The Environmental Consequences of Pay Inequality

Joseph Kalmenovitz and Jason (Pang-Li) Chen*

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Abstract

We study how pay inequality among regulators affects the environment, using individual compensation data on attorneys at the Environmental Protection Agency (EPA). Consistent with incentive theories, high-inequality EPA offices pursue more enforcement actions with higher monetary penalties, especially against severe misconduct. Exploiting the differential exposure of facilities to the EPA's regional offices, we find that facilities in high-inequality jurisdictions reduce pollution levels, slow production and initiate abatement activities. The results suggest that the regulator's compensation structure could create an enforcement risk which is subsequently internalized by regulated entities.

*Drexel University, LeBow College of Business. We thank Michael Wittry (discussant), Nanying Lin (discussant), David Yermack, seminar attendants at Mannheim University, and participants at the FMA Annual Meeting and the Financial Markets and Corporate Governance conference for helpful comments. Kalmenovitz is grateful for the Center for Global Economy and Business for financial support. Please send correspondence to: joseph.kalmenovitz@drexel.edu.

1 Introduction

Pay inequality among coworkers has real consequences, affecting employee morale and subsequently their effort and productivity (Lazear and Rosen 1981; Card, Mas, Moretti, and Saez 2012). In this paper we examine how pay inequality creates externalities beyond the workplace. Specifically, we ask whether pay inequality among regulators could affect the behavior of regulated companies. We focus on enforcement attorneys at the Environmental Protection Agency, the primary enforcer of federal environmental regulations. In an average year, the EPA files $3,589$ enforcement actions against companies who fail to comply with environmental laws, and obtains nearly \$947 million in settlements and verdicts. Given the scope of the EPA's enforcement program, pay inequality among enforcement attorneys can have a ripple effect: on the intensity of EPA enforcement and on the environmental policies of regulated companies. We utilize a novel data set to explore these possibilities and present two findings. First, high EPA inequality leads to more robust enforcement activity. Second, facilities who are exposed to high EPA inequality substantially reduce pollution levels. Combined, our results suggest that the EPA's compensation structure creates an enforcement risk which is subsequently internalized by regulated companies.

To study pay inequality, we submitted repeated Freedom of Information Act requests and obtained a novel data set with the individual compensation records of all EPA attorneys from 1996 to 2016. The EPA's legal staff includes 700 attorneys in 10 regional offices (Figure 1). We have each attorney's employment information including salary, hierarchy rank, bonus awards, and tenure. We focus our attention on pay inequality among those attorneys, defined as the gap between the attorney's own salary and the salary of her immediate superiors.[1] Contrary to popular belief, there is substantial variation in pay inequality across attorneys (Figure 2). The average inequality is 33%, which translates to \$35,000, a non-trivial amount that could affect effort and productivity. However, the direction of the effect is unclear. On one hand, substantial inequality among attorneys

[1] Pay inequality is not explicitly written into the attorney's contract, and there is no consensus on how to define inequality. We discuss alternative definitions in the main text.

could negatively affect their morale and lower their enforcement activity (morale effect; see Adams 1965; Crosby 1976). This concern is especially acute given that the risk of termination in the federal government is extremely low. On the other hand, attorneys who face a large pay gap relative to their superiors could conclude that the monetary value of promotion is high. That, in turn, could motivate them to put more effort into their enforcement activities in order to win a promotion and earn the pay gap (incentive effect; see Lazear and Rosen 1981; Coles, Li, and Wang 2017).

To test the competing hypotheses, we merge the workforce data set with the EPA's publicly available enforcement database. The latter contains case-level information, such as type of violations and settlement terms, for 70,816 enforcement actions. In the cross-section of regional offices, those with higher pay inequality demonstrate considerably more robust enforcement activity: they file more cases against more defendants, focus on more severe violations of environmental regulations, and request larger monetary penalties (Figure 3). The effect is identified within office over time, and therefore not explained by macroeconomic conditions or time-invariant office characteristics. We obtain similar results in the cross-section of cases, an identification strategy which compares settlement terms for cases that were filed by different offices for the same type of violations. The evidence seems to support the incentive hypothesis: offices with higher inequality appear to stimulate greater effort among their enforcement staff which leads to a more robust enforcement activity. Nevertheless, proper identification is challenging since salaries (and hence pay inequality) are not randomly assigned. We can reasonably rule out common explanations, such as local economic conditions (county-level controls) and confounding office-level factors (number of attorneys, average tenure, rate of promotions, turnover rates, and bonus awards). But the lack of exogenous shock to the EPA's pay structure warrants a cautious interpretation.[2]

Motivated by these findings, we turn to study how companies respond to the EPA's compensation structure. To determine optimal pollution levels, companies balance the

[2]Our findings are consistent with Kalmenovitz 2020, who shows that pay gaps at the Securities and Exchange Commission increase enforcement. Based on the extensive discussion there, we believe that the OLS results in our paper are a lower bound to the unbiased effect of pay inequality.

expected benefits from pollution against the risk of having to defend themselves against an EPA enforcement action. If pay inequality increases the probability of EPA enforcement and the expected penalty, then companies face a high enforcement risk, and we expect to see a decline in environmentally-harmful activities. We test this prediction using the EPA's Toxic Release Inventory (TRI) database, which reports chemical releases at the chemical-facility-year level: pounds of the particular chemical released by the facility in a given year.[3] Our identification strategy exploits the EPA's organizational structure, where each of the ten regional offices has jurisdiction over neighboring states. Therefore, each facility's exposure to EPA inequality - and to the resulting enforcement risk - is determined by jurisdictional lines, not by local economic conditions. For example, a facility in Louisville, Kentucky is exposed to inequality among EPA attorneys who work 400 miles away in the Atlanta regional office. Since facilities report their precise location on TRI, we can assign them to their respective EPA regional office.

We find that pay inequality is associated with a significant decrease in chemical releases by regulated plants (Figure 4). The most restrictive specification includes industry-chemical-year fixed effects, comparing releases of an identical chemical used for identical production process at the same time, by facilities located in different EPA jurisdictions and therefore exposed to different levels of pay inequality. The association is conditional on county-level controls and office-level controls, such as the number of attorneys, average tenure, and past enforcement activity, and the effect is economically large: one unit increase in pay inequality is associated with 9% decrease in chemical releases relative to the sample mean. We assign placebo treatment to plants by randomizing pay inequality, for example: explaining chemical releases in Arizona with the Boston office's pay inequality. The coefficients turn statistically insignificant, which helps to ensure that the results are driven by office-specific events. We also confirm that the results are not driven by any individual region and are not affected by different levels of winsorizing, clustering methods, or definitions of pay inequality.

Further analysis reveals that facilities cut back specifically on chemicals that are

[3] Some reporting practices might lead to misinterpretation of the TRI raw numbers (Akey and Appel 2021). We contacted the EPA and followed their suggestions regarding the data cleaning procedure.

known to have adverse consequences to the human body. For instance, an increase in EPA inequality has a substantial effect on reducing a variety of harmful chemicals that affect a broad range of biological systems. We also find that the results are driven by the extensive and intensive margins: pay inequality decreases the amount of chemical releases, as well as the probability that a plant would stop using a toxic chemical for production. Finally, we point to two non-mutually exclusive channels in which plants achieve the reduction in chemical releases. Using the EPA's Pollution Prevention (P2) data set, we find that facilities decrease production levels which is based on toxic chemicals and also proactively initiate abatement activities.

Taken together, the results illustrate a clear pattern. From the perspective of EPA attorneys, inequality creates an incentive to increase enforcement activity and seek higher penalties. From the perspective of regulated companies, that same inequality creates a enforcement risk and raises the expected costs of pollution (enforcement probability and enforcement penalties). As a result, companies reduce their pollution levels. Put differently, regulated companies seem to internalize the enforcement risk created by the regulator's pay inequality.

Our work relates to the extant literature on pay inequality. Studies focus on private sector employees, showing for example how inequality affects the productivity of corporate executives (Main, O'Reilly III, and Wade 1993; Kale, Reis, and Venkateswaran 2009; Kini and Williams 2012; Burns, Minnick, and Starks 2017; Coles, Li, and Wang 2017) and of lower-paid workers (Clark and Oswald 1996; Trevor and Wazeter 2006; Card, Mas, Moretti, and Saez 2012; Breza, Kaur, and Shamdasani 2016). We make two contributions to this literature. First, we examine pay inequality in the public sector, a setting where there is little evidence that compensation incentives matter beyond the employee's intrinsic motivation (Olken, Onishi, and Wong 2014; Rasul and Rogger 2016; Bryson, Forth, and Stokes 2017; Bellé 2015; Deserranno 2015). Second, we trace the impact of pay inequality outside of the workplace, and find that internal gaps among regulators spill over to the economy and affect the choices made by regulated companies.

Our paper is also related to the growing literature on factors that influence corporate pollution and other environmental activities. Prior studies found that environmental choices are affected by financial constraints (Bartram, Hou, and Kim 2019), ownership structure (Shive and Forster 2020), activist investors (Akey and Appel 2019; Chu and Zhao 2019; Naaraayanan, Sachdeva, and Sharma 2020), and rules of limited liability (Akey and Appel 2021). But there is also a recognition that regulation affects the willingness of companies to engage in environmentally-harmful activities (Krueger, Sautner, and Starks 2020; Ilhan, Sautner, and Vilkov 2019; Painter 2020; Karpoff, Lott, and Wehrly 2005). Existing studies emphasize aspects of regulatory risk that are related to the Paris Agreement (Seltzer, Starks, and Zhu 2020) and to enforcement of specific violations (Levine, Lin, Wang, and Xie 2019; Xu and Kim 2020).[4] We contribute to this literature a novel factor: the role of the EPA's enforcement program and the chilling effect it could have on regulated companies. In particular, we highlight how the incentives of individual attorneys who enforce the environmental regulations can affect the enforcement risk borne by companies.

Finally, our paper contributes to the nascent literature on how the organizational design of regulatory agencies affects regulation. Scholars investigate how agencies fund their operations (Kisin and Manela 2018), delegate authority to local offices (Gopalan, Kalda, and Manela 2017), and allocate supervisory hours across regulated entities (Eisenbach, Lucca, and Townsend 2016; Hirtle, Kovner, and Plosser 2019). We contribute to this literature by showing that pay inequality can affect the enforcement productivity of an important regulator, that is, the Environmental Protection Agency.

2 Hypotheses and data sources

2.1 Hypotheses

The empirical analysis consists of two parts. First, we test whether pay inequality among EPA attorneys affects EPA enforcement. Second, we explore whether pay inequality

[4]For instance, violations of the Clean Water Act - the focus of prior papers - represent less than 20% of the EPA's enforcement portfolio (Figure 5).

affects pollution activities by corporations.

The predicted relation of EPA pay inequality with enforcement is ambiguous. One hypothesis is that inequality motivates EPA attorneys to increase their enforcement activity. Attorneys could use their colleagues' salaries to update their beliefs regarding future pay raises (Card, Mas, Moretti, and Saez 2012; Vroom 1964; Kepes, Delery, and Gupta 2009). In a tournament context, wider pay gaps between managers and non-managers motivate the latter to exert more effort in order to earn a promotion (Lazear and Rosen 1981; Lazear, Oyer, Gibbons, and John Roberts 2012). Concentration of pay at the top could also limit rent-seeking behavior by managers and thereby improve the EPA's performance (Hibbs Jr and Locking 2000; Mueller, Ouimet, and Simintzi 2017a). Indeed, many studies show how pay gaps among corporate executives improve productivity (Main, O'Reilly III, and Wade 1993; Kale, Reis, and Venkateswaran 2009; Kini and Williams 2012; Burns, Minnick, and Starks 2017; Haß, Müller, and Vergauwe 2015; Coles, Li, and Wang 2017; Mueller, Ouimet, and Simintzi 2017b). The alternative hypothesis is that pay inequality has a negative impact on EPA enforcement. This could be the result of uncooperative behavior (Lazear 1989), a sense of relative deprivation (Crosby 1976; Sweeney, McFarlin, and Inderrieden 1990), or perceptions of inequity and discomfort (Adams 1963; Adams 1965). Some studies have shown that underpayment to executives compared to the CEO leads to greater turnover (Wade, O'Reilly III, and Pollock 2006; Bloom and Michel 2002; Messersmith, Guthrie, Ji, and Lee 2011), and others report a negative relationship between pay inequality and job satisfaction among lower-paid employees (Cowherd and Levine 1992; Levine 1993; Clark and Oswald 1996; Trevor and Wazeter 2006; Card, Mas, Moretti, and Saez 2012; Breza, Kaur, and Shamdasani 2016).

Following the same logic, the relation between inequality and pollution can go in either direction. Companies who consider their pollution levels must balance the expected benefits from pollution against the expected costs for violating environmental regulations. The latter includes the risk of being caught and having to defend themselves in an enforcement action, and the risk of the subsequent penalties. If pay inequality increases the probability of enforcement and the expected penalties imposed (incentive effect), then the enforcement risk is higher and we expect to see a decline in environmentally-harmful activities. If, on the other hand, pay inequality decreases the probability of enforcement (morale effect), then companies face a lower enforcement risk and we should see an increase in pollution activities.

2.2 Data Sources

The key variable in our analysis is pay inequality, which requires granular compensation data on the EPA's workforce. To that end, we assemble a comprehensive data set on any employee who worked at the EPA at any point between 1996 and 2016. We obtained the data through multiple Freedom of Information Act requests submitted to various federal entities. The data set includes each employee's full name, occupation, and date of accession. It also provides annual information on location (state, county, city), salary, pay plan and pay grade, tenure, and bonus. Since the paper explores enforcement risk, we focus on attorneys at the EPA's regional offices who spearhead the agency's enforcement activities. To the best of our knowledge, the data set is free of selection bias and includes the universe of EPA attorneys from that period.

For enforcement, we download data from the Integrated Compliance Information System for Federal Enforcement & Compliance (ICIS-FE&C). This portal tracks enforcement actions taken by the EPA with regards to a broad range of federal statutes. It includes civil judicial cases (formal lawsuits filed in court) and civil administrative cases (adjudicated internally by administrative judges). Each entry reports the EPA region in charge of the case; the case's timeline; facilities involved (name, location, and industry classification); law sections which were allegedly violated; and monetary outcomes.

To measure pollution activities, we use data from the EPA's Toxic Release Inventory (TRI) program. The program was launched in 1986 to track toxic chemicals that may pose a threat to human health and the environment. Any U.S. facility that meets certain criteria[5] must report annually how much of each chemical is released to the environment. TRI data are self-reported, but the EPA conducts audits to investigate anomalies and

[5]The facility is in one of 409 covered NAICS industries; has 10 or more full-time employees; and uses one of 770 chemicals in the specified amounts. The list of chemicals and industries is often updated.

misreporting can lead to criminal or civil penalties. Facilities report their pollution activities using two forms, A and R, and occasionally file multiple forms with seemingly different information. These practices might lead to misinterpretation of the TRI raw numbers, and we therefore contacted the EPA and followed their suggestions regarding the data cleaning procedure. Most importantly, we drop Form A entries (which do not include chemical quantities), and aggregate all data entries from Form R by facility-chemical-year.[6] TRI facilities report their precise location, including coordinates, and we can thus assign facilities to their respective EPA regional office. Our main dependent variable is total releases at the chemical-facility-year level: pounds of the particular chemical released by the facility in a given year.[7] We limit the analysis to the years 1996-2016, to match the availability of EPA workforce information. We supplement the TRI records with the EPA's Pollution Prevention (P2) data set to measure abatement and production. The former includes actions taken by the facility in a given year to reduce toxic chemical emissions. The latter includes a production ratio, which reflects changes in the production that a chemical is primarily used for. For example, if the facility is producing cars, the index would report the change in the number of cars produced by this chemical in this year versus the prior year.

3 Empirical Strategy and Descriptive Statistics

3.1 Measuring inequality

The empirical analysis consists of two parts. First, we test whether pay inequality among EPA attorneys affects EPA enforcement. Second, we explore whether pay inequality affects pollution activities by corporations. Both parts revolve around the main explanatory variable, $inequality_{i,t}$: the pay inequality among EPA attorneys who work in office i at time t.

[6] Double reporting on Form R is prevalent if the facility consists of several economic units ("multi-establishments"), or when the chemical is unidentified. Any unidentified chemical is labeled "mixtures." For robustness, we drop "mixtures" from the analysis and the results remain unchanged.

[7] Total releases includes off-site and on-site releases, and the latter is further separated into ground, air, and water releases. For the purpose of this paper these distinctions are not essential.

First, a brief note on the institutional setting is in order. As explained above, we focus on the EPA's attorneys who work in regional offices. The agency has ten regional offices, numbered from 1 to 10 (see Figure 1). Each region is responsible for several adjacent states and territories and operates from the regional headquarter. For example, the regional headquarter for Region 1 is in Boston (Massachusetts) and it serves Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Within a regional office, attorneys are organized in a hierarchical system which consists of seven grades or ranks (see Figure 2): non-managers are from GS-10 through GS-15 (6 ranks total), and senior management are in ES-00 (1 rank total).[8]

Based on this information, we construct $inequality_{i,t}$ in two steps. First, we conceptualize attorney-level inequality as the ratio between the attorney's current salary (denominator) and a benchmark salary (numerator). A natural way to define inequality is relative to the attorney's superiors: the top salary available in the next grade within the same office. For example, a GS-10 attorney in Seattle would benchmark her salary to the top salary among GS-11 Seattle attorneys, her immediate superiors. This notion is in line with measures of pay gaps used otherwise in the literature, such as Coles, Li, and Wang 2017 who look at pay gap between CEOs and Kalmenovitz 2020 who studies pay gaps among SEC attorneys.[9] Finally, we define office-level inequality as the median or mean attorney-level inequality. Note that some regional attorneys (less than 4%) work outside of their regional headquarters. For the main part of the analysis we treat them as if they work in their regional HQ, but the results do not change if we exclude them from the analysis.

The salary of an EPA attorney consists of three main components. The base pay is determined by the attorney's rank (pay grade), capped from above and identical for all EPA employees. The adjusted pay multiplies the base pay by a fixed percentage, "locality rate," which is determined by the attorney's duty location. Locality rates slowly increase

[8]Several managers hold a SL-00 designation, which is equivalent to ES-00. We treat 15 attorneys from GS-9 and below as if they are in GS-10, but excluding them from the sample does not change the main result.

[9]EPA attorneys rarely move across offices and can only be promoted one grade ahead, and we therefore consider the next grade within the same office as the attorney's superiors.

over time, and as of 2016 ranged from 14% (Kansas City) to 35% (San Francisco). Cash bonus is a merit-based award, distributed annually at the discretion of the attorney's supervisors to reflect high performance. The bonus program was suspended in 2010, as part of government-wide effort to curtail expenses. We compute attorney-level inequality with the base pay or with the adjusted pay, excluding cash bonus, and the main results are similar.

3.2 Enforcement and inequality

The first question in the paper is whether inequality affects EPA enforcement. We test this in the following regression:

$$y_{i,t} = \alpha + \beta \cdot inequality_{i,t} + \overrightarrow{X}_{i,t} + \lambda_i + \lambda_t + \epsilon_i, \quad (1)$$

where $y_{i,t}$ represents enforcement activity by office i at time t, and $inequality_{i,t}$ represents pay inequality among the attorneys in the office. For the dependent variable, we use the number of enforcement actions as a proxy for the intensity of enforcement activities. As in Shive and Forster 2020, t is the year in which the case was filed by the EPA. This is an intuitive way to compare litigation portfolios across offices, but it does not factor in potential heterogeneity across enforcement actions. Clearly, not all enforcement actions are born equal. Some involve more complex legal issues, higher legal stakes and potentially larger penalties. Empirically, no consensus has been reached on how to weight enforcement actions based on their difficulty or quality. In Section 4.1 we introduce several measures that appear to capture at least some notion of complexity and importance, based on a deeper analysis of the EPA's enforcement activities.

Time fixed effects (λ_t) account for agency-wide initiatives and other macroeconomic conditions which shape the EPA's enforcement agenda. With the inclusion of office fixed effects (λ_i), we study how offices deviate from their average caseload as a function of internal pay inequality among their attorneys. In $\overrightarrow{X}_{i,t}$ we control for other office-specific factors. First, we add workforce characteristics that are likely to affect enforcement:

number of attorneys, average tenure and salary, rate of turnover, rate of recent promotions (since newly promoted attorneys might wish to demonstrate their abilities and thereby file more enforcement actions), and past enforcement levels. We also control for county-level economic conditions (population, income, and employment), which may drive environmental violations and perhaps also correlate with the EPA's pay structure. Robust standard errors are clustered at the office level.

In addition, we examine the cross-section of cases. Specifically, we estimate the following regression at the case level:

$$y_{i,c,t} = \alpha + \beta \cdot inequality_{i,t} + \overrightarrow{X}_{i,t} + \overrightarrow{X}_{i,c,t} + \lambda_t + \epsilon_c \tag{2}$$

Where $y_{i,c,t}$ represents the enforcement outcome for case c filed by office i at time t, and $inequality_{i,t}$ is the pay inequality among the attorneys in this office. We use the natural log of the total monetary consequences of the case, including penalties, compliance costs, and other costs sought in the complaint.[10] Alternatively, we use only state and federal penalties. The advantage of this specification is that we can include $\overrightarrow{X}_{i,c,t}$, a vector of case controls such as the number of defendants and the type of violations. Here, we estimate the correlation between case outcomes and the pay inequality among the attorneys who prosecuted the case, conditional on other observables. Standard errors are clustered at the office level.

3.3 Pollution and inequality

The second question in the paper is whether plants with greater exposure to EPA pay inequality internalize the heightened enforcement risk and reduce their pollution levels. To identify the consequences of enforcement risk we exploit the EPA's organizational structure, where each of the ten regional offices has jurisdiction over neighboring states.

[10]There are three categories of monetary awards: (1) penalties are the sum of federal and state penalties; (2) Supplemental Environmental Project (SEP) and compliance costs are the estimated costs of projects which the defendants are required to undertake, such as installing new devices in order to reduce air pollution; and (3) cost recovery amounts which are incurred by the EPA in order to clean up the site and then billed to the defendants.

Therefore, the company's exposure to EPA inequality - and to the resulting enforcement risk - is determined by jurisdictional lines, and not by local economic conditions. For example, a plant in Louisville, Kentucky is exposed to pay inequality among EPA attorneys who work 400 miles away in the Atlanta regional office. Specifically, we estimate the following regression:

$$y_{c,p,t} = \alpha + \beta \cdot inequality_{p,t} + \overrightarrow{X}_{p,t} + \lambda_{c \times t} + \lambda_p + \epsilon_p, \tag{3}$$

where $y_{c,p,t}$ represents emission of chemical c by plant p at time t. We define emission as the natural log of one plus the pounds of chemical releases. This log transformation includes facility-chemical observations with zero releases. The results remain unchanged when we drop observations with zero value and use the natural log of releases. The main explanatory variable is $inequality_{p,t}$, representing the exposure of the plant to EPA pay inequality. We calculate office-level inequality for each EPA regional office, as explained in Section 3.1, and assign those inequality measures to plants based on the jurisdiction. For example, plants located in Washington are exposed to the pay inequality of the EPA's Seattle office. We add EPA office controls ($\overrightarrow{X}_{p,t}$) which include the number of EPA attorneys, average salary, and median tenure. In some specifications we add a vector of county-level controls that includes population, GDP growth, average income, and employment growth. Plant fixed effects (λ_p) control for time-invariant heterogeneity at the plant level. We include chemical-year fixed effects ($\lambda_{c \times t}$) to control for time-varying heterogeneity at the chemical-year level. As noted by Akey and Appel 2021, there is no clear way to aggregate pollutants or compare their environmental impact; chemical-year fixed effects allow us to exploit within-chemical-time variation. In more restrictive specifications we add chemical-industry-year fixed effects, where industry is defined using the primary four-digit NAICS code of the plant, to control for time-varying chemical-specific heterogeneity at the industry level. We cluster standard errors at the plant level.

3.4 Summary statistics

Table 1 reports descriptive statistics of the main variables. Figure 1 and Figure 2 provide additional illustration of key characteristics.

The EPA workforce sample consists of 1,166 attorneys and 13,943 attorney-year observations. The average attorney has 16 years of experience at the EPA and earns \$110,963 annually. Her benchmark salary is \$145,482 (\$137,669), relative to the top (median) salary in the next grade, and therefore her pay inequality is 33.5% (25.7%). The unconditional probability of leaving the EPA is 3.5%, of being promoted is 9%, and of moving to a different office is 8.8%. At the office level, there are 10 regional offices and 210 office-year observations. The largest offices are in Chicago, New York, Philadelphia and Atlanta. The average office employs 66 attorneys with a total payroll of \$7.37 million, and the remaining statistics (the average within the office) are quite similar to their attorney-level counterparts.

The enforcement sample includes 70,816 enforcement actions filed by 10 regional offices over 21 calendar years, from 1996 till 2016. On average, the EPA filed 3,372 actions per calendar year and the majority of them (94.7%) were administrative. The average case involves 1.5 defendants, 1.5 pollutants (chemicals), and 1.3 specific violations of a single statute. 15% of the cases are considered a priority and 23% of the cases have a reported monetary settlement. Conditional on having a monetary outcome, the average outcome involved \$750,000. The Dallas office leads the pack with 15,477 enforcement actions overall, and the Chicago office has the highest amount of monetary outcomes (\$33.656 billion in total).

The pollution data set includes 43,485 unique facilities and 439,862 facility-year observations. They are distributed across all 50 states and over 2,799 counties, the most populous of which are Los Angeles, California (925 facilities), Cook, Illinois (801), and Harris, Texas (669). The median facility handles 2 different chemicals and emits 2,340 pounds of covered chemicals in a given year. At the chemical-facility-year level, the median release is 500 pounds. The distribution of chemical releases is heavily skewed, and the average facility releases 122,000 pounds (30,910 at the chemical-facility level). One in five (17%) facilities reports at least one abatement activity to reduce pollution, and, conditional on non-zero, engages in 3.7 abatement activities.

4 Results

4.1 Enforcement and inequality

We begin by examining the relationship between pay inequality and enforcement intensity. To obtain a visual impression, panel A in Figure 3 plots office-level inequality against the number of enforcement actions filed by the office. The positive relationship between the two is consistent with the incentive hypothesis: higher pay inequality implies a higher value of promotion, which should lead to greater effort and hence to a higher number of enforcement actions.

We confirm this visual impression using regression analysis. First, we study the cross-section of regional offices (Equation 1) and report the results in Table 2. In column (1) we find a positive and statistically significant relationship between inequality and the number of enforcement actions. Since all variables are divided by their standard deviation, it implies that a one-standard-deviation increase in office inequality is associated with 0.133 standard-deviations increase in the number of enforcement actions. In columns (2)-(8) we replace the outcome variable with various characteristics that reflect the complexity and significance of the cases. First, we use the number of chemicals identified in the complaint as a proxy for the environmental impact of the case (column 2). Next, we use the number of defendants as a proxy for factual complexity, assuming that multi-defendant cases require greater amount of effort (column 3). In addition, we consider the legal complexity of the cases by counting the number of cited violations and the number of separate statutes and law sections that the defendants allegedly violated (columns 4-6). Finally, we proxy for the overall impact of the case using the dollar amount of the relief that the EPA requested: total award (column 7) and specifically the penalties (column 8). Regardless of the measure, we find that offices with higher pay inequality file more important cases, at least in terms of factual and legal complexity and their perceived environmental impact.

Next, we study the cross-section of cases (Equation 2) and report the results in Table 3. In this specification we can control explicitly for the case characteristics, including the underlying violations, the number of defendants, and its priority designation. Here, we use two measures of enforcement outcome: total cost of enforcement and federal penalties (see Section 3.2). We restrict our analysis to concluded cases where the outcome of the enforcement action is known. In our tightest specification we compare cases that allege violations of the same statute and section, have a similar priority designation and the same number of defendants, but were filed by different EPA offices. Across all specifications, we observe a positive and statistically significant relationship between inequality and case outcomes. This further confirms the impression that pay inequality incentivizes EPA attorneys to exert more effort, and in particular to pursue harsher settlement terms for seemingly identical cases. The effect of inequality is economically meaningful. Using the point estimates from column (6), a one-standard-deviation increase in EPA inequality leads to an increase of 31.1 log points in case outcome, which is a 4.1% compared to the mean.

In sum, the results in this section support the incentive hypothesis. Offices with higher inequality bring more enforcement cases, and those cases tend to be of greater importance and have higher monetary value. We must caution, though, that proper identification of inequality effects is difficult. Salaries are not randomly assigned across attorneys and ranks, and hence pay inequality could be correlated with other characteristics which in turn affect EPA enforcement. To provide some context, Kalmenovitz 2020 exploits a quasi-natural experiment where the Securities and Exchange Commission transferred its employees to a new pay system. This event served as a plausibly exogenous shock to the agency's pay structure, which led to a substantial increase in attorney-level enforcement activity. We are not aware of a similar event at the EPA, and instead rely on ordinary least squares regressions with a set of fixed effects and controls. However, based on the extensive discussion in Kalmenovitz 2020, we believe that the OLS results are a lower bound to the unbiased effect of pay inequality. Put differently, any omitted variable that is positively correlated with pay inequality (such as lack of experience), likely has a negative impact on enforcement activity.

4.2 Pollution and inequality

Next, we turn to the relation between EPA inequality and pollution activities. Panel B in Figure 3 gives a visual impression of the relationship. We plot total pollution by chemical-facility against the pay inequality in the EPA office which has jurisdiction over the facility. We divide the release by the standard deviation of the particular chemical, since raw quantities are not comparable across chemicals (Akey and Appel 2021). The significant negative relationship between the two is consistent with a response to enforcement risk: pay inequality increases enforcement risk, and facilities which are exposed to such a high risk reduce their pollution activities.

We examine the relationship in a formal regression (Equation 3) and the results are reported in Table 4. The dependent variable is the natural log of one plus pounds of releases at the plant-chemical level. All specification include facility fixed effects and control for office characteristics, in addition to pay inequality. In the baseline specification (column 2) we add chemical-year fixed effects. In a relatively parsimonious specification we replace chemical-year with year fixed effects (column 1). In a more restrictive specification we supplement chemical-year with industry-year fixed effects (column 3). In the most restrictive form, we replace chemical-year and industry-year with industry-chemical-year fixed effects (columns 4), to force a comparison between the same chemical released at the same time during the same production process. The results indicate that greater inequality among EPA attorneys is associated with a significant decrease in chemical releases by plants in that jurisdiction. The point estimates range from -0.46 to -0.35 and are statistically significant at the 1% level. The effect is economically large: since the average value of the dependent variable is 5.8, it indicates that one unit increase in pay inequality is associated with 9% decrease in chemical releases relative to the sample mean. To put things in perspective, the Online Appendix report regression results where the explanatory variables are divided by their standard deviation. We find that the impact of pay inequality on pollution is more than double the effect of office size and work experience on the outcome.

In the Online Appendix we conduct several robustness checks. First, we winsorize all variables at the 1%, 5%, and 10% levels. The coefficients remain statistically significant and virtually similar, ensuring that the results are not driven by outliers. We cluster standard errors at the plant, chemical, jurisdiction, facility, and industry, to account for the possibility that the error term is serially correlated. The standard deviations increase but all the results remain significant at the 1% level, except for industry where they are significant at 5% level. We estimate Equation 3 in contemporaneous and lagged values. The coefficients are smaller but significant at the 1%. We compute inequality using the adjusted pay, which includes the base pay plus the locality rate, and the results remain unchanged. We verify that the findings are not driven by any individual region, by iteratively removing one region and rerunning our main analysis. The estimate for each iteration remains positive and statistically significant at the 1% level. In a separate test we randomize office-level statistics, including the main variable *Inequality*, across observations and all coefficients turn statistically insignificant. This suggests that the results are driven by office-specific shocks and not by contemporaneous shocks unrelated to pay inequality.

While TRI-covered chemicals are by definition hazardous, some chemicals may be particularly harmful to humans. In Table 5 we examine whether facilities cut back specifically on chemicals that are known to have adverse consequences to the human body. We rely on the TRI-Chemical Hazard information Profiles database to identify chemicals that are harmful to humans. The database reports whether a TRI covered chemical is known to have adverse effects on 17 different human biological systems. Out of 657 covered chemicals, 498 chemicals are known to affect the human body. In our sample, approximately 88% of the chemical-plant observations are known to have adverse consequences to the human body.[11] In panel A, we split the sample into chemicals that are non-classified

[11] Another way of identifying harmful chemicals is using the EPA's Integrated Risk Information System (IRIS). However, this methodology would misclassify a large fraction of TRI covered chemicals,

(columns (1) -(2)) and those that are known to have harmful effects on humans (columns (3)-(4)). We find that the effect of inequality on the release of toxic chemicals is driven by reductions in chemicals that are harmful to humans. In Panel B we further break the sample based on which biological system the chemical affects. We report results for six biological systems that constitute at least 20% of chemical-plant observations in our sample. Overall, we find that the reduction is persistent across different biological systems, suggesting that an increase in EPA inequality has a substantial effect on reducing a variety of harmful chemicals.

In conclusion, we find that plants respond to changes in the EPA's workforce by reducing the amount of chemical releases. This result is consistent with the previous findings: EPA inequality stimulates enforcement activity. Hence, from the plants' perspective, high inequality implies a greater enforcement risk. Weighing the benefits of pollution against the risk of being subject to EPA enforcement, plants tend to reduce their pollution activities, especially with regards to harmful chemicals.

4.3 How do plants reduce pollution?

In the previous sections we have shown that EPA inequality increases enforcement, and that plants seem to respond to the enforcement risk by reducing toxic chemical releases. There are two non-mutually exclusive channels in which plants can achieve this reduction: decrease production, and increase abatement investment. We explore these two channels in Table 6 and Table 7.

We begin by examining whether inequality is associated the likelihood of plants using toxic chemicals. In panel A (B), the dependent variable is an indicator that takes the value of 1 if the facility has ceased (started) to use this chemical in year t. The results indicate that an increase in inequality is associated with a higher probability of retiring toxic chemicals from the manufacturing process. Using the point estimate in column (4), if inequality surges from the 1^{st} to the 99^{th} percentile, then the likelihood of stopping a certain chemical increases by 0.7 percentage points, which is a 6.1% increase relative to

particularly those with CAS number that starts with N.

the unconditional probability. At the same time, we find no evidence that inequality is associated with increased likelihood of a new chemical being used.

Next, we study potential changes in the production process using information from the EPA's Pollution Prevention (P2) data set. The productivity ratio index compares the current year's output relative to previous years' output for a particular chemical. For example, index value of 1 implies that the facility is producing the same amount of goods from this particular chemical relative to the previous year. Columns (1)-(4) report the findings of this analysis. Across all specifications, the point estimate of inequality is negative and statistically significant, which means that facilities decrease production which is based on toxic chemicals. The economic magnitude is quite large: using the point estimate from column (4), if inequality surges from the 1^{st} to the 99^{th} percentile, production ratio would decrease by 0.012 points or 1.2% relative to the mean. Next, we investigate whether plant's abatement policies vary with inequality. Under the Pollution Prevention Act of 1990, reporting plants must annually report their pollution prevention efforts. We count the number of abatement activities reported for each chemical and use the log of one plus the number of abatement actions to measure abatement efforts. The results are reported in columns (5)-(8). Across all specifications, we observe a positive coefficient for inequality. Three out of four specifications are statistically significant. Using the coefficient of inequality in columns (8), if inequality surges from the 1^{st} to the 99^{th} percentile, the dependent variable would increase by 27 basis points or 2.7% relative to the mean.

In conclusion, the findings suggest that plants respond to heightened environmental enforcement risk stemming from government inequality by cutting production and increasing abatement efforts.

5 Conclusion

In August 2015, the Securities and Exchange Commission adopted one of its most controversial rules, requiring companies to disclose the pay ratio between the CEO and the median employee. The rule was proposed as early as 2013, but immediately sparked a heated debate, and in the months leading to its final adoption the agency received nearly 300,000 comment letters.

This anecdote is only one recent example of how pay inequality is a continuing source of fascination and speculation. We investigate this topic in the context of environmental risk, and ask whether pay inequality among federal regulators could affect the pollution behavior of regulated companies. We assemble a novel data set on all enforcement attorneys at the Environmental Protection Agency and present two main findings. First, pay inequality between EPA attorneys leads to a significant increase in the EPA's enforcement activity. Offices with high inequality file more cases against more defendants, focus on more severe violations of environmental regulations, and request and obtain larger monetary penalties. Second, we find that pay inequality is associated with a significant decrease in chemical releases by regulated plants. For identification we exploit the EPA's organizational structure, where the company's exposure to EPA inequality is determined by fixed jurisdictional lines. Taken together, the results illustrate a clear pattern. From the perspective of EPA attorneys, inequality creates an incentive to increase enforcement activity and seek higher penalties. From the perspective of regulated companies, that same inequality creates an enforcement risk and raises the expected costs of pollution (enforcement probability and enforcement penalties). As a result, companies reduce their pollution levels. Put differently, regulated companies seem to internalize the enforcement risk created by the regulator's pay inequality.

Our work adds to the extant literature on pay inequality. Studies are predominantly focused on private sector employees and lower-paid workers (Clark and Oswald 1996; Trevor and Wazeter 2006; Card, Mas, Moretti, and Saez 2012; Breza, Kaur, and Shamdasani 2016). We make two contributions to this literature. First, we examine pay inequality in the public sector, a setting where there is little evidence that compensation incentives matter beyond the employee's intrinsic motivation. Second, we trace the impact of pay inequality outside of the workplace, and find that internal gaps among regulators spill over to the economy and affect the choices made by regulated companies. We also add to the emerging literature on environmental risk. Prior studies found that environmental choices are affected by financial constraints (Bartram, Hou, and Kim 2019), ownership structure (Shive and Forster 2020), activist investors (Akey and Appel 2019; Chu and Zhao 2019; Naaraayanan, Sachdeva, and Sharma 2020), and rules of limited liability (Akey and Appel 2021). We highlight a novel factor: the role of the EPA's enforcement program and the chilling effect it could have on regulated companies. In particular, we demonstrate how the incentives of individual attorneys who enforce the environmental regulations can affect the enforcement risk borne by companies.

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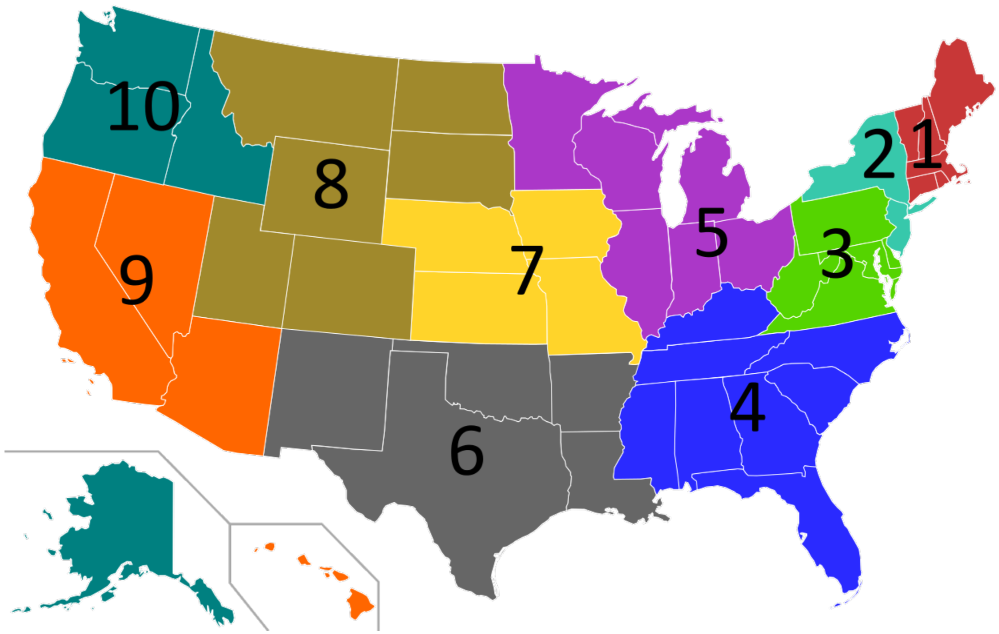
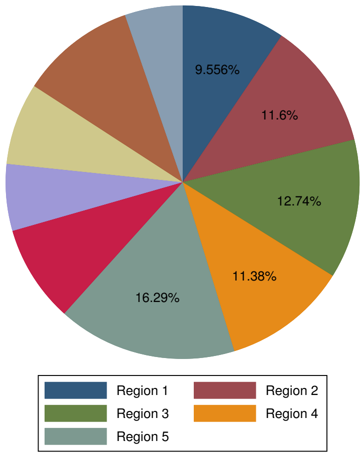
Figure 1: **Geographic distribution of the Environmental Protection Agency**

Regional jurisdiction



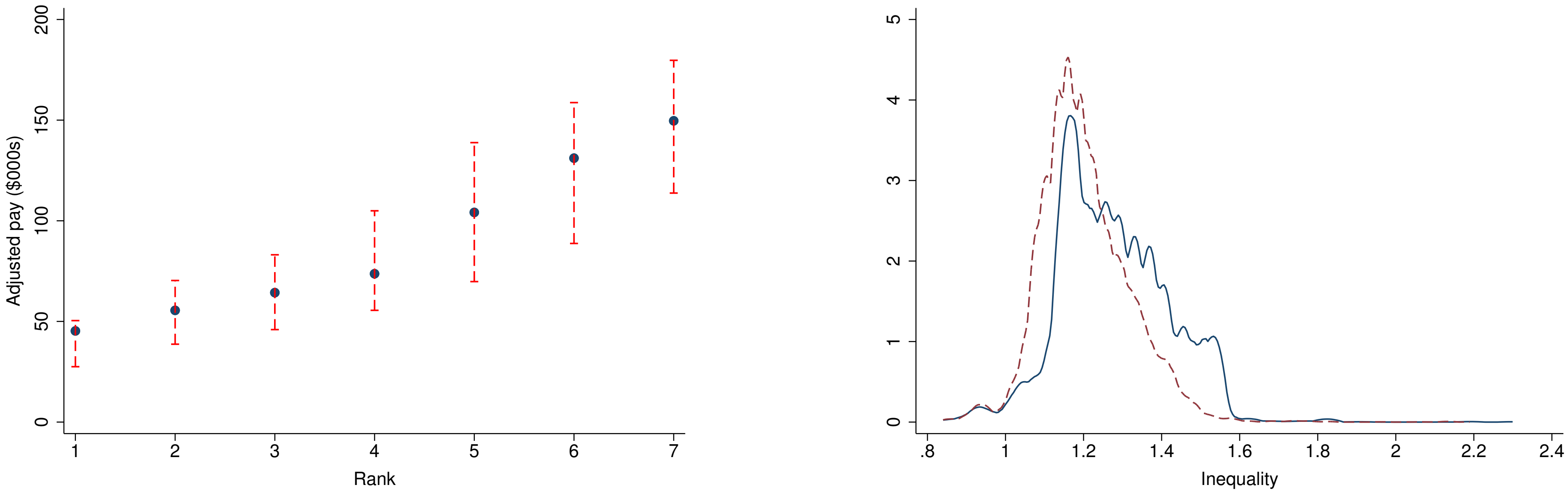
Number of attorneys



Geographic distribution of the EPA's ten regional offices. Region 1 is headquartered in Boston (serving CT, ME, MA, NH, RI, and VT). Region 2 is headquartered in New York City (serving NJ, NY, and Puerto Rico). Region 3 is headquartered in Philadelphia (serving DE, DC, MD, PA, VA, ad WV). Region 4 is headquartered in Atlanta (serving AL, FL, GA, KY, MS, NC, SC, and TN). Region 5 is headquartered in Chicago (serving IL, IN, MI, MN, OH, and WI). Region 6 is headquartered in Dallas (serving AR, LA, NM, OK, and TX). Region 7 is headquartered in Kansas City (serving IA, KS, MO, and NE). Region 8 is headquartered in Denver (serving CO, MT, ND, SD, UT, and WY). Region 9 is headquartered in San Francisco (serving AZ, CA, HI, and NV). Region 10 is headquartered in Seattle (serving AK, ID, OR, and WA)

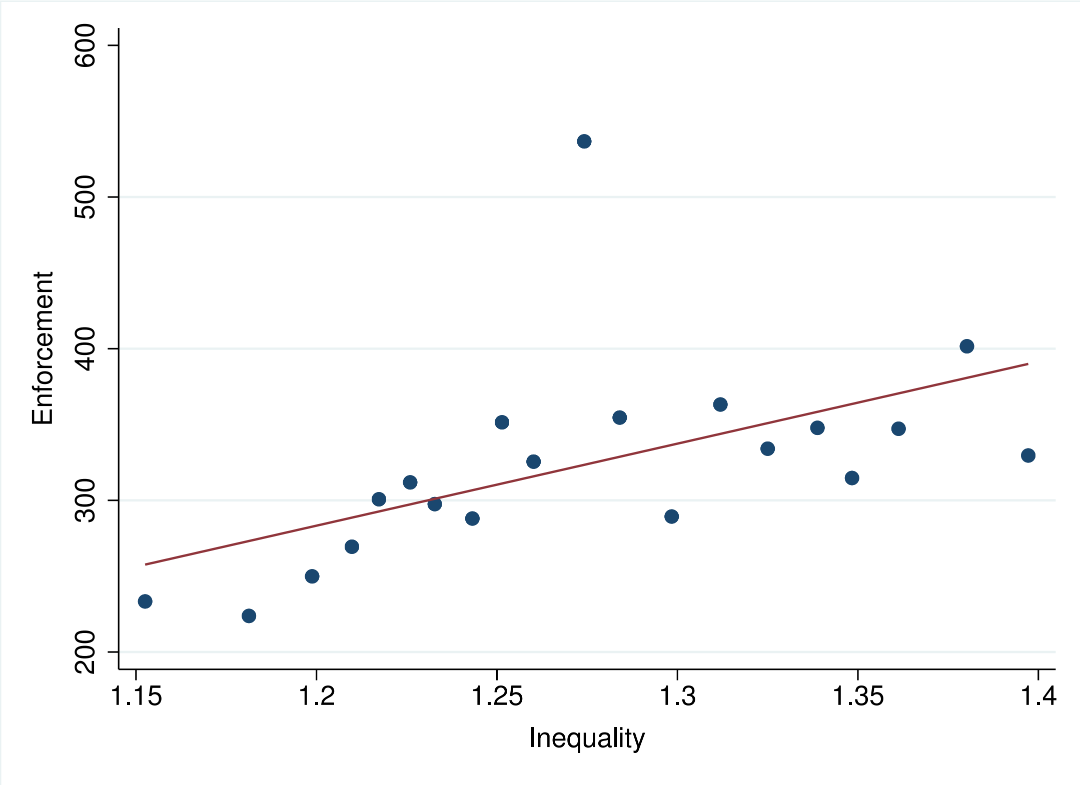
Figure 2: **Compensation structure at the EPA**

(a) Salary by rank **(b) Distribution of pay inequality**



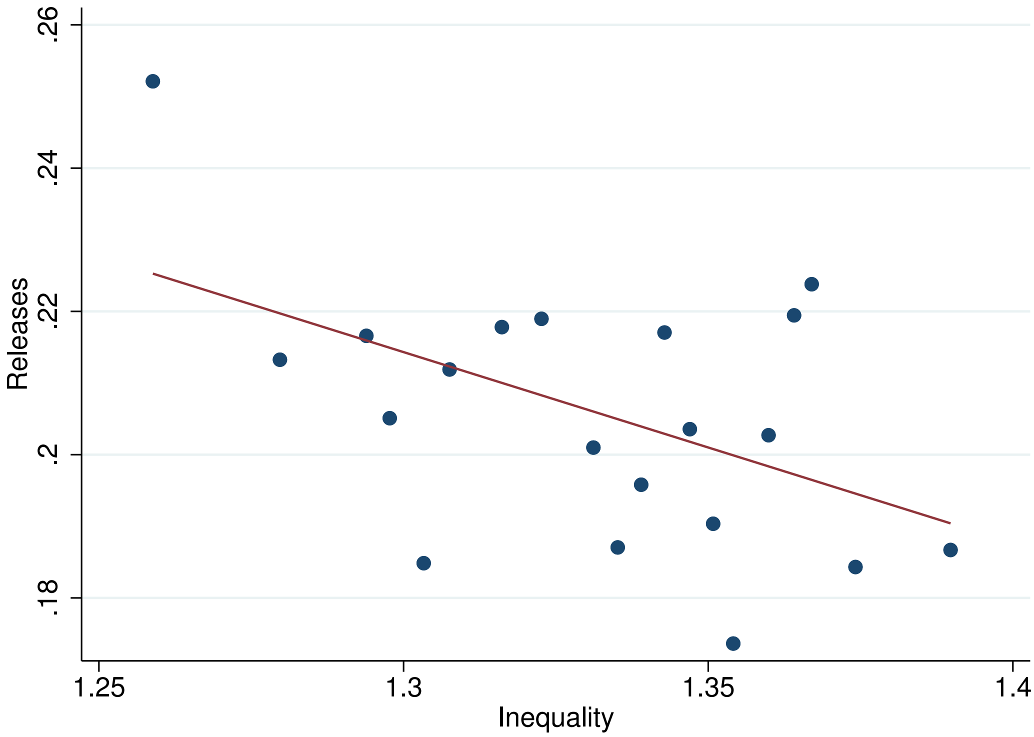
The figure describes the compensation structure at the EPA. In panel A, we report salaries by rank (mean and 95% confidence intervals) in US$(2017). The lowest rank is GS-10, and the highest is ES-00. In panel B, we report the distribution of pay inequality in a pooled sample of attorneys. Inequality is defined as the ratio between the attorney's salary and the top (median) salary in the next rank within the same office.

Figure 3: **Inequality and Enforcement**



The figure plots the non-parametric relation between pay inequality and enforcement. *Enforcement* is the number of enforcement actions filed by the office in a given year, and *inequality* is the average attorney-level inequality (relative to the top salary in the next rank).

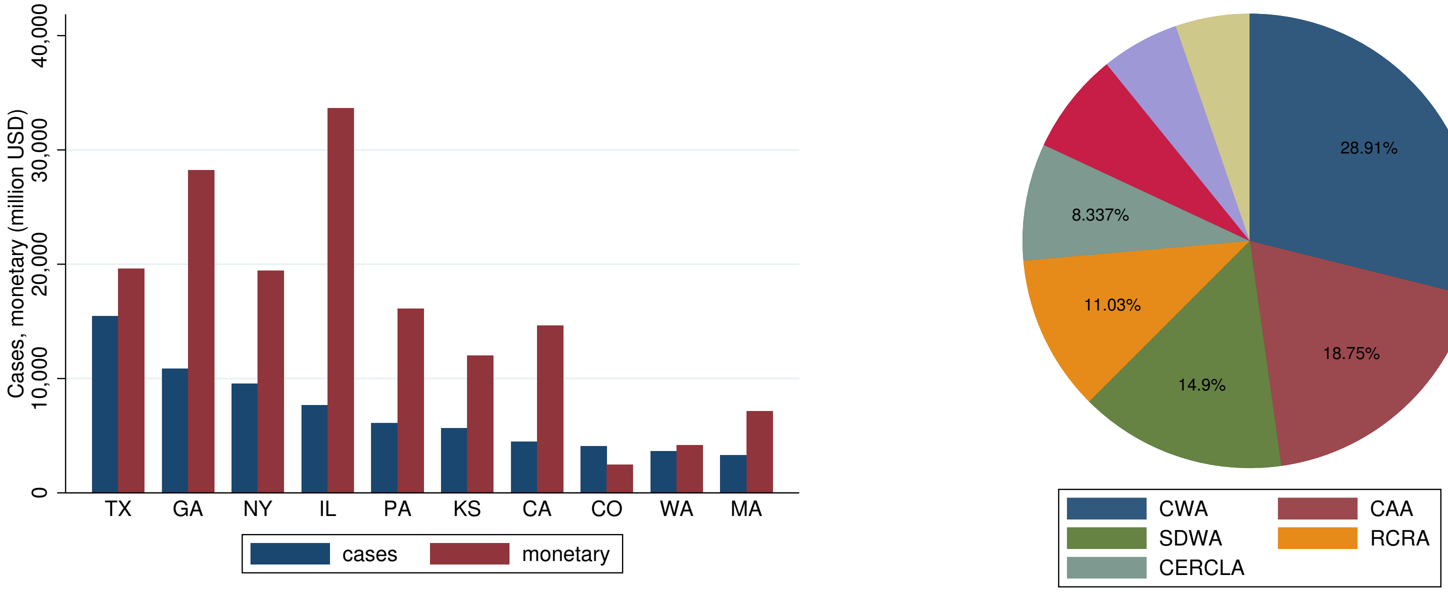
Figure 4: **Inequality and Pollution**



The figure plots the non-parametric relation between pay inequality and pollution levels. *Releases* is the pounds of release by facility-chemical-year, divided by the chemical's standard deviation. *Inequality* is the average attorney-level inequality (relative to the top salary in the next rank) in the EPA office which has jurisdiction over the facility.

Figure 5: **Distribution of EPA enforcement**

(a) By regional office **(b) By statute**



Distribution of EPA enforcement cases, 1996-2016. In panel A, we calculate the number of cases filed by each regional office and the dollar value of monetary awards. Chicago (IL) and Dallas (TX) lead the chart in terms of cases and dollar value, respectively. In panel B, we report the share of cases by statutes. The most common are the Clean Water Act (CWA), Clean Air Act (CAA), Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Table 1: **Summary statistics**

The table reports summary statistics. For variable definitions, see Appendix A.

	Mean	Median	SD	Min	Max	Obs
Attorneys:						
Salary	110,963	111,132	18,746	44,354	198,042	13,943
Tenure	16.2	16.0	8.5	1.0	45.0	13,943
Benchmark (Max)	145,482	140,623	23,104	53,663	198,042	13,245
Inequality (Max)	33.5	32.1	12.1	-9.0	181.7	13,245
Benchmark (Median)	137,669	129,624	26,879	53,663	198,042	13,245
Inequality (Median)	25.7	22.9	12.4	-13.7	113.3	13,245
$\mathbb{1}$*(Promotion)*	9.0	0.0	28.7	0.0	100.0	13,943
$\mathbb{1}$*(Moved)*	8.8	0.0	28.3	0.0	100.0	13,943
$\mathbb{1}$*(Out)*	3.5	0.0	18.4	0.0	100.0	13,300
$\mathbb{1}$*(Bonus)*	72.7	100.0	44.6	0.0	100.0	9,265
Bonus	1,474	1,254	1,220	1	34,904	6,735
Regional Offices:						
Employees	66	64	21	28	111	210
Payroll	7,367	7,073	2,397	2,965	13,040	210
Tenure	16.4	16.0	4.6	8.0	27.0	210
Salary	109,714	112,250	6,921	88,973	121,380	210
Inequality (Median)	25.6	25.1	4.0	15.2	40.3	210
Inequality (Max)	33.4	33.5	3.9	21.6	49.9	210
$\mathbb{1}$*(Promotion)*	9.1	6.8	7.9	0.0	44.4	210
$\mathbb{1}$*(Moved)*	9.3	4.2	20.7	0.0	100.0	210
$\mathbb{1}$*(Out)*	3.6	3.3	2.9	0.0	20.0	200
$\mathbb{1}$*(Bonus)*	71.5	78.8	22.1	3.4	98.6	140
Bonus	1,205	1,204	622	12	3,126	140

	Mean	Median	SD	Min	Max	Obs
Enforcement cases:						
Defendants	1.5	1.0	8.1	1.0	642.0	70,816
$\mathbb{1}$*(ReliefPenalty)*	32.9	0.0	47.0	0.0	100.0	70,816
$\mathbb{1}$*(Priorities)*	15.1	0.0	35.8	0.0	100.0	70,816
Priorities	1.2	1.0	0.5	1.0	9.0	10,691
Statutes	1.0	1.0	0.2	1.0	7.0	70,816
Law Sections	1.2	1.0	0.6	1.0	25.0	70,816
Pollutants	1.5	1.0	1.6	1.0	71.0	26,659
Violations	1.3	1.0	0.8	1.0	37.0	52,735
$\mathbb{1}$*(Monetary)*	23.5	0.0	42.4	0.0	100.0	70,816
Total	748	5	15,937	0	1,027,200	16,675
SEP	279	45	1,054	0	25,000	2,465
Penalty	39	4	365	0	20,000	8,521
Recovery	988	146	3,959	0	71,000	772
Compliance	1,469	1	23,561	0	1,000,000	7,279
Facility-chemical:						
Total release	30.91	0.50	145.52	0.00	1552.35	1,577,544
On-site release	24.59	0.19	122.95	0.00	1326.18	1,577,544
On-site air	11.13	0.08	50.91	0.00	526.90	1,577,544
On-site water	0.53	0.00	4.59	0.00	55.80	1,577,544
On-site ground	6.28	0.00	46.89	0.00	550.20	1,577,544
Off-site release	3.07	0.00	18.22	0.00	198.50	1,577,544
$\mathbb{1}$*(Abatement)*	0.11	0.00	0.32	0.00	1.00	1,577,544
Abatement	1.57	1.00	0.90	1.00	12.00	179,344
Production Ratio	1.02	1.00	0.31	0.00	3.00	1,408,441

Table 2: **Pay inequality at the EPA and enforcement**

The table estimates the effect of pay inequality among EPA attorneys on enforcement. The dependent variable is the total number of cases (column 1), chemicals involved (2), defendants (3), cited violations (4), statutes (5), law sections (6), total monetary award (7), and federal and state penalties (8). *Inequality* is the average attorney-level inequality (relative to the highest salary in the next grade) within the office. Controls include the number of attorneys (*Attorneys*), median tenure (*Tenure*), median salary (*Salary*), and number of promotions (*Promotions*). All variables are divided by their standard deviation. Robust standard errors are in parentheses.

Outcome:				**Enforcement**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inequality	0.133***	0.276***	0.167***	0.145**	0.068***	0.034***	0.120*	0.110**
	(0.037)	(0.075)	(0.050)	(0.056)	(0.019)	(0.011)	(0.071)	(0.049)
Attorneys	-1.676*	-0.897	-0.294	-0.250	-0.819*	-0.434	0.626	-1.510
	(0.919)	(1.839)	(1.229)	(1.386)	(0.456)	(0.266)	(1.757)	(1.196)
Tenure	0.181**	0.799***	-0.018	0.613***	0.094**	0.047*	-0.105	-0.024
	(0.089)	(0.179)	(0.119)	(0.135)	(0.044)	(0.026)	(0.171)	(0.116)
Promotions	-0.000	0.015	0.002	0.009	-0.001	-0.002	0.045	0.012
	(0.038)	(0.077)	(0.051)	(0.058)	(0.019)	(0.011)	(0.073)	(0.050)
Salary	-0.152	-0.563**	-0.059	-0.255	-0.076	-0.039	-0.153	-0.550***
	(0.138)	(0.276)	(0.184)	(0.208)	(0.068)	(0.040)	(0.263)	(0.179)
Office FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.792	0.494	0.708	0.697	0.793	0.791	0.461	0.399
Obs.	210	210	210	210	210	210	210	210

Table 3: **EPA Inequality and the pursuance of settlement terms**

The table estimates the effect of pay inequality among EPA attorneys on enforcement outcomes at the case level. The dependent variable in columns (1)-(3) is the natural log of one plus the federal penalty, in dollars. The dependent variable in columns (4)-(6) is the natural log of one plus the sum of all monetary outcomes related to the enforcement action, in dollars (see Section 3.2). Office controls include (log of) median pay, median tenure, and number of attorneys. Case controls include the number of facilities involved in the case and an indicator that equals one if the case has a priority. Robust standard errors, clustered at the office level, are in parentheses.

Outcome:	*ln(1+Federal penalty)*			*ln(1+Total Cost)*		
	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	2.717**	2.088**	3.208**	5.217***	5.123***	4.378**
	(0.972)	(0.880)	(1.331)	(0.521)	(1.557)	(1.561)
Office controls	Yes	Yes	Yes	Yes	Yes	Yes
Case Controls	No	Yes	No	No	No	Yes
Office FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Statute-Section FE	Yes	Yes	No	No	Yes	Yes
R^2	0.475	0.479	0.032	0.080	0.278	0.296
Obs.	71555	64855	71592	71592	71555	64855

Table 4: **Pay inequality at the EPA and pollution activity**

The table estimates the effect of pay inequality among EPA attorneys on toxic chemical releases. The dependent variable is the natural log of one plus pounds of chemical releases. *Inequality* is the average attorney-level inequality within the EPA regional office that has jurisdiction over the plant. In columns 1-4 (columns 5-8), attorney level inequality is the ratio between the highest (median) salary in the next grade and the attorney's own salary. Office controls include log of the number of attorneys, median tenure, and median salary. County controls include log of population and income per capita. Robust standard errors are in parentheses.

Outcome:	$ln(1 + release)$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inequality	-0.250***	-0.364***	-0.351***	-0.258***	-0.274***	-0.441***	-0.408***	-0.292***
	(0.069)	(0.076)	(0.079)	(0.072)	(0.088)	(0.101)	(0.105)	(0.096)
Office controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chemical×Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
County controls	No	Yes	Yes	Yes	No	Yes	No	No
Industry×Year FE	No	No	Yes	No	No	No	Yes	No
Industry×Year×Chemical FE	No	No	No	Yes	No	No	No	Yes
R^2	0.649	0.650	0.652	0.754	0.649	0.650	0.652	0.754
Obs.	1502264	1347915	1347146	1256523	1502264	1347915	1347146	1256523

Table 5: **Heterogeneity in Health Effects**

The table estimates the heterogeneous effect of pay inequality among EPA attorneys on toxic chemical releases based on whether and how the chemical is harmful to humans. The dependent variable is the natural log of one plus the pounds of toxic chemical releases. *Inequality* is the average attorney-level inequality (relative to the highest salary in the next grade) within the EPA regional office that has jurisdiction over the plant. In panel A, columns 1-2 (3-4), we use the subsample of chemicals that are not known to be harmful to humans (known to be harmful), as classified by the EPA's TRI-Chemical Hazard Information Profiles database. Panel B breaks down harmful chemicals by which biological system the chemical affects. Office controls include (log of) the number of attorneys, median tenure, and median salary. County controls include (log of) population and income per capita. Robust standard errors are in parentheses.

Panel A: Harmful vs unclassified				
Outcome:	$ln(1 + release)$			
	Non-classified		**Harmful**	
	(1)	(2)	(3)	(4)
Inequality	-0.007	0.172	-0.397***	-0.387***
	(0.190)	(0.200)	(0.080)	(0.083)
Office controls	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes
Chemical×Year FE	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes
Industry×Year FE	No	Yes	No	Yes
R^2	0.770	0.773	0.653	0.656
Obs.	162623	161138	1182824	1181982

Panel B: Biological Systems						
Outcome:	$ln(1 + releases)$					
System Affected:	Developmental (1)	Hepatic (2)	Neurological (3)	Respiratory (4)	Hematological (5)	Renal (6)
Inequality	-0.433***	-0.411**	-0.294***	-0.280***	-0.182	-0.505***
	(0.145)	(0.176)	(0.105)	(0.108)	(0.132)	(0.138)
Office controls	Yes	Yes	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes	Yes	Yes
Chemical FE	Yes	Yes	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.708	0.762	0.744	0.694	0.760	0.772
Obs.	341805	165378	503597	585706	377168	285280

Table 6: **Pay inequality at the EPA and chemical usage**

The table estimates the effect of pay inequality among EPA attorneys on the likelihood of using toxic chemicals. In columns 1-4 (5-8), the dependent variable is an indicator that takes the value one if a firm stops (starts) using a toxic chemical in year t and zero otherwise. *Inequality* is the average attorney-level inequality (relative to the highest salary in the next grade) within the EPA regional office that has jurisdiction over the plant. Office controls include (log of) the number of attorneys, median tenure, and median salary. County controls include (log of) population and income per-capita. Robust standard errors are in parentheses.

Outcome:	$\mathbb{1}$*(Stop using)*				$\mathbb{1}$*(Start using)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inequality	0.019**	0.016*	0.020*	0.027***	0.006	0.020**	0.001	-0.000
	(0.009)	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)
Office controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chemical×Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
County controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Industry×Year FE	No	No	Yes	No	No	No	Yes	No
Industry×Year×Chemical FE	No	No	No	Yes	No	No	No	Yes
R^2	0.140	0.145	0.162	0.205	0.184	0.189	0.237	0.284
Obs.	1502264	1347915	1347145	1256517	1502264	1347915	1347145	1256517

Table 7: **Pay inequality at the EPA and the production process**

The table estimates the effect of pay inequality among EPA attorneys on the production and abatement activities. In columns 1-4 (5-8), the dependent variable is the production ratio (natural log of one plus the number of abatement activities). *Inequality* is the average attorney-level inequality (relative to the highest salary in the next grade) within the EPA regional office that has jurisdiction over the plant. Office controls include (log of) the number of attorneys, median tenure, and median salary. County controls include (log of) population and income per-capita. Robust standard errors are in parentheses.

Outcome:	*Productivity ratio index*				*ln(1+#Abatement)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inequality	-0.041***	-0.023**	-0.041***	-0.046***	0.014***	0.008	0.012**	0.010*
	(0.009)	(0.010)	(0.011)	(0.011)	(0.005)	(0.005)	(0.005)	(0.006)
Office controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chemical×Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
County controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Industry×Year FE	No	No	Yes	No	No	No	Yes	No
Industry×Year×Chemical FE	No	No	No	Yes	No	No	No	Yes
R^2	0.100	0.110	0.140	0.144	0.745	0.751	0.757	0.762
Obs.	1338652	1190552	1189820	1104860	1497572	1343309	1342545	1252196

Appendix A. Variable Definitions

Variable	Description
Attorneys:	
Salary	Base pay of the attorney
Tenure	Tenure (years working at the EPA)
Benchmark (max)	Max salary for attorneys in the next rank at the same office
Inequality (max)	The gap between *salary* and *Benchmark (max)*
Benchmark (median)	Median salary for attorneys in the next rank at the same office
Inequality (median)	The gap between *salary* and *Benchmark (median)*
$\mathbb{1}$*(Promotion)*	Was the attorney promoted (indicator)
$\mathbb{1}$*(Moved)*	Did the attorney relocate to a different EPA office (indicator)
$\mathbb{1}$*(Out)*	Did the attorney leave the EPA (indicator)
$\mathbb{1}$*(Bonus)*	Did the attorney receive a cash bonus (indicator)
Bonus	Bonus pay ($, conditional on $\mathbb{1}(Bonus) = 1$)
Regional offices:	
Employees	Number of attorneys
Payroll	Total payroll expenses (sum of all salaries)
Tenure	Median tenure of attorney
Salary	Median salary of attorney
Inequality (Max)	Average of attorney-level *Inequality (max)*
Inequality (median)	Average of attorney-level *Inequality (median)*
$\mathbb{1}$*(Promotion)*	Fraction of attorneys promoted
$\mathbb{1}$*(Moved)*	Fraction of attorneys moved to a different office
$\mathbb{1}$*(Out)*	Fraction of attorneys that left the EPA
$\mathbb{1}$*(Bonus)*	Fraction of attorneys that received bonus pay
Bonus	Average bonus pay
Enforcement:	
Defendants	Number of defendants
$\mathbb{1}$*(ReliefPenalty)*	Indicator of whether the complaint requested a penalty.
$\mathbb{1}$*(Priorities)*	Was the case designated a national or local priority (indicator)
Priorities	Number of priorities that the case received
Statutes	How many statutes were allegedly violated
Law Sections	How many law sections were allegedly violated
Pollutants	Number of chemicals involved in the underlying violation

Variable	Description
Violations	Number of violations
$\mathbb{1}$*(Monetary)*	Indicator of whether the case resulted in monetary penalty
Total	Total monetary costs associated with an enforcement (sum of the next four variables)
Penalty	Total penalty (State + federal penalty)
SEP	The cost of environmentally beneficial projects which the defendant agreed to undertake
Recovery	The total dollar amount of cost recovery awarded for the enforcement
Compliance	The dollar amount of the complying action activities
TRI variables:	
Total Release	Lbs of total releases (On-site releases + off-site release)
On-site release	Lbs of total on-site releases
On-site air	Lbs of total on-site air release (stock + fugitive emissions)
On-site water	Lbs of total on-site water release (stock + fugitive emissions)
On-site ground	Lbs of total on-site ground release (stock + fugitive emissions)
$\mathbb{1}$*(Abatement)*	Indicator for whether abatement effort is reported
#Abatement	Number of abatement activities reported
Productivity Ratio	Output in year t divided by output in year t-1