 (0.255)	0.130 (0.104)	0.111 (0.103)
State % Hispanic	0.048 (0.177)	-0.325*** (0.088)	-0.315*** (0.085)
State Median Income (in 1999\$)	-0.000 (0.002)	-0.000 (0.001)	-0.000 (0.001)
State Population (in million)	0.001 (0.007)	0.002** (0.001)	0.002*** (0.001)
Inspection ($t - 1$)	-0.222*** (0.011)	-0.226*** (0.011)	-0.224*** (0.011)
Violation ($t - 1$)	0.101*** (0.010)	0.109*** (0.010)	0.108*** (0.010)
Observations	1,555,283	1,555,283	1,555,283

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Column (1) includes state fixed effects. Columns (1–3) include year and industry fixed effects (results omitted) and state clustered standard errors. We report average marginal effects

Table 3 Fine/warning (1/0)—logit regressions

	(1)	(2)	(3)	(4)
State Agency (Ψ)		-0.013 (0.012)	0.007 (0.024)	0.012 (0.024)
Unemployment	0.004 (0.004)	0.000 (0.004)	-0.003S (0.003)	-0.003 (0.003)
Ψ * Unemployment			0.005* (0.003)	0.005* (0.003)
Programmed	-0.008*** (0.003)	-0.013*** (0.004)	0.006* (0.003)	0.006* (0.003)
Ψ * Programmed			-0.037***	-0.037***

Table 3 continued

	(1)	(2)	(3)	(4)
			(0.007)	(0.007)
Adv. Notice	0.008 (0.006)	0.007 (0.006)	0.011 (0.008)	0.011 (0.008)
ψ * Adv. Notice			-0.008 (0.012)	-0.009 (0.012)
ln (Employees Exposed)	0.006*** (0.001)	0.005*** (0.002)	0.002* (0.001)	0.003*** (0.001)
ψ * ln (Employees Exposed)			0.005* (0.003)	0.002 (0.003)
Violations	0.018*** (0.001)	0.019*** (0.002)	0.022*** (0.003)	0.022*** (0.003)
ψ * Violations			-0.007** (0.003)	-0.007** (0.003)
Serious (1/0)	0.205*** (0.003)	0.212*** (0.006)	0.211*** (0.014)	0.211*** (0.014)
ψ * Serious			-0.005 (0.023)	-0.004 (0.023)
Repeat Offender (1/0)	0.213*** (0.010)	0.222*** (0.016)	0.193*** (0.015)	0.193*** (0.015)
ψ * Repeat Offender			0.039* (0.023)	0.039* (0.023)
Willful (1/0)	0.129*** (0.017)	0.133*** (0.021)	0.099*** (0.020)	0.099*** (0.020)
ψ * Willful			0.063 (0.044)	0.063 (0.044)
Gravity (1-10)	0.028*** (0.002)	0.027*** (0.003)	0.034*** (0.003)	0.034*** (0.003)
ψ * Gravity			-0.015*** (0.005)	-0.015*** (0.005)
Union	0.007** (0.003)	0.008** (0.004)	0.008*** (0.003)	0.008*** (0.003)
ψ * Union			-0.001 (0.008)	-0.001 (0.008)
President (1 = Repub.)	-0.034 (0.024)	-0.076*** (0.022)	-0.071*** (0.018)	-0.070*** (0.017)
ψ * President			-0.022*** (0.006)	-0.025*** (0.009)
Congressman (1 = Repub.)	0.003 (0.003)	-0.005 (0.005)	-0.003 (0.004)	0.002 (0.003)

Table 3 continued

	(1)	(2)	(3)	(4)
ψ * congressman			-0.007 (0.005)	-0.016* (0.008)
Majority Congressman	0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
ψ * Majority			0.003 (0.002)	0.002 (0.002)
Party Rank	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
ψ * Party Rank			-0.000 (0.000)	-0.000 (0.000)
President * Nr.Exposed	-0.003*** (0.001)	-0.002** (0.001)	-0.001 (0.001)	-0.002 (0.001)
ψ * President * Nr.Exp.				0.001 (0.002)
Congressman * Nr.Exp.	-0.001 (0.001)	-0.000 (0.001)	0.001 (0.001)	-0.002** (0.001)
ψ * Congressman * Nr.Exp.				0.004* (0.003)
State Average Age	-0.001 (0.003)	-0.005 (0.004)	-0.003 (0.003)	-0.003 (0.003)
State % High School	0.007 (0.139)	0.302 (0.205)	0.217 (0.193)	0.218 (0.192)
State % No College	-0.265* (0.140)	-0.350** (0.144)	-0.232* (0.127)	-0.232* (0.127)
State % Black	0.179*** (0.064)	-0.299*** (0.065)	-0.251*** (0.052)	-0.251*** (0.052)
State % Hispanic	0.092 (0.106)	-0.193** (0.076)	-0.142** (0.067)	-0.142** (0.067)
State Median Income (in 1999\$)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
State Population (in million)	0.003 (0.002)	0.005*** (0.001)	0.005*** (0.001)	0.005*** (0.001)
Observations	684,372	684,372	684,372	684,372

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Column (1–4) estimates obtained from all inspections with violations. Column (1) includes state fixed effects. Columns (1–4) include year and industry fixed effects (results omitted) and state clustered standard errors. We report average marginal effects

Table 4 Log-initial penalties—OLS regression

	(1)	(2)	(3)	(4)
State Agency (ψ)		-0.404** (0.162)	-0.535 (0.406)	-0.503 (0.395)
Unemployment	0.018 (0.031)	-0.006 (0.052)	-0.026 (0.037)	-0.026 (0.037)
ψ * Unemployment			0.045 (0.049)	0.046 (0.049)
Programmed	-0.205*** (0.041)	-0.309*** (0.069)	-0.102*** (0.036)	-0.102*** (0.036)
ψ * Programmed			-0.569*** (0.107)	-0.569*** (0.107)
Adv. Notice	0.164*** (0.052)	0.135** (0.071)	0.229*** (0.069)	0.229*** (0.069)
ψ * Adv. Notice			-0.270** (0.132)	-0.269** (0.132)
ln (Employees Exposed)	0.161*** (0.020)	0.151*** (0.023)	0.147*** (0.021)	0.152*** (0.020)
ψ * ln (Employees Exposed)			0.008 (0.039)	-0.006 (0.040)
Violations	0.610*** (0.026)	0.619*** (0.031)	0.669*** (0.030)	0.668*** (0.030)
ψ * Violations			-0.118*** (0.044)	-0.118*** (0.044)
Serious (1/0)	3.869*** (0.249)	3.834*** (0.259)	3.505*** (0.219)	3.505*** (0.219)
ψ * Serious			0.641 (0.483)	0.641 (0.483)
Repeat Offender (1/0)	2.341*** (0.114)	2.304*** (0.116)	2.071*** (0.072)	2.071*** (0.072)
ψ * Repeat Offender			0.602** (0.229)	0.604** (0.229)
Willful (1/0)	2.330*** (0.103)	2.324*** (0.108)	2.127*** (0.075)	2.127*** (0.075)
ψ * Willful			0.932*** (0.276)	0.933*** (0.276)
Gravity (1– 10)	0.259*** (0.010)	0.260*** (0.011)	0.256*** (0.008)	0.256*** (0.008)
ψ * Gravity			0.037 (0.029)	0.037 (0.029)
Union	0.324*** (0.037)	0.290*** (0.052)	0.308*** (0.039)	0.308*** (0.039)

Table 4 continued

	(1)	(2)	(3)	(4)
Ψ * Union			-0.054 (0.256)	-0.055 (0.256)
President (1 = Repub.)	-0.846*** (0.157)	-0.953*** (0.182)	-0.806*** (0.169)	-0.824*** (0.147)
Ψ * President			-0.329*** (0.101)	-0.288** (0.101)
Congressman (1 = Repub.)	0.035 (0.036)	-0.003 (0.051)	-0.003 (0.041)	0.039 (0.036)
Ψ * Congressman			-0.056 (0.074)	-0.166 (0.130)
Majority Congressman	0.002 (0.007)	0.001 (0.006)	-0.007 (0.008)	-0.006 (0.008)
Ψ * Majority			0.013 (0.016)	0.013 (0.016)
Party Rank	(0.001)	(0.001)	(0.001)	(0.001)
Ψ * Party Rank			-0.004 (0.002)	-0.004 (0.002)
President * Nr.Exposed	(0.001)	(0.001)	(0.001)	(0.001)
	-0.047* (0.027)	-0.042 (0.026)	-0.037 (0.023)	-0.031 (0.023)
Ψ * President * Nr.Exp.				-0.015 (0.036)
Congressman * Nr.Exp.	-0.004 (0.011)	0.002 (0.013)	0.006 (0.013)	-0.011 (0.009)
Ψ * Congressman * Nr.Exp.				0.043 (0.029)
State Average Age	-0.032 (0.025)	-0.063* (0.035)	-0.058* (0.033)	-0.058* (0.033)
State % High School	-1.522 (1.279)	3.705 (2.491)	3.082 (2.237)	3.087 (2.235)
State % No College	-1.609 (1.458)	-3.518* (2.081)	-2.993 (1.937)	-2.991 (1.934)
State % Black	1.834 (1.177)	-2.484*** (0.772)	-2.386*** (0.689)	-2.386*** (0.688)
State % Hispanic	0.703 (0.950)	-2.273** (0.954)	-2.011** (0.899)	-2.010** (0.899)
State Median Income (in 1999\$)	-0.004 (0.005)	0.004 (0.008)	0.004 (0.007)	0.004 (0.007)
State Population (in million)	0.027 (0.038)	0.067*** (0.016)	0.064*** (0.015)	0.064*** (0.015)

Table 4 continued

	(1)	(2)	(3)	(4)
Constant	3.547*** (1.052)	4.118** (1.798)	3.983** (1.826)	3.962** (1.819)
Observations	684,373	684,373	684,373	684,373
R squared	0.684	0.667	0.673	0.673

Robust standard errors in parentheses *** $p < 0.01$ ** $p < 0.05$, * $p < 0.1$. All column estimates obtained from all inspections that resulted in violations and positive initial penalties. All regressions are run with year and industry fixed effects (results omitted) and state-year two-way clustered standard errors. In addition column (1) is run with state fixed effects

Table 5 Percent penalty reductions—OLS regression

	(1)	(2)	(3)	(4)
State Agency (ψ)		-0.035* (0.021)	-0.094* (0.052)	-0.093* (0.052)
Initial penalty	0.090*** (0.008)	0.092*** (0.007)	0.090*** (0.007)	0.090*** (0.007)
Unemployment	-0.003 (0.005)	-0.007 (0.006)	0.001 (0.005)	0.001 (0.005)
ψ * Unemploy.			-0.010* (0.005)	-0.010* (0.005)
Programmed	0.019*** (0.003)	0.020*** (0.005)	0.020*** (0.003)	0.020*** (0.003)
ψ * Programmed			-0.002 (0.010)	-0.002 (0.010)
Adv. Notice	-0.058*** (0.008)	-0.058*** (0.008)	-0.056*** (0.008)	-0.056*** (0.008)
ψ * Adv. Notice			0.025 (0.024)	0.025 (0.024)
ln (Employees Exposed)	-0.011*** (0.001)	-0.009*** (0.002)	-0.012*** (0.002)	-0.012*** (0.001)
ψ * ln (Employees Expd.)			0.005 (0.004)	0.004 (0.003)
Violations	-0.009*** (0.003)	-0.011*** (0.003)	-0.014*** (0.004)	-0.014*** (0.004)
ψ * Violations			0.017*** (0.005)	0.017*** (0.005)
Serious (1/0)	-0.150*** (0.015)	-0.146*** (0.015)	-0.164*** (0.021)	-0.164*** (0.021)
ψ * Serious			0.030 (0.030)	0.030 (0.030)

Table 5 continued

	(1)	(2)	(3)	(4)
Repeat Offender (1/0)	-0.125*** (0.006)	-0.129*** (0.006)	-0.137*** (0.010)	-0.137*** (0.010)
Ψ * Repeat Offender			0.031** (0.015)	0.031** (0.014)
Willful (1/0)	-0.135*** (0.018)	-0.146*** (0.018)	-0.136*** (0.018)	-0.136*** (0.018)
Ψ * Willful			-0.003 (0.023)	-0.003 (0.023)
Gravity (1–10)	-0.006*** (0.001)	-0.005*** (0.001)	-0.009*** (0.001)	-0.009*** (0.001)
Ψ * Gravity			0.017*** (0.004)	0.017*** (0.004)
Union	-0.002 (0.003)	-0.004 (0.005)	-0.007 (0.006)	-0.007 (0.006)
Ψ * Union			0.007 (0.014)	0.007 (0.014)
President (1 = Repub.)	-0.037* (0.021)	-0.102*** (0.029)	-0.115*** (0.029)	-0.115*** (0.029)
Ψ * President			0.010 (0.015)	0.011 (0.015)
Congressman (1 = Repub.)	-0.003 (0.005)	-0.003 (0.006)	-0.006 (0.006)	-0.005 (0.007)
Ψ * Congressman			0.006 (0.010)	0.004 (0.011)
Majority Congressman	0.001 (0.001)	0.001 (0.002)	0.002 (0.001)	0.002 (0.001)
Ψ * Majority			-0.001 (0.003)	-0.001 (0.003)
Party Rank	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Ψ * Party Rank			-0.000 (0.000)	-0.000 (0.000)
President * Nr.Exposed	0.001 (0.001)	0.000 (0.001)	0.002** (0.001)	0.002* (0.001)
Ψ * President * Nr.Exp.				-0.000 (0.002)
Congressman * Nr.Exp.	0.001 (0.001)	0.002* (0.001)	0.002** (0.001)	0.002* (0.001)
Ψ * Congressman * Nr.Exp.				0.001 (0.002)

Table 5 continued

	(1)	(2)	(3)	(4)
State Average Age	-0.003 (0.004)	-0.010* (0.005)	-0.011** (0.005)	-0.011** (0.005)
State % High School	0.135 (0.256)	-0.532 (0.377)	-0.452 (0.354)	-0.452 (0.354)
State % No College	-0.471** (0.223)	0.781*** (0.298)	0.573** (0.275)	0.573** (0.275)
State % Black	-0.209 (0.206)	0.008 (0.138)	-0.047 (0.123)	-0.047 (0.123)
State % Hispanic	-0.014 (0.176)	0.052 (0.153)	-0.026 (0.139)	-0.026 (0.139)
State Median Income (in 1999\$)	-0.001 (0.002)	0.003* (0.002)	0.002* (0.001)	0.002* (0.001)
State Population (in million)	-0.009 (0.008)	-0.004*** (0.001)	-0.002** (0.001)	-0.002** (0.001)
Constant	0.282 (0.290)	-0.168 (0.335)	0.006 (0.291)	0.006 (0.291)
Observations	578,382	578,382	578,382	578,382
R squared	0.218	0.184	0.192	0.192

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All column estimates obtained from all inspections that resulted in violations and positive initial penalties. All regressions are run with year and industry fixed effects (results omitted) and state-year two-way clustered standard errors. In addition column (1) is run with state fixed effects

Table 6 Violation (1/0)—logit and OLS regressions comparing single to double clustering

Variables	(1) Logit coeff cluster by state	(2) Logit coeff cluster by state-time	(3) Logit marg. eff cluster by state
State Agency (Ψ)	0.185 (0.208)	0.185 (0.223)	0.040 (0.045)
Unemployment	0.039 (0.027)	0.039 (0.032)	0.008 (0.006)
Ψ * Unemployment	-0.053*** (0.020)	-0.053* (0.030)	-0.012*** (0.004)
Programmed	-0.127** (0.061)	-0.127* (0.070)	-0.028** (0.013)
Ψ * Programmed	0.446*** (0.143)	0.446*** (0.150)	0.096*** (0.031)
Adv. Notice	-0.293*** (0.047)	-0.293*** (0.051)	-0.063*** (0.010)
Ψ * Adv. Notice	-0.603	-0.603*	-0.130*

Table 6 continued

Variables	(1) Logit coeff cluster by state	(2) Logit coeff cluster by state-time	(3) Logit marg. eff cluster by state
	(0.368)	(0.355)	(0.079)
Union	-0.087**	-0.087	-0.019**
	(0.036)	(0.055)	(0.008)
$\Psi * \text{Union}$	-0.278***	-0.278***	-0.060***
	(0.081)	(0.084)	(0.017)
President (1= Repub.)	0.280*	0.280*	0.061*
	(0.167)	(0.146)	(0.036)
$\Psi * \text{President}$	-0.184***	-0.184**	-0.040***
	(0.063)	(0.087)	(0.014)
Congressman (1 = Repub.)	-0.061**	-0.061*	-0.013**
	(0.031)	(0.032)	(0.007)
$\Psi * \text{Congressman}$	-0.039	-0.039	-0.008
	(0.046)	(0.048)	(0.010)
Majority Congressman	0.018	0.018	0.004
	(0.011)	(0.012)	(0.002)
$\Psi * \text{Majority}$	-0.021	-0.021	-0.004
	(0.015)	(0.014)	(0.003)
Party Rank	-0.002	-0.002	-0.000
	(0.002)	(0.001)	(0.000)
$\Psi * \text{Party Rank}$	0.004*	0.004*	0.001*
	(0.002)	(0.002)	(0.000)
State Average Age	0.015	0.015	0.003
	(0.026)	(0.024)	(0.006)
State % High School	-0.512	-0.512	-0.111
	(1.767)	(1.607)	(0.382)
State % No College	-1.981*	-1.981*	-0.428*
	(1.101)	(1.085)	(0.238)
State % Black	0.513	0.513	0.111
	(0.478)	(0.489)	(0.103)
State % Hispanic	-1.459***	-1.459***	-0.315***
	(0.398)	(0.391)	(0.085)
State Median Income (in 1999\$)	-0.001	-0.001	-0.000
	(0.005)	(0.005)	(0.001)
State Population (in million)	0.011***	0.011***	0.002***
	(0.004)	(0.004)	(0.001)
d_inspectedL1	-1.036***	-1.036***	-0.224***
	(0.050)	(0.055)	(0.011)
d_violationL1	0.501***	0.501***	0.108***

Table 6 continued

Variables	(1) Logit coeff cluster by state	(2) Logit coeff cluster by state-time	(3) Logit marg. eff cluster by state
	(0.046)	(0.051)	(0.010)
Constant	1.269 (1.271)	1.269 (1.186)	
Observations	1,555,283	1,555,283	1,555,283
<i>R</i> squared			

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7 Fine/warning (1/0)—logit and OLS regressions comparing single to double clustering

Variables	(1) Logit coeff cluster by state	(2) Logit coeff cluster by state-time	(3) Logit marg. eff. cluster by state.
State Agency (Ψ)	0.310 (0.586)	0.310 (0.528)	0.012 (0.024)
Unemployment	-0.086 (0.078)	-0.086 (0.077)	-0.003 (0.003)
Ψ * Unemployment	0.125* (0.070)	0.125* (0.069)	0.005* (0.003)
Programmed	0.138* (0.072)	0.138 (0.086)	0.006* (0.003)
Ψ * Programmed	-0.914*** (0.165)	-0.914*** (0.170)	-0.037*** (0.007)
Adv. Notice	0.278 (0.184)	0.278 (0.228)	0.011 (0.008)
Ψ * Adv. Notice	-0.213 (0.301)	-0.213 (0.305)	-0.009 (0.012)
Union	0.210*** (0.078)	0.210*** (0.080)	0.008*** (0.003)
Ψ * Union	-0.023 (0.207)	-0.023 (0.195)	-0.001 (0.008)
President (1= Repub.)	-1.746*** (0.464)	-1.746*** (0.323)	-0.070*** (0.017)
Ψ * President	-0.610*** (0.230)	-0.610*** (0.134)	-0.025*** (0.009)
Congressman (1= Repub.)	0.054 (0.062)	0.054 (0.062)	0.002 (0.003)
Ψ * Congressman	-0.403** (0.190)	-0.403** (0.192)	-0.016* (0.008)
Majority Congressman	-0.018 (0.026)	-0.018 (0.024)	-0.001 (0.001)

Table 7 continued

Variables	(1) Logit coeff cluster by state	(2) Logit coeff cluster by state-time	(3) Logit marg. eff. cluster by state.
Ψ * Majority	0.062 (0.046)	0.062* (0.037)	0.002 (0.002)
Party Rank	0.002 (0.003)	0.002 (0.003)	0.000 (0.000)
Ψ * Party Rank	-0.005 (0.005)	-0.005 (0.005)	-0.000 (0.000)
State Average Age	-0.084 (0.073)	-0.084 (0.068)	-0.003 (0.003)
State % High School	5.396 (4.880)	5.396 (4.271)	0.218 (0.192)
State % No College	-5.745* (3.138)	-5.745** (2.844)	-0.232* (0.127)
State % Black	-6.226*** (1.177)	-6.226*** (1.145)	-0.251*** (0.052)
State % Hispanic	-3.508** (1.705)	-3.508** (1.609)	-0.142** (0.067)
State Median Income (in 1999\$)	-0.004 (0.016)	-0.004 (0.014)	-0.000 (0.001)
State Population (in million)	0.117*** (0.017)	0.117*** (0.018)	0.005*** (0.001)
Constant	3.566 (4.151)	3.566 (3.895)	
Observations	684,372	684,372	684,372
<i>R</i> squared			

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All regressions are run with time, state, and industry fixed effects (results omitted) and state clustered standard errors. We report average marginal effects

Appendix 4: figures

See Appendix Figures 1, 2, 3 and 4.

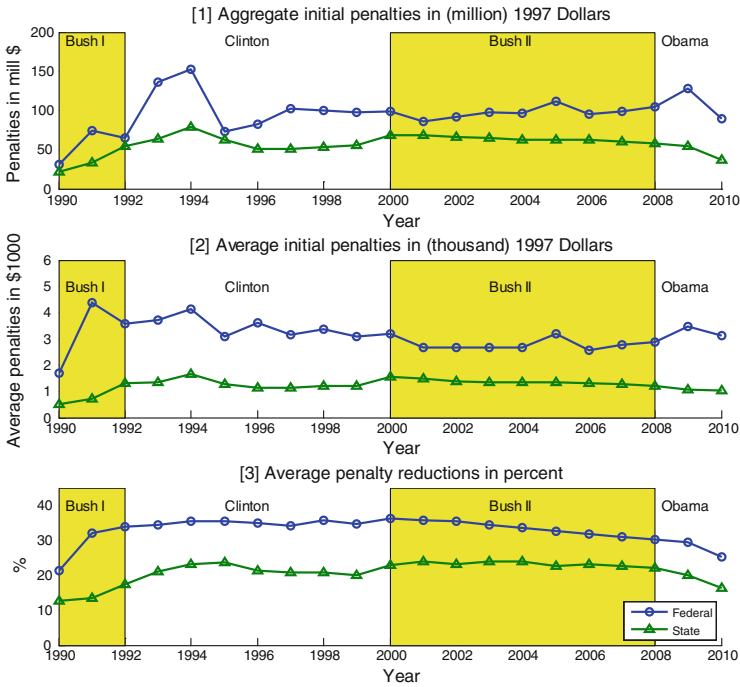


Fig. 3 OSHA Penalties. Data: OSHA 1990–2010. 1,616,254 inspections. Penalties in 1997 dollar values

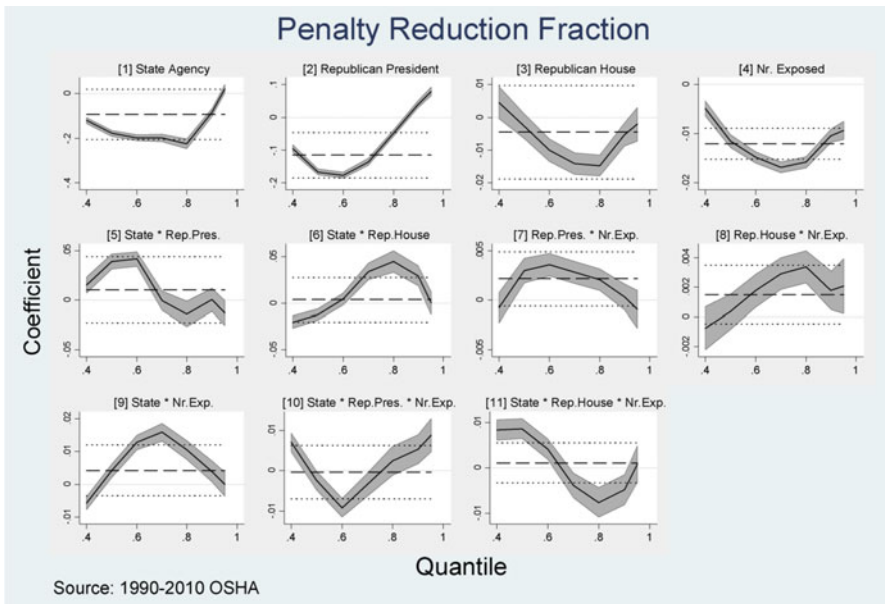


Fig. 4 Quantile regressions of penalty reductions in percent. Note Control variables are identical to those used in Table 5 of Appendix 3, column 4. $N = 578,382$. We report standard errors and t statistics that are asymptotically valid under heteroskedasticity and misspecification (Angrist et al. 2006; Machado et al. 2012). The dashed horizontal lines are 95 % confidence intervals of the original OLS

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