ARE CHIEF SUSTAINABILITY OFFICERS GUARDIANS OF ENVIRONMENTAL JUSTICE? AN EMPIRICAL EVALUATION

FINN PETERSEN
Carlson School of Management
University of Minnesota
Minneapolis MN 55455, USA

VIBHUTI DHINGRA
Schulich School of Business, York University

RACHNA SHAH
Carlson School of Management, University of Minnesota

ABSTRACT

Environmentally hazardous manufacturing facilities are disproportionately located in underserved communities, which exposes low-income and non-white populations to significantly higher toxic releases and adverse health risks. We study whether a firm governance reform—specifically, appointing a Chief Sustainability Officer (CSO)—can mitigate this environmental injustice. Using data on the toxic releases of U.S. manufacturing facilities from 2000 to 2020, we find that appointing a CSO decreases toxic releases by up to 19% and that the effect is particularly pronounced for facilities in under-served communities. Our work sheds new light on how corporate governance reforms act as a control mechanism for addressing environmental injustice, an issue that has proven challenging to regulate effectively.

INTRODUCTION

Manufacturing firms build and operate environmentally hazardous facilities in low-income, non-white neighborhoods (hereafter, underserved communities) more often than in wealthy, white neighborhoods (hereafter, better-served communities). Such environmental injustice is well documented (Diaz 2017; Mohai et al. 2009). It exposes underserved communities to higher levels of environmental hazards such as toxic releases or particulates in air and it can result in adverse health effects such as cancer and other chronic illnesses (Mohai et al. 2009). Establishing the presence of environmental injustice prompts an essential question: What can be done to diminish environmental injustice in the form of disproportionate toxic releases in underserved communities?

In this paper, we investigate whether a specific firm governance reform—appointing a Chief Sustainability Officer (CSO)—can mitigate environmental injustice. Firms began to appoint CSOs in the early 2000s to spearhead their social and environmental initiatives and bolster their credibility with sustainability-focused stakeholders (Arora et al. 2020). Under CSO leadership, firms emphasize social and environmental sustainability, which may lead them to reduce disparities in toxic releases and thereby reduce environmental injustice. However, this assertion relies on the assumption that appointing a CSO improves environmental performance in general and reduces toxic releases in particular. Yet, despite a growing literature on the effects of CSO appointments, evidence that supports this conjecture is scarce. To date, no study links CSO

appointments to facility-level outcomes, and the only study that examines the relationship between CSO appointments and firm-level environmental performance suggests CSOs might actually reduce environmental performance (Kanashiro and Rivera 2019). Therefore, in this paper, we first examine whether and to what degree CSO appointments affect facility-level environmental performance (RQ-1). Then, we examine whether CSO appointments impact environmental injustice by being more effective for facilities in underserved communities. To do so, we investigate whether the type of community in a facility's host neighborhood moderates the effect of appointing a CSO on toxic releases (RQ-2).

We empirically examine these research questions using data on facility-chemical level toxic releases of U.S. manufacturing facilities between 2000 and 2020 from the Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI) program (EPA 2023). Toxic releases are a well-established measure of environmental performance in both the operations management (Muthulingam et al. 2022) and the environmental injustice literature (Mohai and Saha 2007). Our sample includes facility-chemical level observations for 609 publicly traded companies—168 of which appointed a CSO during the sample period.

To answer our first research question, we use a two-way fixed effects (TWFE) regression with matching to account for the endogenous decision to appoint a CSO. We find that CSO appointments do indeed improve environmental performance. Specifically, our estimate indicates that toxic releases decrease by up to 19% following the appointment of a CSO.

Next, to answer our second research question, we use a split sample analysis based on the type of community in which a facility is located. Our results show that appointing a CSO reduces toxic releases more for facilities in underserved communities than for facilities in better-served communities, which reduces environmental injustice.

Our results contribute to theory, practice, and regulation in several ways. First, we empirically establish the positive effect that appointing a CSO has on facility-level environmental performance, a subject of debate in the CSO literature (Fu et al. 2020; Kanashiro and Rivera 2019). Second, we show that appointing a CSO mitigates environmental injustice by reducing the toxic releases of facilities in underserved communities. In doing so, we answer the call for more operations management research that considers issues of equity and inclusion in the context of environmental performance (Kalkanci et al. 2019). Third, we contribute to the emerging literature on the link between operations management and organizational misconduct (Skilton and Bernardes 2022; Belavina et al. 2020) by highlighting the potential of governance reforms to address misconduct in the form of environmental injustice. For practitioners, our results suggest that social sustainability–conscious managers and stakeholders should consider pushing their firms to create a dedicated CSO role. Doing so may help direct the attention of decision-makers to social and environmental sustainability issues and ultimately lead to improved sustainability performance.

HYPOTHESIS DEVELOPMENT

Two theories provide the theoretical grounding for our empirical investigation: the attention-based view of the firm (Ocasio 1997) and the operating frontier theory (Schmenner and Swink 1998). First, we draw on the attention-based view to hypothesize how the creation of the CSO role at the firm level affects toxic releases at the facility level. Our theoretical model suggests that appointing a CSO increases the attention that local decision-makers pay to environmental issues because it changes the attention structure of the firm. This, in turn, leads them to reduce toxic releases. Therefore, we hypothesize the following:

Hypothesis 1: Appointing a Chief Sustainability Officer reduces toxic releases.

Second, we combine the attention-based view with the operating frontier theory to hypothesize how the effect of appointing a CSO might vary based on how underserved the community surrounding a facility is, thereby affecting environmental injustice. Underserved communities lack the sociopolitical power to influence facilities in their vicinity to pay attention to environmental issues (Diaz 2017). This means that facilities in underserved communities often paid less attention to toxic waste issues in the past, making them operate further from their "environmental" operating frontier. The operating frontier represents a facility's maximum achievable performance within a given set of operating choices, as well as existing plant design and investment constraints (Schmenner and Swink 1998). The further a facility is from its operating frontier, the fewer resources it needs to improve its performance, and vice versa. In the context of toxic releases, facilities with a history of attention to toxic release issues, such as those in better-served communities, likely have already implemented easy improvements, which makes additional improvements difficult to achieve. Conversely, facilities in underserved communities, which have not focused on toxic release issues in the past, are further from their operating frontier. Therefore, they can reduce their toxic releases more easily once they focus their attention on them. These arguments bring us to the following hypothesis:

Hypothesis 2: Appointing a Chief Sustainability Officer reduces toxic releases more for facilities in underserved communities than for those in better-served communities, which decreases environmental injustice.

DATA AND EMPIRICAL STRATEGY

Data and Variables

To test our hypotheses, we collect information on various aspects of firms, their environmental impact, and their governance structures. First, we obtain detailed data on toxic releases among individual facilities and the firms to which they belong from the EPA's Toxic Release Inventory (TRI). This dataset provides information for over 650 chemicals and is a common resource for environmental performance research (Muthulingam et al. 2022). Each observation in the data corresponds to the release quantity of a specific chemical for a specific facility, which allows us to answer our research question at the facility-chemical level. Second, we identify the presence of Chief Sustainability Officers (CSOs), using the comprehensive board composition and governance information available in the BoardEx database (Fu et al. 2020). Beyond these core datasets, we obtain data from Compustat, Thomson/Refinitiv, the U.S. Census American Community Survey, the League of Conservation Voters, and the MIT Election Data and Science Lab to enrich our analysis with more firm-level and contextual information. We restrict our sample to facilities of publicly traded firms for which a BoardEx record exists. Our sample period is from 2000 to 2020 and our unit of analysis is the facility-chemical year.

Our dependent variable is *Toxic Releases*, which we measure as the total toxic releases of chemical c for facility i in year t (Muthulingam et al. 2022). To facilitate the interpretation of our coefficients, we report *Toxic Releases* in thousands of pounds. We winsorize the variable at 1% on the upper tail to reduce the influence of reporting errors or outliers.

Our treatment variable is *After Appointment*, which is an indicator that takes the value of one for every year t after firm j first appoints a CSO, and is zero otherwise. Following Fu et al. (2020), we identify CSO appointments from the BoardEx database based on job titles containing "sustainability," "sustainable," "responsibility," "ethics," or "environment." In our sample, 168 of 609 firms created a CSO role.

To measure how underserved the community in a facility's host neighborhood is, we compute the percentage of People of Color who live in a 1-km radius around the facility. We define People of Color as individuals who, in the U.S. Census American Community Survey, list their race as anything other than 'white', list their ethnicity as Hispanic/Latino, or both.

Consistent with the existing literature on toxic releases and CSO appointments, we control for a facility's production ratio, its year-on-year changes in toxin intensity, the tenure (in years) of the certifying official and the technical person who are responsible for the TRI data entry, the presence of an environmental management system, the regulatory pressure that a facility faces, and the voting behavior of the county in which a facility is located.

Empirical Strategy

We use a Two-Way Fixed Effects (TWFE) regression approach to estimate the effect of appointing a CSO on toxic releases. This approach requires data from a treatment and control group. In our case, the treatment group is the facility-chemical pairs from 168 parent companies that created a CSO role between 2000 and 2020, whereas the control group comes from parent companies that did not create a CSO role during our sample period.

Typically, firms create a CSO role with the expectation that the CSO will impact their environmental performance. We account for this selection into treatment within the TWFE framework by creating a matched sample of facility-chemical pairs in the treatment and control groups using propensity score matching. We then compare the difference in toxic releases of facility-chemical pairs in the treatment group before and after appointing a CSO to the difference in toxic releases of the facility-chemical pairs in our control group. Specifically, we estimate the following model:

$$Toxic\ Releases_{cit} = \delta * After\ Appointment_{jt} + \beta * X_{cit} + \alpha_{ci} + \gamma_t + \lambda_j + \epsilon_{cijt}, \quad (1)$$

where X is a vector of our control variables, α are facility-chemical fixed effects, γ are year fixed effects, λ are firm fixed effects, and ϵ is the error term.

We test whether appointing a CSO has a disproportionate effect on toxic releases at facilities in underserved communities (relative to those in better-served communities) by splitting the sample into two sub-samples based on the median value of People of Color (73%), such that facilities in host neighborhoods above the median are underserved.

RESULTS

Hypothesis 1 predicts that appointing a Chief Sustainability Officer reduces toxic releases. Our results in Table 1 show that facilities belonging to firms that create a CSO role subsequently reduce their toxic releases. Specifically, we find that appointing a CSO leads to a reduction of -6.469 ($p < 0.001$) in toxic releases—a 6,469 pounds or 19% reduction from average toxic release levels before CSO appointment. Thus, we find strong support for Hypothesis 1.

Table 1 about here

Next, we examine the effect of CSO appointments on environmental injustice. Hypothesis 2 predicts that appointing a CSO reduces environmental injustice because it decreases toxic releases more for facilities in underserved communities than for those in better-served communities. Our results support this hypothesis. Specifically, facilities in better-served communities reduce their toxic releases (-4.234; $p < 0.05$) to a lesser degree than those in underserved communities (-8.177; $p < 0.001$). This indicates that CSO appointments contribute to reducing environmental injustice by being more effective for facilities in underserved communities.

We conduct five robustness checks to validate our findings. First, we replicate our main analysis while considering the staggered appointment of CSOs across firms using Sun and Abraham's (2021) dynamic treatment effects model. Second, we evaluate the parallel trends assumption that underpins our analysis, finding that parallel trends in the matched sample likely hold. Third, we run a specification analysis and find that our results are robust to 50 different matching settings. Fourth, we conduct a placebo analysis and conclude that our results are unlikely driven by chance. Finally, we replicate our analysis using an instrumental variable approach. The resulting coefficients are similar in magnitude and significance.

DISCUSSION AND CONCLUSION

Facilities in underserved communities emit higher volumes of toxic releases than those in better-served communities (Diaz 2017; Mohai et al. 2009). In this paper, we investigated whether firm governance reforms, specifically the appointment of a Chief Sustainability Officer (CSO), can alleviate this environmental injustice. We examined whether CSO appointments at the firm level affect facility-level toxic releases (RQ 1) and whether the type of community in a facility's host neighborhood moderates this relationship (RQ 2).

We find that toxic releases decrease significantly following the appointment of CSOs, and this effect is more pronounced for facilities in underserved communities, which reduces environmental injustice. Our theoretical arguments and empirical evidence advance research and practice in several ways.

First, we examine the effect that appointing a top management team member like a CSO has on facility-level outcomes. This is particularly important because much of the existing literature on top management team appointments in general and CSO appointments in particular examines firm-level outcomes such as financial performance (Arora et al. 2020; Wiengarten et al. 2017) or aggregate environmental outcomes (Fu et al. 2020; Kanashiro and Rivera 2019). Second, we advance research on environmental injustice by providing evidence of the power of firm governance reforms to address it. Most research in the environmental injustice literature focuses on descriptive analysis to understand its existence and applied policy analysis to understand the impact of regulatory interventions. In contrast, our analysis builds on the understanding that manufacturing firms significantly contribute to environmental injustice and should therefore be part of the solution. Third, we contribute to the emerging literature that explores organizational misconduct through an operations management lens (Skilton and Bernardes 2022; Belavina et al.

2020). While regulatory interventions—a frequently used mechanism to control organizational misconduct—seem unsuccessful in this context, we show that governance reforms—another popular control mechanism—can effectively control organizational misconduct in the form of environmental injustice.

Beyond these research contributions, our study has two main practical implications. First, social sustainability–conscious managers and stakeholders should consider pushing their firms to create a dedicated CSO role. Our study, together with the existing research on CSOs, reinforces the notion that appointing a CSO improves both environmental and financial performance. This is particularly pertinent since investors are becoming increasingly concerned about the regulatory and legal ramifications of the environmental practices of their portfolios. Since investors cannot directly monitor or control the actions of their investee companies, a CSO can serve as an intermediary safeguarding their interests. Second, our results should encourage regulators to shift their focus from regulatory solutions to firm governance reforms to solve environmental injustice. While presidential executive orders have fallen short, our findings suggest that decisions such as appointing a CSO can contribute to a more environmentally just society. Thus, regulators should explore ways to encourage firms to contribute to environmental justice rather than requiring government agencies to consider such issues in their actions.

In conclusion, we revisit our initial question: What can be done to diminish environmental injustice in the form of disproportionate toxic releases in underserved communities? Firm governance reforms, particularly the decision to appoint a CSO, play a critical role in shaping a firm's environmental performance. Given that environmental injustice often stems from a lack of attention to environmental issues by facilities in communities that lack the socioeconomic power for change, governance reforms that change the attention structures within firms prove effective in achieving environmental justice. Thus, it appears that Chief Sustainability Officers are indeed guardians of environmental justice.

REFERENCES AVAILABLE FROM THE AUTHORS

Table 1: Two-Way Fixed Effects Results of the Effect of CSO Appointments

	Toxic Releases (in 1000s lb)			
	(1)	(2)	(3)	(4)
After Appointment	-6.469***	-4.234*	-8.177***	7.110*
	(1.359)	(1.756)	(2.001)	(3.345)
After CSO Appointment × People of Color				-0.190***
				(0.049)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Sample	All	Better-served communities	Underserved communities	All
Observations	131,244	58,467	72,777	131,244
R-squared	0.814	0.804	0.818	0.814

Notes. Facility-chemical clustered SE in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$