Do Independent Boards Harm Employee Safety and Health? *

Lixiong Guo†
University of Mississippi

Zhiyan Wang‡
Wingate University

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Abstract

Independent boards have become the global norm for good corporate governance. Although they are welcomed by shareholders, their impact on non-shareholder stakeholders is less known. This paper examines the impact of board independence on employee safety and health. Using a regulatory reform in the U.S. for identification, we find that the transition to a majority independent board significantly improves workplace safety. The effect is stronger for treated firms that need to implement a larger increase in board independence to comply with the mandate. The positive effect on workplace safety is mainly explained by independent directors' greater reputation concerns and stronger incentive to cater to the interests of major shareholders. Increasing safety spending and linking CEO pay to employee safety are two methods used by independent boards to improve workplace safety. Overall, our evidence suggests that board independence can benefit non-shareholder stakeholders when managerial agency problems harm both shareholders and other stakeholders and when shareholders have prosocial values.

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† Lixiong Guo is with the University of Mississippi. Address: School of Business Administration, University of Mississippi, 362 Holman Hall, University, MS 38677. Electronic Mail: lguo@bus.olemiss.edu.
‡ Zhiyan Wang is with the Wingate University. Address: Byrum School of Business, Wingate University, N. Main St, Wingate, NC 28714. Electronic Mail: z.wang@wingate.edu.

1. Introduction

Since the 1990s, regulatory reforms have significantly increased the independence of corporate boards around the world. As of now, almost all major jurisdictions in the world have introduced some minimum board independence requirements.[1] This trend is in general welcomed by shareholders. A large body of studies has shown that board independence in general and the adoption of a majority independent board (for brevity, independent board) in particular reduces agency problems and increases shareholder wealth (Adams, Hermalin and Weisbach, 2010) (Masulis, 2020). However, the impact of this global embrace of more independent boards on employees is less known. Given that the interests of shareholders are often in conflict with those of employees, an important question to ask is whether the increase in board independence harms employee interests, especially in the context of the current movement to rebalance the interests of shareholders and employees. In this paper, we provide some causal evidence about this issue by examining how board independence affects one important employee welfare: employee safety and health at the workplace.

Workplace injuries and illnesses are arguably one of the most serious threats to employee well-being in many industries. From 1996 to 2008, there were 4.9 million non-fatal injuries and more than 5700 fatal injuries each year in the U.S. private sector.[2] According to the most recent estimate from the National Safety Council, the total economic cost of work-related

[1] According to the 2021 OECD Corporate Governance Factbook, almost all jurisdictions have introduced a requirement or recommendation with regard to a minimum number or ratio of independent directors. The recommendation for boards to be composed of at least 50% independent directors is the most prevalent voluntary standard. Fauver et. Al. (2017) record 31 regulatory reforms that involve provisions related to board, audit committee and auditor independence before 2007, including countries such as Canada, China, Finland, Germany, Indonesia, Italy, Philippines, Poland, Singapore, Spain, Thailand, Turkey, UK, US, etc.

[2] The source of injuries and fatalities data is from the Bureau of Labor Statistics (BLS), U.S. Department of Labor, see https://www.bls.gov/iif/. In 2019, there were 2.8 million non-fatal injuries and illnesses and 5,333 fatal injuries in private workplaces in the U.S.

deaths and injuries in 2020 was $163.9 billion, or about $1,100 per worker.[3] Given that U.S. workplaces are among the safest in the world, these statistics suggest that workplace safety remains an important social and economic issue globally. Understanding the impact of board independence on workplace safety thus has important policy and social welfare implications.

To establish causality, we use the reform of exchange listing rules in the U.S. in 2003 as a quasi-experiment. In the wake of the Sarbanes-Oxley Act (SOX) in 2002, the NYSE and Nasdaq revised their listing standards in 2003. The new standards require publicly traded firms to have more than 50% independent directors on the board as well as fully independent audit, compensation, and nominating committees (i.e. committees comprised solely of independent directors). Since a significant number of public firms were already compliant with this board independence requirement before 2003, we are able to apply the difference-in-differences method to isolate the board independence effect from other confounding effect, especially the effect of SOX which affects all firms.

Using a matched sample of treated and control establishments, we find that the mandatory transition to an independent board reduces the total case rate (TCR hereafter) in treated establishments by between 13.3% and 14.9% of the sample mean relative to control establishments. For the average establishment in our sample, this reduction translates into approximately 1.7 fewer injuries annually per 100 full-time employees (the equivalent of 20,000 hours worked). Our estimates of the dynamic treatment effect by year relative to year 2003 (the year of the regulatory shock) suggest that there were no differential time trends in TCR before 2003 but a statistically significant fall in TCR in treated establishments relative to control establishments after 2003. Furthermore, it is establishments belonging to treated firms

[3] This number includes the economic cost to the nation, employers and individuals of work-related death and injuries. The source of data is at https:/injuryfacts.nsc.org/work/costs/work-injury-costs/.

that were further below the 50% independent director threshold and thus had to add more independent directors to the board to meet the requirement that mainly drive the decrease in TCR. We also find that transition to an independent board reduce the frequency of OSHA violations by treated firms.

This finding is not fully expected ex ante because the interests of shareholders are often in conflict with that of employees. To the extent that independent directors better serve the interests of shareholders than non-independent directors, one may expect that the firm would increase workers' workloads and cut workplace safety spending to increase profits after the transition to an independent board, both actions can potentially increase the TCR. Moreover, prior studies find that independent boards are more responsive to poor firm performance in their CEO dismissal decisions, which further increases the incentive of the CEO to take the actions described above to boost short-term firm performance. Our finding suggests that other positive effects of board independence on workplace safety overshadow these potential negative effects.

Why does the transition to an independent board have a positive effect on workplace safety? We propose and examine three possible explanations. First, independent directors may improve workplace safety to protect their labor market reputation. Poor workplace safety may damage independent directors' reputation at two levels. First, the negative publicity associated with OSHA violations or employee and shareholder lawsuits after large workplace safety incidents may negatively affect directors' reputation. Second, poor workplace safety may harm shareholders' interests and thus damage independent directors' reputation. In an efficient labor market, director reputation should ultimately depend on whether they maximize shareholders' interests. In most firms, shareholders are interested in maximizing their wealth. In theory, there

is an optimal level of safety investments that maximizes shareholder value. In some firms, major shareholders may have pro-social preferences and prefer an even higher level of workplace safety investments than the optimal level for maximizing shareholder value. In either case, poor workplace safety may indicate underinvestment in workplace safety relative to what maximizes shareholders' interests and thus damages independent directors' relations with major shareholders. Our finding of a positive effect of the regulatory shock on workplace safety suggests that entrenched managers tend to underinvest in workplace safety relative to the level the maximizes independent directors' reputation. There two reasons for this. First, managers bear significant effort cost of maintaining a safe workplace. Second, managers can gain private benefit from diverting safety funds to pay perks to themselves or to invest in their pet projects. This combination of underinvestment in workplace safety by entrenched managers and independent directors' reputation incentives provide one explanation of the positive effect of the transition to an independent board on workplace safety.

The second explanation is that the positive effect on workplace safety is driven by a reduction in real earnings management by managers in treated firms. (Caskey and Ozel, 2017) show that earnings expectations induce managers to cut safety spending and increase worker workloads and these actions compromise workplace safety. If the more intensive monitoring of an independent board makes all methods of real earnings management more difficult for managers to hide, then workplace safety may improve as a consequence of it.

The third explanation is that the transition to an independent board may lead to other changes in firm characteristics and polices that indirectly reduce workplace injuries. For example, the transition to an independent board may lead to restructurings of operations that indirectly reduce workplace injuries. These three explanations are not mutually exclusive.

However, there is an important difference between the first and the last two explanations. The first explanation assumes that independent directors believe that workplace safety can significantly affect shareholders' interests and their labor market reputation. In contrast, the last two explanations are not predicated on the above assumption.

We examine the validity of these explanations one by one in detail. If the positive effect on workplace safety is driven by independent directors' reputation concerns, we should observe greater effect for treated firms in which the reputation concerns of independent directors are greater. Consistent with this, we find that establishments of treated firms with higher ex-ante labor lawsuit risk and higher media coverage experience a greater improvement in workplace safety. Since large workplace safety incidents are likely to attract lawsuits and media coverage of poor workplace safety can aggravate the damage to independent directors' reputation following OSHA violations or workplace safety incidents, independent directors are likely to have greater concern for workplace safety in these firms. In an efficient labor market, the incentives of independent directors to avoid association with OSHA violations and large workplace safety incidents should not lead to overinvestment in workplace safety because ultimately directors are judged by whether they serve shareholders' interests. Like underinvestment, overinvestment in workplace safety also hurts shareholders' interests. However, frictions in labor market may cause independent directors to overinvest in workplace safety to benefit themselves at the expense of shareholders. To shed light on whether the improvement in workplace safety induced by the board structure change is the result of overinvestment pushed by independent directors, we compare the treatment effects for firms with high and low ownership by dedicated institutional investors. Dedicated institutional investors hold long-term concentrated ownership in the firm so they want the board to

maximize the long-term value of their shares. In terms of workplace safety, this means that they want the firm to make the optimal level of safety investments. Since dedicated institutional investors hold large voting power, meanwhile, independent directors rely more on the support of shareholders to keep their current directorship and gain new directorships than non-independent directors do, the transition to an independent board should lead to firm policy changes that are more aligned with the interests of dedicated institutional investors. Our result shows that establishments of treated firms with high ownership of dedicated institutional investors experience a greater improvement in workplace safety than establishments of treated firms with low ownership of dedicated institutional investors. This is inconsistent with the improvement in workplace safety is driven by overinvestment. This result suggests that firms with low ownership by dedicated institutional investors seem still underinvest in workplace safety after the transition to an independent board by the standard of maximizing long-term firm value. This can be due to two reasons. First, investors with shorter investment horizons than dedicated investors are less interested in safety investments because these investments have a long payback period. Second, other investors have lower incentives to monitor independent directors so they make less effort to improve workplace safety. While dedicated institutional investors typically want their firms to invest the optimal amount in workplace safety, there are institutional investors who want their firms to invest more than the optimal amount in workplace safety because of their prosocial preferences. In firms with large ownership by such prosocial institutional investors, their votes are likely to be important for the labor market performance of independent directors. Consistent with independent directors improving workplace safety to cater to the interests of major shareholders, we find that establishments of treated firms with higher ownership by employee-friendly institutional

investors experience a greater improvement in workplace safety after the transition to an independent board. These results provide strong support for the first explanation that the positive effect on workplace safety is driven by independent directors' labor market incentives.

The second explanation states that independent boards are more effective at reducing real earnings management and the improvement in workplace safety is a direct consequence of the reduction in real earnings management rather than that of independent directors' greater interests in good workplace safety. We find no support for this explanation. Following Roychowdhury (2006), we measure real earnings management using abnormal production costs and the negative of abnormal discretionary expenditures. We also construct a measure of the overall extent of real earnings management by adding the two measures. Our result shows that none of the real earnings management measures significantly changes after the regulator shock in treated firms relative to control firms. This finding is consistent with prior studies that find that the strengthening of internal governance around SOX does not reduce real earnings management (Cohen, Dey and Lys, 2008). Using the same quasi-experiment as in this paper, (Chen, Cheng and Wang, 2015) find that firms that were non-compliant with the requirement for a majority independent board on average do not experience a decrease in earnings management after the transition to an independent board, though earnings quality improve in firms with better information environment. Meanwhile, however, we find that establishments of treated firms that score higher on these two measures in the year before the regulatory shock experience a greater improvement in workplace safety following the shock. This suggests that these two measures are related to safety-reducing actions in treated firms before the regulatory shock but not after the shock. One possible explanation for this is that managers shift away from using safety-reducing methods to manipulate earnings after the board becomes

independent but do not reduce the overall level of real earnings manipulation. Consistent with this explanation, we find that the transition to an independent board significantly weakens the relationship between being a n earnings manipulation suspect and workplace injuries, suggesting managers in treated firms are more constrained in using safety-reducing methods to manipulate earnings after the regulator shock. Overall, it is not the reduction in real earnings management that leads managers to rely less on safety-reducing methods to manipulate earnings but independent directors' strict oversight on workplace safety.

We take two approaches to test the third explanation. First, we control for changes in firm characteristics that my affect workplace safety, which include firm profitability, leverage, cash holdings, capital expenditure, analyst coverage, institutional ownership, etc. We find that the treatment effect decreases very little after including these control variables. Second, we examine the effect of the board structure change on establishment level employment. One of the strategies that private equity buyout firms use to improve efficiency is to cut employment. Independent directors may adopt a similar strategy to improve operating efficiency. This may affect workplace injuries in two ways. First, the reduction in employment may mean that the workloads of retained workers increase. This however should lead to an increase in workplace injuries and thus cannot explain the positive effect on workplace safety. Second, treated firms may cut the costs of workplace injuries by reducing employment in establishments with high injury risk exposure using automation. This may result in fewer workplace injuries. Inconsistent with this, we find no significant changes in employment in treated establishments relative to control establishments, in particular, we find no evidence that the employment in establishments with high injury risk exposures falls more than that in establishments with low injury risk exposures.

Lastly, the improvement of workplace safety may be driven by a change in firms' injury reporting. Managers in treated firms may become more likely to underreport workplace injuries in fear of the punishment by the board for poor safety management after the transition to an independent board. Although this alternative explanation is still consistent with independent directors caring more about workplace safety than non-independent directors do, it implies that the improvement in workplace safety is only cosmetic and does not benefit employees. This concern is however alleviated by our result on OSHA violations. The OSHA violations are recorded by OSHA inspectors rather than self-reported by firms.

We next examine how independent boards improve workplace safety. According to the first explanation, the transition to an independent board should lead to an increase in managerial safety efforts and safety investment in treated firms relative to control firms. Since managerial effort is unobservable, we proxy for it using the inclusion of safety metrics in CEO compensation contracts. CEOs in general respond to compensation incentives. We measure safety investments using SGA expenses scaled by firm size because the safety expenditures are usually included in the SGA expenses (Caskey and Ozel, 2017). We find that treated firms are 9.7% more likely to include safety metrics in CEO compensation contracts and increase SGA expenses following the treatment.

In robustness checks, we find that our main finding remains hold when we match treated and control firms using the propensity-score matching method, when we measure workplace safety using alternative injury rates that exclude minor injuries, and when we exclude very small establishments for which the injury rate may contain larger noises.

This paper makes several contributions to the corporate governance and ESG literature. First, to the best of our knowledge, this study is the first to examine the impact of board

independence on non-shareholder stakeholders using an exogenous shock. As of now, almost all jurisdictions have passed regulatory reforms that require corporate boards to meet some minimum requirements for board independence. Although the impact of board independence on shareholders is well studied, there is little robust causal evidence on its impact on non-shareholder stakeholders. Our paper fills in this gap and significantly enriches our understanding of the benefits and costs of independent boards.

Second, our study provides important insights into the role of independent boards in facilitating shareholders' ESG demands. Although independent boards are often associated with maximizing profits, our analysis suggests that they can be relied upon in the push for better ESG performance as well. The way in which the labor market works dictates that independent directors are more responsive to shareholders' demand than non-independent directors, be it demand for maximization of firm value or more investments in ESG. Hence, independent boards are an effective board structure for facilitating major shareholders' ESG preferences. In recent years, institutional investors, especially the "Big Three", have been credited for improving their portfolio firms' ESG performance by engaging with the management. Our evidence suggests that such success is partially built upon the fact that corporate boards are quite independent during this period, largely driven by the regulator reforms we discuss in this study. We think that this benefit of independent boards is currently underappreciated. Meanwhile, our evidence suggests that, when the board is independent and the labor market works efficiently, the ESG preferences of major shareholders ultimately determine the ESG outcomes of their firms.

Third, our paper adds to the literature on director labor market works. Prior papers in general find that the director labor market works efficiently in aligning the interests of

independent directors with that of shareholders. We show that this alignment also extends to ESG issues. When major shareholders have preferences for strong ESG performance, we can expect the labor market to incentivize the independent directors to deliver it.

Our study is related to two prior studies that examine the relation between corporate governance and CSR using board independence as one of the measures of internal governance. (Jo and Harjoto, 2011) test whether CSR is better explained by agency theory or the stakeholder theory. They show that both internal and external governance proxies are positively related to CSR and thus support the stakeholder theory. They argue that good corporate governance causes higher CSR score because CSR is positively related to lagged corporate governance proxies but corporate governance proxies are not related to lagged CSR. (de Villiers, Naiker and van Staden, 2011) examines the relation between board characteristics and corporate environmental performance and find a positive correlation between board independence and the KLD environmental score. Our study differs from these studies in three important ways. First, our study uses more rigorous identification method to establish causation. In unreported result, we find that the regulatory shock we exploit in this paper does not cause an overall increase in treated firms' KLD CSR scores. Second, our study goes beyond documenting a causal relation between board independence and workplace safety and investigate various explanations for the relation, while these studies stop at documenting a relation. Third, our measure of workplace safety is more concrete and transparent than CSR ratings which are often inconsistent across different data providers, especially for the social performance category.

Our study also contributes to the growing finance and accounting literature on workplace safety. (Cohn and Wardlaw, 2016) relate a firm's financial conditions to workplace safety and

show that financial constraint reduces workplace safety. (Cohn, Nestoriak and Wardlaw, 2021) examine the impact of private equity buyouts on worker welfare measured by workplace injury rates and find a decrease in workplace injury rates following private buyouts. (Gong, Guo and Wang, 2023) find that greater shareholder litigation risk incentivizes directors and managers to invest more in workplace safety. In the accounting literature, (Caskey and Ozel, 2017) show that real earnings manipulation can compromise workplace safety through discretionary reductions in safety spending and increases in workloads. (Bradley, Mao and Zhang, 2022) find that analyst monitoring improves workplace safety. This paper extends this literature to the role of the board of directors in workplace safety.

2. Workplace Safety and Shareholder Value

Workplace safety is an important employee welfare. There were a total of 5.2 million non-fatal injuries and illnesses and 5,900 fatal injuries in private industry workplaces in the U.S. during 2001, a year in the middle of our sample period.[4] These workplace injuries not only impose significant human costs on workers but also significant economic costs on employers. In the short run, firms need to pay medical and indemnity costs. In the long run, persistent poor safety records can force a firm to pay a higher wage premium to compensate workers for bearing the higher injury risk and a higher compensation premium to the state insurance fund (Viscusi, 2016). Poor workplace safety can also increase employee turnover, damage the firm's reputation among stakeholders, and even lead to disastrous safety accidents such as the BP refinery explosion in Texas in 2005. The National Safety Council estimates that the total cost of work injuries in 2020 was $163.9 billion or about $1,100 per worker.[5] To put this number into perspective, it is about 14 times Amazon's 2019 profits. At least, a proportion of this cost is

[4] The source of injuries and fatalities data is from the Bureau of Labor Statistics (BLS), U.S. Department of Labor, see https://www.bls.gov/iif/.
[5] The source of data is at https:/injuryfacts.nsc.org/work/costs/work-injury-costs/.

borne by employers. Hence, maintaining a certain level of workplace safety is in shareholders' interests. Consistent with this, (Cohn and Wardlaw, 2016) find a negative relation between workplace injury rates and firm value. However, maintaining a safe workplace requires firms to invest in machine upkeep and upgrades, personal protection equipment, safety training, and a variety of other things.[6] Improving workplace safety may also require employers to sacrifice some productivity (Christensen *et al.*, 2017; Gilje and Wittry, 2021). Hence, there is an optimal level of workplace safety that maximizes shareholder value in a firm. At this optimal level, the marginal benefit due to an improved work environment equals the marginal cost of providing such an environment.

3. Empirical Methodology

3.1. The Regulatory Shock

In response to a few high-profile corporate accounting scandals involving public firms such as WorldCom and Enron in the early 2000s, Congress passed the Sarbanes-Oxley (SOX) Act in July 2002 to restore investor confidence in public firm accounting and governance. Shortly after the passage of the SOX, the NYSE and Nasdaq proposed new exchange listing rules that require that publicly-traded firms must have more than 50% of independent directors on the board and an audit, nominating, and compensation committee comprised of 100% independent directors (>50% if firms are listed on Nasdaq only).[7] These proposals were approved by the SEC in 2003 and implemented by 2004.

[6] According to the U.S. Bureau of Economic Analysis, U.S. companies in aggregate spent between $52 and $66 billion on compliance with OSHA regulations in 2010, accounting for about 5% of the domestic corporate profits (Kniesner and Leeth, 2014).

[7] A company in which more than 50% of the voting power is held by an individual, group, or another company is exempt from the requirements. However, these companies still need to meet the requirement for a fully independent audit committee because it is required by SOX.

The issuance of the new exchange listing rules provides an ideal setting for studying the causal impact of board independence on workplace safety. First, the change in exchange listing rules is plausibly exogenous because the corporate scandals that led to the passage of SOX were not anticipated by the financial markets and the issuance of new exchange listing rules quickly followed the passage of SOX. Second, a considerable proportion of the firms in our sample already had a majority of independent directors on the board before SOX so they can be used as control firms to filter out the effect of SOX which affected all firms. Lastly, increasing the percentage of independent directors from below to above 50% represents a critical shift in the power balance between independent directors and non-independent directors because board decisions are usually passed by a majority support.

We follow (Guo and Masulis, 2015) and use the board structure in 2001 to classify firms into treated and control firms.[8] Firms that had less than or equal to 50% of independent directors on the board in 2001 are defined as treated firms and their establishments are defined as treated establishments, while firms that already had more than 50% of independent directors on the board in 2001 are defined as control firms and their establishments are defined as control establishments. We chose the year 2003 to be the first year of the post-treatment period.[9]

3.2. The Empirical Model

Our main difference-in-differences (DiD) regression is specified at the establishment level as follows:

[8] This is because some firms began to comply with the requirements when the NYSE and Nasdaq began to discuss the propels for the new listing rules in 2002.

[9] We choose the year 2003 as the first year of the post-treatment period because many firms started to make board structure changes as early as the year 2002 even though the deadlines for compliance with the board and committee independence requirements are October 2004 for firms with non-classified boards and December 2005 for firms with a classified board. However, our results are qualitatively same if we use 2002, 2004, or 2005 as the threshold year.

$$Y_{i,j,l,s,t+1} = \alpha + \beta\ Independent\ Board_{j,t} + \gamma F_{j,t} + \delta E_{i,t} + \theta_i + \mu_{l,t+1} + \pi_{s,t+1} + \varepsilon_{i,j,l,s,t+1} \quad (1)$$

where subscripts *i*, *j*, *l*, *s*, and *t* refer to an establishment, firm, establishment industry, establishment state of location, and year. $Y_{i,j,l,s,t+1}$ equals the injury rate at establishment *i* in year $t+1$; $Independent\ Board_{j,t}$ is an indicator that equals one for the year 2003 and after if firm *j* is a treated firm, and zero otherwise. The coefficient β captures the treatment effect of the board independence requirement on the injury rate. The vectors F_{jt} and $E_{i,t}$ contain firm and establishment characteristics that can be correlated with workplace injury rates, respectively. θ_i denotes establishment fixed effects, $\mu_{l,t}$ denotes industry-year fixed effects that capture time-varying industry shocks to workplace injury rates, and $\pi_{s,t}$ denotes establishment state-year fixed effects that capture time-varying local factors at the establishment's state level. $\varepsilon_{i,j,l,s,t}$ is the residual error term. We cluster heteroscedasticity-robust errors at the firm level.

We conduct our analysis at the establishment level for two reasons. First, a firm's establishments can be in different industries and states. Since injury rates vary greatly across industries, we can more accurately control for innate differences in injury rates across establishments using industry fixed effects based on the establishment's rather than the firm's industry code. Likewise, injury rates may also vary across states due to differences in regulatory environment and social norms in different states. The establishment-level analysis allows us to more precisely control for the geographic differences in injury rates using the location of each establishment rather than the headquarters state of the parent firm. Second, OSHA revised its recording and reporting rule in 2001 (see Federal Register number 66:5916-6135). The rule change exempted some SIC 3-digit industries from the survey and added other SIC 3-digit industries to the survey. If a firm has establishments in these affected SIC 3-digit

industries, then the firm-level injury rates aggregated from its establishments can change around 2001 due to some establishments being surveyed before 2001 dropping out of the survey after 2001 and some new establishments entering the survey after 2001. Such changes may confound the effect of board independence on workplace safety. An establishment-level analysis is not affected by this change in recording and reporting rule because an establishment must be in our sample both before and after 2001 to be included in our DiD estimation.

A key assumption underlying the DiD approach is that injury rates in treated and control establishments follow parallel trends in the absence of the regulatory shock. To check for potential violation of this parallel trends assumption, we estimate the dynamic effects of the regulatory shock on injury rates in Section 5.2 and find no evidence that this assumption is violated.

4. Data and Sample

Our establishment-level injury and illness data are from the OSHA Data Initiative Program (ODI). The board of directors' data is from the Institutional Shareholder Services (ISS) database, accounting data from the Compustat database, institutional ownership data from Thomas Reuters 13F Holdings, analyst forecast data from IBES, industry union membership data from the Union Membership and Coverage Database, and regulatory safety violations data from the OSHA Enforcement Database. We start our sample in 1996 because it is the first year that the board of directors' data and the ODI data are available. We end our sample in 2008 so that we have a symmetric time window around the passage of SOX in 2002. Six years after SOX should be a long enough time for the board independence requirement to exhibit its full effects.

4.1. The ODI Data and Workplace Safety Measures

In 1996, OSHA initiated the ODI annual surveys to collect injury and illness data on private-sector employers. Each year, OSHA collected data on injuries and acute illnesses attributable to work-related activities from approximately 80,000 private-sector establishments that are in high-hazard industries or on the OSHA's watch list and meet the minimum size requirement.[10] An establishment refers to a single physical location where business is conducted. The main industries covered include agriculture, construction, manufacturing, transportation, trade, and service industries. Along with these data, OSHA also collected information about the name, location, industry, the number of employees, and the total number of hours worked by employees of each establishment. The program was ended in 2011 due to a budget cut.

The ODI program collects data on three injury rates that differ in the types of injuries that are included: (1) The Total Case Rate (*TCR*) is the primary metric. It includes all recordable cases of nonfatal injuries and illnesses in an establishment year. (2) The Case Rate of Days Away, Restricted, or Transferred (*DART*) only includes injuries and illnesses that require days away from work or job restriction or transfer. In these incidents, the workers have to cease working or restrict their work activities or be transferred to a different department or job due to injuries or illnesses. (3) The Case Rate of Days Away from Work (*DAFWII*) only includes injuries and illnesses that require days away from work. All rates are calculated as the number of injuries per 100 full-time equivalent employees in a year. We use the *TCR* as our primary

[10] The high-hazard industries are defined as those that have an average annual Days Away, Restricted, or Transferred (DART) incidence rate of 5.0 or greater. See https://www.industrysafe.com/blog/osha-recordkeeping/what-is-a-dart-rate. The ODI program covered establishments with a minimum of 60 employees in the year 1996 and 1997, 50 employees in 1998, and 40 employees between 1998 and 2011.

measure of workplace safety and the latter two injury rates as alternative measures of workplace safety in robustness checks. Our results are not sensitive to which injury rate we use.

OSHA revised its recording and reporting rule in 2001 (see Federal Register number 66:5916-6135). This raises a question about the impact of this change on our estimate of the treatment effect of the regulatory shock. We carefully studied the specific changes in the revised rule and communicated with OSHA statisticians. As we explain below in detail, these changes are unlikely to bias the coefficient estimates in our analysis.[11]

The revised reporting rule includes three main changes: (1) an update of the partially exempt industry list, specifically, the new rule adds some three-digit SIC industries within some formerly exempted 2-digit SIC industries to the survey and, at the same time, exempts some or all of the 3-digit SIC industries under some formerly covered 2-digit SIC industries from the survey; (2) a reduction in the requirement to keep track of lengthy employee absences and work restrictions caused by work-related injuries and illnesses; and (3) a simplification of the required forms. The first change may cause some establishments in our sample before 2001 to disappear after 2001 if the new rule exempts their industries from reporting. On the other hand, some establishments not in our sample before 2001 may appear for the first time after 2001 if the new rule adds their industries to the survey. However, this change should not bias our estimate because injury rates are compared within each establishment (our model includes establishment fixed effects). Establishments that are only in the OSHA data before or after 2001 do not contribute to our estimate. The second change is unlikely affect the injury rate measures

[11] Caskey and Ozel (2017) begin their sample in 2002, citing this OSHA rule change as the main reason. However, our analysis is different from theirs in at least two aspects, which mitigates the concern. First, our analysis is a difference-in-differences analysis while theirs is just a panel regression with establishment fixed effects. Since there is no reason to believe that the change in data reporting affect treatment and control establishments differently, any effect is likely to be cancelled in the comparison between treatment and control establishments. Second, we control for industry-year fixed effects while they only control for year fixed effects. The effect of changes in industry composition of the sample on benchmark injury rates is completely filtered out by the use of industry-year fixed effects.

used in this study because none of the measures is based on the length of time an establishment tracks the employee absence and work restrictions. The third change may affect reporting quality, but since we use a difference-in-differences design, unless the change affects treatment and control establishment differently, it should not bias our coefficient estimate.

4.2. Sample Construction

We begin with the establishment-level ODI data. Since the ODI dataset does not contain a unique parent firm identifier, we manually match each establishment from the ODI database to its parent firm in the Compustat databases by comparing their names (Caskey and Ozel, 2017).[12] We then add the parent firm's board of directors' information from the ISS database to the injury data. We require that all firms have director data available from the ISS database in 2001 because this is the year in which we classify firms into treated and control firms. We further require that a firm's common stock be listed on the NYSE or NASDAQ from 2001 to at least 2005 so that it is exposed to the full regulatory shock. Firms that do not meet these requirements are excluded from our sample along with their establishments. For the remaining establishments, we further require that they must have at one observation before and one observation after the regulator shock. Lastly, we excluded utility firms (SIC codes 4900-4999) and financial firms (SIC codes 6000-6999) because they are usually studied separately in existing literature. These filters yield an initial sample of 54,809 establishment-year observations from 540 firms for the period 1996–2008.

[12] We begin with direct searches of parent firm names in the Compustat database for establishments in the ODI dataset. If the searches do not produce successful matches, we conduct internet searches for establishments via Google, Hoovers, and company websites to identify parent firm names and match establishments to corresponding Compustat firms. In the case that an establishment is matched to a hierarchy of Compustat parent firms, we keep the nearest parent firm in the hierarchy. In the case that a parent firm is acquired in an acquisition, we match the establishment to its historical parent firm for the years before the acquisition and to the acquirer for the years after the acquisition.

4.3. Coarsened Exact Matching

Our identification strategy requires that firms are randomly assigned to the treated and control groups. However, this requirement is almost surely violated by our observational data because the board structure before the regulatory shock is endogenously determined (Adams, Hermalin and Weisbach, 2010b). To address this concern, we match the treated and control firms in our sample on key observable characteristics before 2001 using a method called Coarsened Exact Matching (CEM).[13] First, we divide our sample firms into three bins along each of the following dimensions: total assets, Tobin's Q, return on assets, and board size, following (Balsmeier, Fleming and Manso, 2017). The values of these variables are the averages of their values in 2000 and 2001.[14] Then, treated firms and controls firms that fall into the same bins for all dimensions and are in the same 2-digit SIC industry are retained as being matched. Unmatched firms are dropped from the sample (for applications, see (Blackwell *et al.*, 2009)). Each treated firm can be matched with more than one control firms. This method has several advantages over conventional propensity score matching methods in reducing the imbalance, model dependence, and estimation bias (for details, see (Iacus, King and Porro, 2011, 2012)(King and Nielsen, 2019)).[15] In principle, the selection bias should mainly stem from systematic differences at the parent firm level since the assignment of the treatment is at the firm level. However, since our analysis is at the establishment level, we further require the establishments of matched treated and control firms to have similar sizes measured by the number of employees. Like us, (Cohn, Nestoriak and Wardlaw, 2021) also use the number of

[13] "The CEM algorithm performs exact matching on coarsened data to determine matches and then passes on the uncoarsened data that were matched to estimate the causal effect." (Blackwell et al. 2020)
[14] Our results are unchanged if we take the average values of these variables over the period 1996 to 2001.
[15] In Table A2 of the robustness checks, we form a balanced sample based on nearest-neighbor propensity score matching and find the same qualitative results.

employees as the main criterion in matching establishments of private equity buyout targets with control establishments.

The final matched sample contains 449 unique firms, 110 of them are in the treated group and 339 of them are in the control group. This translates into 2776 treated establishments and 5874 control establishments. The total number of establishment-year observations is 45,932. Panel A of Table 1 reports the two-sample t-tests of differences in the means of key characteristics between the treated and control groups before 2001 at both the firm and establishment levels. As shown, none of the differences is statistically significant except for two measures, the percentage of independent directors at the firm level and the TCR at the establishment level. Treated firms have 28% fewer independent directors than control firms over 2000 and 2001. Treated establishments have 4.38 fewer workplace injuries per 100 full-time equivalent employees per year than control establishments over 2000 and 2001, suggesting that firms with non-independent boards on average had poorer workplace safety than firms with independent boards before the regulatory shock.

4.4. Summary Statistics

Panel B of Table 1 presents summary statistics for the establishment-level and firm-level variables in our analysis. The definitions of these variables are in the Appendix. All continuous variables are winsorized at the 1st and 99th percentiles to reduce the influence of potential outliers. Our main dependent variable, *TCR,* has a mean and a median of 12.01 and 10.15, respectively, indicating that there are on average 12.01 injuries per 100 full-time equivalent (FTE) employees (each full-time employee is assumed to work for 2,000 hours a year) in an establishment in a year, and half of the establishments have more than 10.15 injuries per 100 FTE employee in a year. The average sample establishment has 337 employees. All

establishment-level and firm-level summary statistics are comparable to those reported in prior workplace safety studies such as (Cohn and Wardlaw, 2016) and (Caskey and Ozel, 2017).

Panel A of Figure 1 shows the histogram of our main dependent variable, *TCR,* at the establishment-year level, which exhibits a similar distribution to the SOII data used in (Cohn and Wardlaw, 2016). Panel B of Figure 1 reports the average TCR by Fama and French 48 industries. The top three industries by average TCR are healthcare, transportation, and food products. Healthcare, transportation, and retail are the top three industries by the number of establishments in our sample.

5. Results

5.1. The Effect of Board Independence on Workplace Safety

In this section, we establish the causal effect of board independence on workplace safety without any prior on the direction of the relation.

5.1.1 Baseline results

Table 3 reports estimates of the effect of the mandatory adoption of an independent board on establishment-level TCR from variants of Equation (1). The dependent variable is the annual total case rate (TCR). Column 1 contains no control variables. In column 2, we add controls for establishment characteristics. In column 3, we further control for parent firm characteristics. The firm characteristics we control for include firm size measured by *Ln(Assets),* financial conditions measured by *Cash/Assets*, *Debt/Assets, Dividends/Assets,* asset utilization measured by *Sales*/*Assets*, profitability measured by *ROA*, asset tangibility measured by *PPE/Assets*, capital expenditure measured by *CapEx/Assets* and *Acquisition/Assets,* growth opportunities measured by *Tobin's Q,* R&D expenses measured by *R&D/Assets*, and CEO compensation measured by *Ln(CEO Compensation)*. All models include establishment fixed effects to control

for time-invariant heterogeneity at the establishment level, industry-by-year fixed effects to control for time-variant industry heterogeneity in TCR, and establishment location state-by-year fixed effects to control for time-variant geographical heterogeneity in TCR. The coefficient of *Independent Board* is negative and statistically significant at the 1% level in all columns, indicating a significant decrease in TCR in treated establishments relative to control establishments. The coefficient estimate, -1.194, in column 3 indicates the transition to an independent board reduces TCR by 1.194 cases per 100 FTE employees per year, which translates into a 10% decline relative to the sample mean injury rate (12.01). To contextualize this estimate, a comparable decline in TCR across all establishments in the U.S. private sector in 2002 would lead to approximately 1.4 million fewer injuries.[16] Hence, the result shows that the transition to an independent board improves workplace safety.

5.1.2. Dynamics of the treatment effect

The validity of our DiD approach hinges on a parallel trend assumption, which says that the TCR in treated and control establishments follow parallel trends in the absence of the treatment. This assumption cannot be tested directly because we do not observe the counterfactuals in the post-treatment period. However, one necessary condition for the assumption to hold is that the time trends in injury rates are similar across treated and control establishments before the treatment. To verify this, we estimate a dynamic version of Equation (1) where the single *Independent Board* indicator is replaced with a set of indicator variables, $Independent\ Board_{j,k}$ for k = -4-, -3, -2, 0, +1, +2, +3, +4+, where k indicates the year relative to 2003, the year that the SEC approved the change in exchange list rules. For example,

[16] Following Cohn et. al. (2021), we calculate the hypothetical response implied by the coefficient of -1.585 as (0.01585/0.053)×4.7M=1.4M where 4.7M is the number of nonfatal workplace injuries in 2002, and 0.053 is the number of injuries per full-time equivalent employee, both per the BLS (2002) news release on workplace injuries and illnesses.

Independent Board$_{j,0}$ equals one for year 2003 and zero otherwise, and *Independent Board*$_{j,+2}$ equals one for 2005 and zero otherwise. The coefficient of *Independent Board*$_{j,k}$ measures the average change in TCR between the base year (the year 2002) and event year *k* for treated establishments relative to control establishments. Figure 1 plots the coefficient estimates along with their 95% confidence intervals.[17] The figure shows that the coefficient of *Independent Board*$_{j,k}$ is statistically insignificant for *k* from before -4- to -2, suggesting that there are no differential time trends in TCR between the treated and control establishments up until one year before the regulatory shock. From the year of the regulatory shock (k=0), the coefficients of *Independent Board*$_{j,k}$ are negative and statistically significant for each year after 2003. The significant coefficient of *Independent Board*$_{j,+4+}$ suggests that the decrease in TCR in treated establishments does not reverse. At first glance, the significant treatment effect in 2003 seems to come too soon. This however can be explained by the fact that some firms began to comply with the board independence requirement in 2002. Consistent with our expectation that it takes some time for the effect of the change in board independence to be fully reflected in TCR, Figure 1 shows that the TCR continue to fall after 2003.

5.1.3. Distance from the fifty-percent threshold and the treatment effect

Our finding is consistent with the improvement in workplace safety being driven by the increase in board independence. However, there is still a concern that some unobservable shock that coincides with the timing of the change in exchange listing rules and happens to have different effects on treated and control firms driving the improvement in workplace safety. To address this concern, we examine the relation between the degree of the workplace safety improvement and the degree of the board independence change. If the treatment effect is driven by the increased representation of independent directors on the board, then firms that increase

[17] The regression results are reported in Internet Appendix Table A2.

board independence more should exhibit greater improvement in workplace safety. In Table 4, we report estimates from a triple difference-in-differences (DDD) regression where treated firms are classified into two groups based on whether their distance from the 50% independence threshold in the year before the regulatory shock is above or below the sample median. We use the distance from the 50% threshold to separate treatment firms because actual change in board independence can be endogenous. We find that the treatment effect is more pronounced for firms having above the sample median distances from the 50% threshold.

5.2. Explaining the Positive Effect on Workplace Safety

Our results so far demonstrate a robust positive causal effect of board independence on workplace safety. In this section, we explore three possible non-mutually exclusive explanations for the positive effect. First, the positive effect can be driven by independent directors' stronger incentives to protect their labor market reputation than non-independent directors. Second, independent directors may be more effective at restraining real earnings management. Since some real earnings management actions can compromise workplace safety, the transition to an independent board may improve workplace safety by restricting such actions. Third, the improvement in workplace safety may be driven by other changes made by the majority independent board that inadvertently improves workplace safety.

5.2.1. Labor lawsuit risk and media coverage

Poor workplace safety increases the likelihood of large workplace safety incidents which can attract lawsuits by employees or shareholders and media attention. The lawsuits and negative media coverage may damage independent directors' labor reputation. In the U.S., workplace safety is regulated by OSHA. OSHA enforces its regulations by conducting inspections. Failure to comply with OSHA regulations and safety standards carries the penalty

of citations and fines. OSHA violations may damage independent directors' reputation because compliance with government regulations may be considered a basic duty of directors. If the positive effect on workplace safety is driven by independent directors' greater incentives to protect their reputation, we should observe stronger effect on treated firms that are more exposed to labor lawsuit risk and, since, greater media coverage can aggravate the reputation damages associated with labor lawsuits and OSHA violation, on treated firms with higher media coverage prior to the regulatory shock. We test this prediction by separating treated firms into two groups: those with high labor lawsuit risk (media coverage) and low labor lawsuit risk (media coverage) based on the sample median in the year prior to the regulatory shock. To calculate the lawsuit risk, we first estimate a logit model to predict the likelihood of a firm being the target of a labor lawsuit next year. The model is estimated using all firms in both the Compustat and the Audit Corporate Legal database from 2000 to 2011. A lawsuit is classified as a labor lawsuit if it is classified as a violation of "Labor Law" or "Fair Labor Standards Act" in the Audit Corporate Legal database. Following (Kim and Skinner, 2012), the predictors include total assets, sales growth, market-adjusted return, stock return skewness, stock return standard deviation, asset turnover, and indicators for membership in biotechnologies, computers, electronics and retail industries (Francis, Philbrick and Schipper, 1994). The fitted values from this model in the year prior to the regulatory shock are used to classify treated firms into the high and low labor lawsuit risk groups. We measure the level of media coverage of a firm by the number of media outlets that track the firm in the year prior to the regulatory shock. The media coverage data is obtained from the RavenPack database.

Table 4 reports the results from triple difference-in-differences (DDD) regressions. For brevity, we only report the coefficient of the triple interaction term. In support of the reputation

hypothesis, we find that the positive effect on workplace safety is concentrated in establishments of treated firms with higher ex ante labor lawsuit risk and media coverage and the differences between the high and low groups are statistically significant at the 5% statistical significance level or better.

5.2.2. Dedicated institutional ownership

Reducing workplace safety accidents, OHSA violations and lawsuits is often in shareholders' interests because these events are costly to firms. However, this requires more investment in workplace safety. As a firm spends more on workplace safety, the marginal benefit of each additional dollar of investment decreases while the marginal cost increases. In theory, there exist an optimal level of investment for each firm that maximizes shareholder value. Before reaching this optimal level, more investments would benefit both employees and shareholders. Over this optimal level, however, the additional investment would hurt shareholders. Our findings so far suggest that the transition to an independent board benefits employees, however, its effect on shareholders is unclear. If the labor market is efficient, then the reputational incentives of independent directors should not lead to overinvestment in workplace safety because ultimately directors should be judged by whether they have served in shareholders' interests. If the labor market is inefficient, however, overinvestment can occur. Since the optimal level of safety investment is unobservable, it is difficult to assess the impact of the improvement in workplace safety that we document on shareholder value. Such a question also cannot be answered by examining the change in firm value with the change in workplace injury rates because firm value is affected by many factors and it is very difficult to isolate the effect of the change in workplace safety on firm value.

In this section, we shed light on this question by examining the relation between the treatment effect and ownership by dedicated institutional investors. (Bushee, 1998) classifies institutional investors that hold large, long-term equity positions in a small number of firms, as dedicated institutions. These investors have strong incentives to monitor their portfolio firms so that the long-term value of their holdings is maximized. Since the benefits of safety investment accrue over long term, these investors are likely to pay closer attention to workplace safety investments than other investors do. Hence, the change in safety investment in firms with higher ownership by dedicated institutional investors should be more consistent with shareholder value maximization than that in firms with low ownership by dedicated institutional investors. If the positive effect on workplace safety is stronger in firms with higher ownership by dedicated institutional investors, then it suggests that the positive effect does not indicate overinvestment in workplace safety. On the other hand, if the positive effect is weaker for firms with higher ownership by dedicated institutional investors, then no clear conclusion can be drawn. It could suggest that dedicated institutional investors are better able to restrict overinvestment by independent directors. However, if monitoring by dedicated institutional investors is a substitute for monitoring by an independent board, then it does not suggest overinvestment by independent directors.

We obtain data on institutional holdings from the Thomas Reuters 13F database. We first follow the procedures in (Bushee, 1998) to construct a list of dedicated institutional investors based on their past investment behavior. We then calculate the percentage of outstanding shares held by all dedicated institutional investors in each treated firm in the year prior to the regulator shock. We next assign the treated firms into a high and a low dedicated ownership groups based on the sample median proportion of ownership by dedicated institutions. Table 5 reports the

estimates from a triple difference-in-differences regression. We find that the treatment effect is concentrated in treated firms with high ownership by dedicated institutional investors. This is inconsistent with independent directors overinvesting in workplace safety. Instead, it suggests that independent directors are mainly motivated by the labor market incentive to serve the interests of major shareholders.

5.2.3. Ownership of employee-friendly institutional investors

Although the interests of dedicated institutional investors in workplace safety investments are driven by financial returns, the interests of some institutional investors may be partially driven by their prosocial values. For these prosocial investors, the optimal level of workplace safety investments that maximizes their welfare is likely to be above the level that maximizes shareholder value. Hence, if the positive effect on workplace safety is driven by independent directors' reputation concerns, they should have a stronger incentive to improve workplace safety in firms with large ownership by prosocial institutional investors. In this section, we test whether ownership by prosocial institutional investors affect independent directors' incentive to improve workplace safety.

5.2.4. Testing the explanation based on real earnings management

(Caskey and Ozel, 2017) find that real earnings management by managers can potentially compromise workplace safety. There are at least two actions that managers can take to manipulate up reported earnings that would harm workplace safety. One is to cut safety spending and the other is to increase workers' workloads. Since earnings management can mislead investors and hurt long-term firm value, independent directors, being better aligned with shareholders, should have strong incentives to curb earnings manipulation by managers. Hence, another potential explanation for the positive effect on workplace safety is that the

transition to an independent board reduces real earnings management by managers, which indirectly improves workplace safety.

To test this explanation, we construct two measures of real earnings management, abnormal discretionary expenses and abnormal production, following (Roychowdhury, 2006). They capture the extent of real activities manipulation through cuts in discretionary expenses and overproduction, respectively. We also construct a measure of overall level of real earnings management by subtracting abnormal discretionary expenses from abnormal production. We then estimate the effect of the regulatory shock on real earnings management using a difference-in-differences regression that is similar to Equation (1) but is at the firm level. The dependent variable is one of the above three measures of real earnings management. The result is reported in Table 6. We find that the coefficient of *Independent Board* is statistically insignificant in all models, suggesting no change in real earnings management around the regulatory shock. This does not support the explanation based on a reduction in real earnings management. This finding is consistent with (Chen, Cheng and Wang, 2015) even though our sample and regression model are different from theirs. A related study by (Cohen, Dey and Lys, 2008) examine the evolution of real and accrual-based earnings management in the pre- and post-SOX periods. They find that there is a shift from accrual-based to real earnings management after SOX. Both papers suggest that corporate boards do not appear to be effective at restraining real earnings management.

This result together with our main result suggest that although managerial propensity to manipulate earnings through changes in real activities does not decrease after the transition to an independent, managers are less likely to use safety-reducing methods, such as cutting safety expenditures, to manipulate earnings. Consistent with this, we find that the positive relation

between workplace injury rates and being a suspect of earning manipulation is significantly weakened following the transition to an independent board. In other words, being an earnings manipulation suspect is less strongly related to higher injury rates in the post-regulation period than in the pre-regulation period for establishments of treated firms relative to establishments of control firms. The result is reported in Table 7. In this table, we regress the establishment level TCR on an indicator for being an earnings manipulation suspect in the year and allow the relation to be affected by the regulatory shock. To identify earnings suspects, we obtain analysts' earnings forecast data from the I/B/E/S database. We first calculate the earnings surprise as the difference between the actual earnings per share for a fiscal year and the average of all analysts' latest earnings forecasts made within the [-180,-4] day window before the earnings announcement date, rounded to the nearest cent. Following (Caskey and Ozel, 2017), we define a firm as an earnings manipulation suspect if the earnings surprise is between 0 and 2 cents. The table shows that being an earnings manipulation suspect is positively related to the TCR, though the coefficient is statistically insignificant. The coefficient of *Independent Board* × *Earnings Suspect* is negative and statistically significant at the 5% level, suggesting that the relation is significantly less positive after the transition to an independent board.

5.2.5. Testing the explanation based on other changes in treated firms

The last explanation we test is that the improvement in workplace safety is an indirect consequence of other changes in firm policies or restructuring. In Table 3, we already control for many of these changes, such as R&D expenses, CEO compensation, analyst coverage, institutional ownership, board business, etc., and the board independence effect remains statistically significant. In this section, we focus on change in employment at the establishment level. Few workers may reduce the difficulty of workplace safety management and the safety

investment needed to maintain the same level of workplace safety. The change in employment may also proxy for a potential change in production technology, which can affect workplace safety. In Table 8, we examine whether the transition to an independent board significantly changes the number of workers at the establishment level. The regression model is the similar to the DiD model in Equation (1) with two notable changes. First, we replace the dependent variable with the natural logarithm of total number of employees in the establishment. Second, we allow the treatment effect to vary with industry level injury rates because changes in employment in high injury risk establishments are likely to have a bigger impact on the average decrease in TCR that we discover. Inconsistent with change in employment driving our main result, we find no evidence that the regulatory shock changes employment.

5.2.6. Product market competition and union coverage

In Tables 4 and 5, we find that ownership by dedicated institutional investors and employee-friendly institutional investors have a complementary relation with board independence in improving workplace safety. One explanation for the complementary relation is that institutional investors mainly monitor firms through their voting rights. Since independent directors rely more on their support to keep their board seats than non-independent directors, they have a greater influence on independent boards. In this section, we examine the relation between board independence and two other governance mechanisms. These mechanisms have the potential to substitute for board independence in reducing managerial agency problems associated with underinvestment in workplace safety. The first one is product market competition. A large literature shows that product competition can reduce managerial slack and substitute for internal governance (Giroud and Mueller, 2010). The second one is monitoring by labor unions. Workplace safety is a top bargaining issue for labor unions. Union

workers are also more aware of workplace safety and health hazards than non-union workers thanks to the education programs run by labor unions. As a result, unionized firms usually have better workplace safety and are subject to greater scrutiny from (Weil, 1991; Morantz, 2013).

To measure the degree of product market competition, we use two text-based market concentration measure constructed by (Hoberg and Phillips, 2016) and separate our sample of treated firms into a high and low competition subsample based on the sample median. To measure union power, we use the union coverage rate in the treated firm's industry to proxy for the union coverage rate in its establishment. The data comes from the Union Membership and Coverage Database as described in (Hirsch and Macpherson, 2003).[18] We define an indicator variable, *High Union Coverage*, which equals one if the firm operates in an industry whose union coverage rate is above the sample median of the year and zero otherwise. Industries are defined by 3-dight SIC codes before 2002 and 4-digit NAICS codes after 2002. We then estimate triple difference-in-differences (DDD) regressions to see if the treatment effect is different for establishments of treated firms facing different level of product market competition and union pressure. The results are reported in Table 9. Consistent with a substitute relation between board independence and these governance mechanisms, we find that the improvement in workplace safety is more pronounced for establishments of treated firms operating in concentrated industries and low unionization industries.

5.2.7. OSHA violations

The ODI data is self-reported by employers. Although OSHA has specific rules for the reporting of work-related injuries and illnesses, establishments are likely to have some discretion over their reporting practices. This raises the concern that our main result may be driven by changes in self-reporting practices in treated establishments relative to control

[18] See https://www.unionstats.com/.

establishments. To address this concern, we corroborate our main results using changes in OSHA violations, which are recorded by OSHA inspectors. We collect establishment-level data on OSHA inspections from the Department of Labor website. We match each inspected establishment to its parent firm in our matched sample of treated and control firms and define two new dependent variables. The first variable, *Violation,* is an indicator variable that equals one if an inspected establishment receives a citation or a fine from OSHA inspectors for violating OSHA standards and zero otherwise, while the second variable, *Serious violation,* is an indicator variable that equals one only if an inspected establishment receives fines from the OSHA inspectors and zero otherwise. We then estimate a linear probability model similar to Equation (1) using these two indicators as the dependent variables.[19] The results are reported in Table 10. We find that inspected treated establishments experience a 17% decline in the probability of having an OSHA violation relative to the sample mean (0.55) compared with inspected control establishments. The decline is 16% of the sample mean (0.427) for the probability of receiving an OSHA fine. Since OSHA violations are recorded by OSHA, this result suggests that the improvement in workplace safety in treated establishments that we find in Table 3 is unlikely to be driven by a change in self-reporting practices from before to after the regulatory shock.

6. Channels

6.1. Increases in Safety Inputs

We argue that managerial agency problems are likely to result in underinvestment in workplace safety. Hence, one channel for independent boards to improve workplace safety is through an increase in safety spending. Since firms are not required to report safety spending in

[19] Since OSHA rarely inspects the same establishment in our sample repeatedly, we replace the establishment fixed effects with parent firm fixed effects. For the same reason, Cohn et. al. (2021) exclude establishment fixed effects when estimating the change in the likelihood of establishment-level OSHA violations around private buyouts.

separate line items, we do not have an accurate, direct measure of safety spending. However, most safety expenses, such as expenses for maintenance and training, are included in the SG&A expenses and they can account for a non-trivial proportion of the SG&A expenses.[20] Hence, we follow (Caskey and Ozel, 2017) and use selling, general and administrative expenses (SG&A) as our proxy for safety spending. We scale SG&A expenses by total assets, sales and total number of employees. We then estimate a regression model that is similar to Equation (1) at the firm level where the dependent variable is the scaled SG&A expenses. The results are reported in Table 11. We find that the coefficient of *Independent Board* is positive and statistically significant at the 5% level for two of the scaled SG&A measures, supporting an increase in safety spending as a channel for the improvement in workplace safety in treated establishments.

6.2. The Inclusion of Safety Metrics in CEO Compensation Contracts

CEO compensation contract is another important device that boards use to address agency problems, especially when the CEO's effort is difficult to observe. The most common practice is to tie a large proportion of a CEO's pay to the firm's stock performance, for example, through equity-based compensation. Besides stock prices, the board often sets short-term or strategic goals for the CEO to achieve that are based on accounting or other performance measures, for example, EBIT, customer satisfaction, employee safety, etc.[21] Thus, we next examine whether the transition to an independent board increases the frequency of employee safety-related metrics being included in CEO compensation contracts. We manually search the

[20] For example, Cohn and Wardlaw (2016) provide an example in which safety expenditures and training comprised 32% of company's SG&A expenses over a ten-year period.

[21] According to a recent survey of boards of directors by Willis Towers Watson, "nearly four in five respondents (78%) are planning to change how they use ESG with their executive incentive plans over the next three years. More than four in 10 (41%) plan to introduce ESG measures into their long-term incentive plans over the next three years, while 37% plan to introduce ESG measures into their annual incentive plans. Additionally, about a third plan to raise the prominence of environmental and social/employee measures in their incentive plans." See https://www.globenewswire.com/news-release/2020/12/09/2142357/0/en/4-in-5-companies-planning-to-change-ESG-measures-in-executive-pay-plans-over-next-3-years-Willis-Towers-Watson-survey-finds.html.

Incentive Lab data for the presence of a list of safety-related words, such as "incident", "injury", "injure", "safe", "safety", "health", "OSHA" and so on. We then read the details of the discussions and confirm that safety metrics are used in the determination of CEO compensation. Most of the safety metrics are used in setting a CEO's cash bonuses. We define an indicator variable, *Safety Metric,* which equals one if a safety metric is included in the CEO's compensation contract in a year and zero otherwise. We then estimate a DiD regression similar to Equation (1) at the firm level, where the dependent variable is *Safety Metric*. The model includes firm and year fixed effects and controls for firm size and performance, which are found to affect CEO compensation. The regression result is reported in columns 7 and 8 of Table 11. We find that the coefficient of *Independent Board* is positive and statistically significant at the 5% level. The estimate indicates that treated firms increase the likelihood of including safety metrics in CEO compensation contracts by 10.8 percentage points relative to control firms. The explicit inclusion of safety metrics in a CEO's compensation contract signals a strong desire of the board to improve workplace safety. This result thus shows another specific channel through which the transition to an independent board improves workplace safety.

7. Additional Evidence

7.1. Does Board Committee Independence Matter?

Besides the requirement for a majority independent board, the new exchange listing rules also require listed firms to have fully independent auditing, compensation, and nominating committees. In this section, we examine whether the full independence of different board committees has any effect on workplace safety.[22] We estimate a variant of Equation (1) where

[22] As noticed by Guo and Masulis (2015), a sizeable proportion of firms that already had an independent board before SOX did not meet the fully independent board committees requirements. Specifically, they show in their

we include two sets of DiD terms, one for the independence of the board and the other for the full independence of a board committee. Table 12 shows that only the full independence of the audit committee has an incremental effect on workplace safety. Although the primary purpose of a company's audit committee is to provide oversight of the financial reporting and audit process and internal system of control, it is usually also responsible for compliance with laws and regulations. Hence, safety reporting and compliance with OSHA standards are likely to fall under the purview of the audit committee. Audit committee members may also be more aware of their company's safety spending than other board members.

7.2. Further Robustness Checks

In the Internet Appendix, we show that our results are robust to using the propensity score matching method to match treatment and control firms, to including only more serious injuries in calculating injury rates, to excluding small establishments where injury rates are less stable, and to controlling for concurrent changes in a variety of corporate governance variables.

8. Conclusion

The proliferation of independent boards (i.e. boards with more than 50% independent directors) around the world has mostly been driven by its purported benefits to shareholders. However, relatively little is known about how board independence affects non-shareholder stakeholders. This paper fills this gap by conducting the first study of the effect of independent boards on employee safety and health at workplaces.

Exploiting an exogenous regulatory change in the U.S that mandates all publicly listed firms to have more than 50% independent directors on the board, we find that the adoption of

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Table 3 that among firms with an independent board in 2001, 61% of them do not have a fully independent nominating committee, 22% do not have a full independent audit committee and 18% do not have a fully independent compensation committee.

independent boards significantly improves workplace safety. Although existing studies find that managerial agency problems can benefit employees in certain circumstances, our evidence suggests that managerial agency problems have a net negative impact on employee safety and health. By reducing these managerial agency problems, independent boards not only benefit shareholders but also benefit employee safety and health.

Our study opens up a new direction for board independence research. Future studies can explore other aspects of non-shareholder stakeholders' interests to enrich our understanding of the relation between this important dimension of corporate governance and stakeholder interests. Our paper also provides important evidence for the current debate on whether the shareholder governance model should be replaced with a shareholder governance model.

Appendix
Table A1. Variable Definitions

Board Independence Mandate		Data Source
Independent Board	An indicator that equals one for the year 2003 and beyond for firms that had a non-independent board in 2001 but an independent board in 2003 or later and zero otherwise.	ISS
Independent Audit Committee	An indicator variable that equals one if a firm has a fully independent audit committee in a year and zero otherwise.	ISS
Independent Nominating Committee	An indicator variable that equals one if a firm has a fully independent nominating committee in a year and zero otherwise.	ISS
Independent Compensation Committee	An indicator variable that equals one if a firm has a fully independent compensation committee in a year and zero otherwise.	ISS
Establishment Characteristics		
TCR	The number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000.	OSHA ODI
Ln(Number of Employees)	The natural logarithm of total number of employees at an establishment.	OSHA ODI
Ln(Total Hours Worked)	The natural logarithm of total number of annual hours worked at an establishment.	OSHA ODI
Ln(Hours/Employee)	The natural logarithm of total number of annual hours worked at an establishment divided by the number of employees.	OSHA ODI
Strike	An indicator variable that equals one if an establishment has a strike/lockout in a year.	OSHA ODI
Shutdown	An indicator variable that equals one if an establishment has a shutdown/layoff in a year.	OSHA ODI
Seasonal	An indicator variable that equals one if an establishment employs seasonal workers in a year.	OSHA ODI
Natural Disaster	An indicator variable that equals one if an establishment has adverse weather conditions/natural disasters in a year.	OSHA ODI
Violation	An indicator variable that equals one if the establishment has any safety violations under OSHA inspection in the year and zero otherwise.	OSHA Enforcement
Serious Violation	An indicator variable that equals one if the establishment has any fines-associated safety violations under OSHA inspection in the year and zero otherwise.	OSHA Enforcement
Firm Characteristics		
Ln(Assets)	The natural logarithm of book value of total assets.	Compustat
Cash/Assets	The ratio of cash and short-term investment over total assets.	Compustat
Leverage	The ratio of long-term and short-term debt over total assets.	Compustat
Tobin's Q	The ratio of market value of assets (book value of total assets minus book value of equity minus deferred taxes plus market value of equity) over book value of total assets.	Compustat
ROA	The ratio of a firm's operating income over lagged total assets.	Compustat
PPE/Assets	The ratio of net property, plant, and equipment over total assets.	Compustat
CapEx/Assets	The ratio of capital expenditures over total assets.	Compustat
R&D/Assets	The ratio of research and development spending over lagged total assets.	Compustat
Dividends/Assets	The ratio of common dividends paid over lagged total assets.	Compustat
Ln(CEO Compensation)	The natural logarithm of total CEO compensation.	Execucomp
% of Independent Directors	The percentage of independent directors in a board.	BoardEx and ISS

Δ*Independent Director*	The percentage change of independent directors from 2001 to passing the mandate threshold value of 50%.	BoardEx and ISS
Labor Penalty	The dollar amount of labor-related violation penalty for a firm in a year.	Good Job First
Labor Suit Risk	The likelihood of being sued in a labor lawsuit. The likelihood is estimated with all firms in Compustat and Audit Corporate Legal database based on Model 3 of Kim and Skinner (2012). First, we define the dependent variable as "Sued" if a firm is sued in a labor-related lawsuit in a year. We classify a labor lawsuit based on the violation of two law categories in Audit Analytics Legal database: "Labor Law" and "Fair Labor Standards Act". Second, we regress "Sued" on FPS (Francis, Philbrick and Schipper) industry indicator, lagged book assets, lagged sales growth, lagged market-adjusted return, lagged return skewness, lagged return standard deviation, and lagged asset turnover. Third, we obtain the fitted value as the probability of being sued for a firm.	Compustat and Audit Analytics Corporate Legal
Abnormal Production	An indicator variable that equals one if a firm's abnormal production is above the top quartile of the sample firms in 2001 and zero otherwise; abnormal production is the residual from regressions of the sum of the cost of goods sold and the change in inventory divided by the beginning book assets [$(COGS_t+INVCH_t)/AT_{t-1}$] on the inverse beginning book assets [$1/AT_{t-1}$], the sales divided by the beginning book assets [$SALE_t/AT_{t-1}$], the sales changes divided by the beginning book assets [$SALE_t/AT_{t-1}$] and the beginning sales changes divided by the beginning book assets [$SALE_{t-1}/AT_{t-1}$]for each year and 2-digit SIC industry. Each industry-year has at least 15 observations	Compustat
Abnormal Discretionary Expenses	An indicator variable that equals one if a firm's abnormal discretionary expense is above the top quartile of the sample firms in 2001 and zero otherwise; abnormal discretionary expense is the residual from regressions of the selling, general, and administrative expenses divided by the beginning book assets [$XSGA_t/AT_{t-1}$] on the inverse beginning book assets [$1/AT_{t-1}$] and the sales divided by the beginning book assets [$SALE_t/AT_{t-1}$] for each year and 2-digit SIC industry. Each industry-year has at least 15 observations.	Compustat
SGA/Assets	The ratio of the selling, general, and administrative expenses over lagged total assets.	Compustat
SGA/Sales	The ratio of the selling, general, and administrative expenses over total sales.	Compustat
SGA/Employees	The ratio of the selling, general, and administrative expenses over the number of employees.	Compustat
Employee Friendly IO	The percentage of shares outstanding owned by employee friendly institutional investors. Similar with Cao et al. (2022) and Thomas et al. (2023), we identify from 13F institutions based on the employee treatment footprint of their portfolio firms. First, we calculate KLD employee net score for each firm in a year. We measure the employee orientation of an institutional investor by taking the stock value-weighted average of the employee net score of all stocks in its portfolio at the end of each quarter. Third, we sort all institutions into three groups based on the average environment net score of their holding portfolios each quarter and define those in the top tercile as environmentally sustainable institutions. Fourth, Employee Friendly IO is the percentage of shares outstanding owned by employee friendly institutions.	TR 13F and MSCI KLD
Dedicated IO	The percentage of shares outstanding owned by dedicated institutional investors (Bushee, 2001)	TR 13F and Bushee's Investor

		Classification
CEO Safety Compensation	An indicator variable that equals one if a firm has at least one safety performance-based compensation award in its CEO compensation contract in a year and zero otherwise.	ISS Incentive Lab
TNIC Market HHI	The industry concentration based on the text-based network industry classification.	(Hoberg and Phillips, 2016)
TNIC Product Similarity	The firm's product similarity index relative to its competitors.	(Hoberg and Phillips, 2016)
Dual CEO	An indicator variable that equals one if an CEO is also the chair of the board.	BoardEx and ISS
Board Size	The number of directors in a board.	BoardEx and ISS
Busy Board	An indicator variable that equals one if a majority of the independent directors on the board serve on three or more boards.	BoardEx and ISS
IO	The percentage of shares outstanding owned by institutional investors.	TR 13F
Analyst Coverage	The natural logarithm of one plus the number of analyst earnings forecasts in a year.	IBES
Industry Characteristics		
Sales Market HHI	The sum of squares of market shares in the industry, $\sum^{[s/S]^2}$, where s is firm sales and S is the sum of sales for all Compustat firms in a 4-digit SIC industry.	Compustat
Union Membership	The percentage of workers who are unionized in the industry of a firm. Industries are defined by 4-dight SIC codes before 2002 and 6-digit NAICS codes after 2002.	Union Membership and Coverage
Director Election Characteristics		
Support Votes	The percentage of election votes casted by owners who support to pass the election of a director.	ISS Voting Analytics Vote Results

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Figure 1. Dynamic Effects of Independent Board

This figure plots the dynamic effects of the board independence mandate on workplace injury rate around the issuance of the NYSE and Nasdaq new listing rules in 2003. The coefficient estimates on *Independent Board*$_{j,k}$ and their 95% confidence intervals from the following model are plotted in the figure.

$$Y_{i,j,l,s,t} = \alpha + \sum_{k\in(-4-,-2)\cup(0,+4+)} \beta_k * Independent\ Board_{j,k} + \delta E_{i,t-1} + \gamma F_{j,t-1} + \theta_i + \mu_{l,t} + \pi_{s,t} + \varepsilon_{i,j,l,s,t}$$

Independent Board$_{j,k}$ is an indicator variable that equals one for the *k-th* year relative to 2003 for all establishments of treatment firm j. The year 2002 is the base year. *Independent Board*$_{j,-1}$ is excluded so that all estimates are relative to the base year. $Y_{i,j,l,s,t}$ is workplace injury rate for an establishment year; $E_{i,t-1}$ is a vector of establishment-level control variables; $F_{j,t-1}$ is a vector of firm-level control variables; θ_i is establishment fixed effects; μ_{lt} is establishment industry by year fixed effects; π_{st} is establishment state of location by year fixed effects; and $\epsilon_{i,j,l,s,t}$ is the error term. Standard errors are clustered at the firm level.

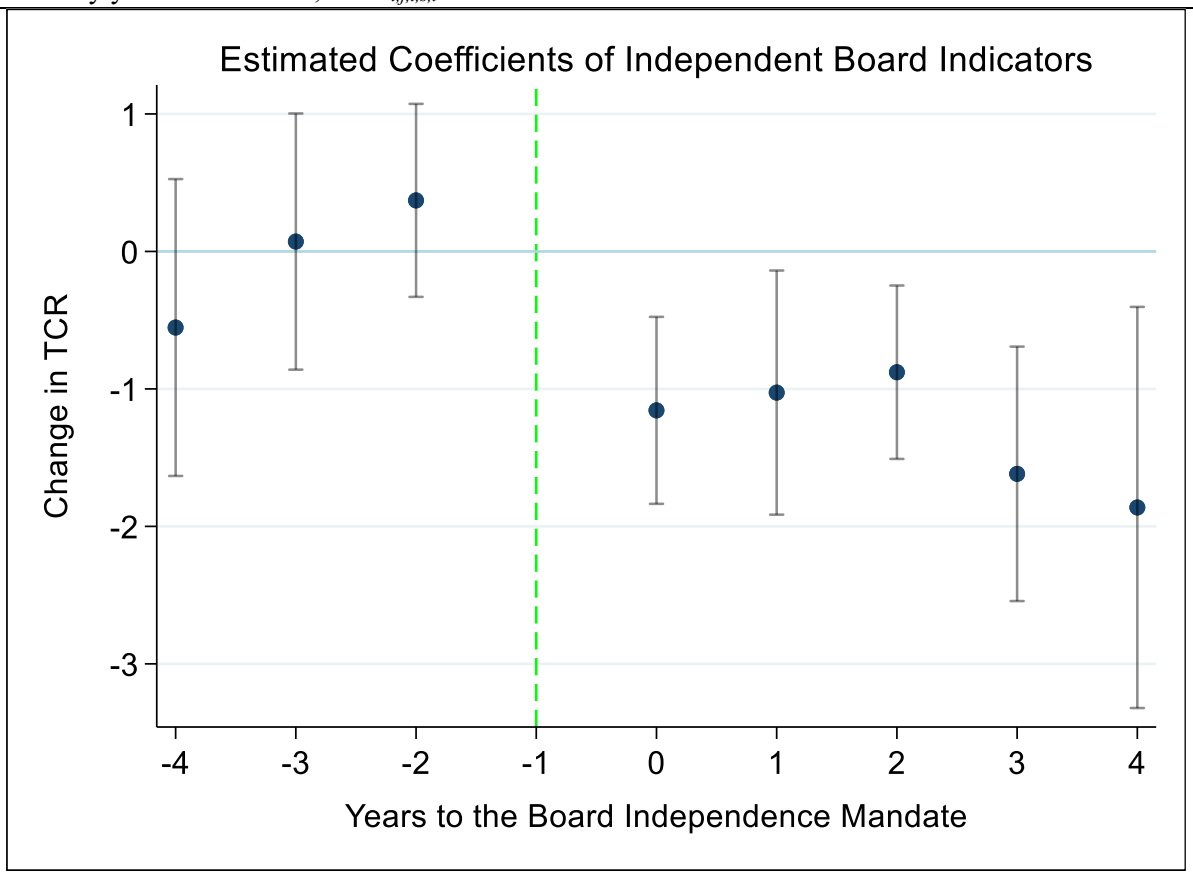


Table 1. Sample Construction

This table reports the sample for the matched firms and establishments after two-stage coarsened exact matching based on 2-digit SIC industry codes, the natural logarithm of total assets, cash, leverage, free cash flow, Tobin's Q, and ROA at the firm level and then based on 2-digit SIC industry codes, the number of employees, and the total hours worked at the establishment level. The sample period is from 1996 to 2008. T tests compare the means of key characteristics of treatment and control firms and treatment and control establishments, averaged over the years 2000 and 2001.

Panel A: CEM Matched Firms and Establishments

	Treat Firms		Control Firms			
		Mean		Mean	Difference	Pr(|T| > |t|)
Ln(Assets)	88	7.206	289	7.455	0.249	0.115
Cash/Assets	88	0.077	289	0.071	-0.006	0.550
Leverage	88	0.251	289	0.250	-0.001	0.946
Free Cash Flow	88	0.113	289	0.106	-0.007	0.297
Tobin's Q	88	1.850	289	1.813	-0.037	0.725
ROA	88	0.177	289	0.167	-0.010	0.250
PPE/Assets	88	0.314	289	0.302	-0.012	0.524
CapEx/Assets	88	0.069	289	0.063	-0.006	0.276
Sales/Assets	88	1.410	289	1.429	0.018	0.849
Board Size	87	9.169	288	9.578	0.410	0.128
% of Independent Directors	87	0.422	288	0.705	0.283	0.000
	Treat Establishments		Control Establishments			
		Mean		Mean	Difference	Pr(|T| > |t|)
Number of Employees (000s)	1581	319.224	4111	319.314	0.091	0.995
Ln(Total Hours Worked)	1581	12.695	4111	12.715	0.021	0.497
TCR	1581	15.392	4111	11.008	-4.384	0.000

Table 2. Summary Statistics

This table reports the summary statistics of establishment-level and firm-level variables in our sample. See variable definitions in Table A1. All continuous variables are winsorized at 1% and 99%.

	N	Mean	S.D.	P25	Median	P75
B.1. Establishment Injuries and Illnesses Data from OSHA ODI						
TCR	34657	12.016	9.409	5.267	10.150	16.422
DART	34657	7.462	6.410	2.574	6.086	10.659
DAFWII	34657	3.693	4.342	0.660	2.215	5.123
Number of Employees (000s)	34657	0.337	0.509	0.088	0.160	0.353
Ln(Number of Employee)	34657	2.269	0.439	1.944	2.204	2.548
Ln(Total Hours Worked)	34657	12.772	1.032	12.002	12.628	13.457
Strike	34657	0.004	0.065	0.000	0.000	0.000
Shutdown	34657	0.067	0.249	0.000	0.000	0.000
Seasonal	34657	0.035	0.183	0.000	0.000	0.000
Natural Disaster	34657	0.006	0.075	0.000	0.000	0.000
B.2. Establishment OSHA Safety Violation Data from OSHA Enforcement						
Violation (0/1)	3923	0.436	0.496	0	0	1
Serious Violation (0/1)	3923	0.348	0.476	0	0	1
B.3. Accounting and Other Data						
Ln(Assets)	3336	7.604	1.374	6.587	7.446	8.365
Cash/Assets	3336	0.072	0.078	0.016	0.042	0.102
Leverage	3336	0.239	0.143	0.139	0.236	0.333
Tobin's Q	3336	1.773	0.737	1.249	1.558	2.106
ROA	3336	0.168	0.075	0.116	0.161	0.213
PPE/Assets	3336	0.295	0.154	0.175	0.268	0.384
CapEx/Assets	3336	0.060	0.044	0.029	0.047	0.077
Dividends/Assets	3336	0.015	0.016	0.000	0.011	0.023
R&D/Assets	3336	0.019	0.024	0.000	0.009	0.029
Ln(CEO Compensation)	3336	7.930	0.942	7.241	7.911	8.568
Board Size	3066	9.815	2.142	8.000	10.000	11.000
Board Independence	3066	0.675	0.168	0.556	0.700	0.818
Abnormal SGA	3058	0.050	1.588	-0.535	0.492	1.098
Earnings Suspect	3336	0.087	0.282	0.000	0.000	0.000
SGA/Assets	3089	0.272	0.179	0.134	0.232	0.363
SGA/Sales	3089	0.210	0.116	0.117	0.117	0.278
SGA/Employees	3089	44.706	30.717	23.346	36.700	58.667
CEO Safety Compensation	644	0.045	0.208	0.000	0.000	0.000

Table 3. Independent Board and Workplace Safety

This table reports estimates from a difference-in-differences regression estimating the effect of the independent board mandate on establishment-level workplace injury rate. The sample consists of all establishments in our matched sample for the period 1996-2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *TCR* is the number of injuries and illnesses divided by the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. All control variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*			
	(1)	(2)	(3)	(4)
Independent Board	-1.206***	-1.233***	-1.117***	-1.128***
	(0.452)	(0.460)	(0.426)	(0.412)
Ln(Number of Employees)		1.189*	1.201**	1.206**
		(0.606)	(0.606)	(0.607)
Strike		2.612***	2.621***	2.635***
		(0.780)	(0.777)	(0.774)
Shutdown		0.161	0.137	0.137
		(0.191)	(0.186)	(0.186)
Seasonal Hiring		0.466*	0.473*	0.468*
		(0.266)	(0.270)	(0.270)
Natural Disaster		1.356**	1.330**	1.326**
		(0.564)	(0.566)	(0.567)
Ln(Assets)			0.352	0.342
			(0.381)	(0.369)
Cash/Assets			1.928	1.909
			(2.732)	(2.691)
Leverage			-2.731	-2.728
			(1.569)	(1.544)
Tobin's Q			0.001	-0.004
			(0.278)	(0.276)
ROA			-3.993*	-3.861*
			(2.234)	(2.260)
PPE/Assets			-4.434	-4.349
			(3.625)	(3.484)
CapEx/Assets			-2.836	-2.611
			(4.131)	(4.125)
Dividends/Assets			3.939	4.060
			(4.699)	(4.760)
R&D/Assets				-10.861
				(13.391)
Ln(CEO Compensation)				0.014
				(0.169)
Establishment FE	Y	Y	Y	Y
Industry × Year FE	Y	Y	Y	Y
State × Year FE	Y	Y	Y	Y
Adjusted R^2	0.586	0.587	0.588	0.588
Observations	34,657	34,657	34,657	34,657

Table 4. Treatment effect and distance from the threshold, labor lawsuit risk and media coverage
This table presents results from estimating the effect of the board independence mandate on establishment-level workplace injury rate with addition of independent directors, litigation risk, and media coverage. The sample consists of all establishments belonging to firms in the matched sample of treatment and control firms over the period from 1996 to 2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *TCR* is the number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. Δ*Independent Director* is the percentage change of independent directors from 2001 to passing the mandate threshold value of 50%. *Labor Suit Risk* is the likelihood of being sued in a labor lawsuit. *Media Coverage* is the number of media outlets that track a firm. High/Low group is defined if the variable is above/below the sample median in one year before the regulation and zero otherwise. All columns include the same control variables as Column (3) of Table 2. All variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*		
	(1)	(2)	(3)
Independent Board × *High* Δ*Independent Director*	-1.693***		
	(0.535)		
Independent Board × *Low* Δ*Independent Director*	-0.339		
	(0.509)		
Independent Board × *High Labor Suit Risk*		-1.507***	
		(0.442)	
Independent Board × *Low Labor Suit Risk*		0.249	
		(0.758)	
Independent Board × *High Media Coverage*			-1.784***
			(0.444)
Independent Board × *Low Media Coverage*			-0.081
			(0.526)
Controls	Y	Y	Y
Establishment FE	Y	Y	Y
Industry × Year FE	Y	Y	Y
State × Year FE	Y	Y	Y
F-test (High - Low)	3.700	4.450	7.530
Prob > F	0.055	0.036	0.006
Adjusted R^2	0.589	0.589	0.589
Observations	34,463	34,456	34,463

Table 5. Treatment Effect and Institutional Ownership

This table presents results from estimating the effect of the board independence mandate on establishment-level workplace injury rate with shareholder investment horizon and pro-labor preference. The sample consists of all establishments belonging to firms in the matched sample of treatment and control firms over the period from 1996 to 2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *TCR* is the number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. *Dedicated IO* is the percentage of shares outstanding owned by dedicated institutional investors. *Employee Friendly IO* is the percentage of shares outstanding owned by employee friendly institutional investors. High/Low group is defined if the variable is above/below the sample median in one year before the regulation and zero otherwise. All columns include the same control variables as Column (3) of Table 2. All variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*	
	(1)	(2)
Independent Board × *High Dedicated IO*	-1.558***	
	(0.435)	
Independent Board × *Low Dedicated IO*	0.091	
	(0.606)	
Independent Board × *High Employee Friendly IO*		-1.475***
		(0.428)
Independent Board × *Low Employee Friendly IO*		-0.069
		(0.631)
Controls	Y	Y
Establishment FE	Y	Y
Industry × Year FE	Y	Y
State × Year FE	Y	Y
F-test (High - Low)	6.200	4.560
Prob > F	0.013	0.033
Adjusted R^2	0.589	0.589
Observations	34,463	34,463

Table 6. The effect on real earnings management

This table examines the effect of the board independence mandate on real earnings management. The sample consists of all firms in the matched sample of treatment and control firms over the period from 1996 to 2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *Abnormal Production* is the residual from regressions of the sum of the cost of goods sold and the change in inventory divided by the beginning book assets $[(COGS_t+INVCH_t)/AT_{t-1}]$ on the inverse beginning book assets $[1/AT_{t-1}]$, the sales divided by the beginning book assets $[SALE_t/AT_{t-1}]$, the sales changes divided by the beginning book assets $[SALE_t/AT_{t-1}]$ and the beginning sales changes divided by the beginning book assets $[SALE_{t-1}/AT_{t-1}]$ for each year and 2-digit SIC industry. *Abnormal Discretionary* is the residual from regressions of the sum of research and development expenses and advertisement expenses divided by the beginning book assets $[(XRD_t+XAD_t)/AT_{t-1}]$ on the inverse beginning book assets $[1/AT_{t-1}]$ and the sales divided by the beginning book assets $[SALE_t/AT_{t-1}]$ for each year and 2-digit SIC industry. Following the literature, we replace missing values with zeros for research and development expenses and advertisement expenses. We multiply *Abnormal Discretionary* by minus one so that higher values indicate more real earnings management. For both models, we require each industry-year to have at least 15 observations. *REM* is the sum of abnormal production and abnormal discretionary expenses. All columns include the same control variables as Column (3) of Table 2. See variable definitions in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*Abnormal Production*		*Abnormal Discretionary*		*REM*	
	(1)	(2)	(3)	(4)	(5)	(6)
Independent Board	-0.003	-0.014	-0.002	-0.001	-0.011	-0.021
	(0.015)	(0.011)	(0.003)	(0.003)	(0.018)	(0.013)
Controls	N	Y	N	Y	N	Y
Firm FE	Y	Y	Y	Y	Y	Y
Firm Industry × Year FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.833	0.930	0.834	0.863	0.810	0.901
Observations	2,975	2,975	2,975	2,975	2,975	2,975

Table 7. The effect on the relation between earnings manipulation and workplace safety

This table presents results from estimating the effect of the board independence mandate on SG&A expense manipulation and on establishment-level workplace injury rate with earnings expectation. The sample consists of all firms in the matched sample of treatment and control firms over the period from 1996 to 2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *Abnormal SGA* is the residual from regressions of the selling, general, and administrative expenses divided by the beginning book assets [$XSGA_t/AT_{t-1}$] on the inverse beginning book assets [$1/AT_{t-1}$] and the sales divided by the beginning book assets [$SALE_t/AT_{t-1}$] for each year and 2-digit SIC industry. We require each industry-year to have at least 15 observations. In Panel B, we include the full set of main effects and interaction terms for a triple difference-in-differences regression in the model, however, for brevity, we only report the coefficients of selected terms. *Earnings Suspect* is an indicator variable that equals one if a firm meets or beats the average analyst earnings forecasts by one cent or less in a year. All columns include the same control variables as Column (3) of Table 2. See variable definitions in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Independent Board and Abnormal SGA

Dependent Variable	*Abnormal SGA*	
	(1)	(2)
Independent Board	0.158*	0.241***
	(0.094)	(0.080)
Controls	N	Y
Firm FE	Y	Y
Firm Industry × Year FE	Y	Y
Adjusted R^2	0.865	0.925
Observations	3,058	3,058

Panel B: Earnings Manipulation and Safety

Dependent Variable	*TCR*
	(1)
Independent Board × *Earnings Suspect*	-2.060***
	(0.476)
Independent Board	-0.771*
	(0.401)
Earnings Suspect	0.217
	(0.240)
Controls	Y
Establishment FE	Y
Industry × Year FE	Y
State × Year FE	Y
Adjusted R^2	0.588
Observations	34,657

Table 8. The effect on number of employees

This table presents results of estimating the effect of the board independence mandate on establishment-level total employment. The sample consists of all establishments in the matched sample over the period from 1996 to 2008. *Independent Board* equals one for year 2003 and beyond for treatment firms, and zero otherwise. *Ln(Number of Employees)* is the natural logarithm of the number of employees at an establishment in a year. *Industry TCR* is the 4-digit industry injury rate for an establishment. *Firm TCR* is the parent firm injury rate for an establishment. All columns include the same control variables as Column (3) of Table 3. All variables are defined in the Appendix. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*Ln(Number of Employees)*			
	(1)	(2)	(3)	(4)
Independent Board × *Industry Injury Rate*	0.002	0.002		
	(0.001)	(0.001)		
Industry Injury Rate	0.003***	0.003***		
	(0.001)	(0.001)		
Independent Board × *TCR*			0.001	0.001
			(0.001)	(0.001)
TCR			-0.000	-0.000
			(0.001)	(0.001)
Independent Board	-0.003	-0.007	-0.003	-0.007
	(0.018)	(0.017)	(0.019)	(0.018)
Controls	Y	Y	Y	Y
Establishment FE	Y	Y	Y	Y
Industry × Year FE	Y	Y	Y	Y
State × Year FE	Y	Y	Y	Y
Adjusted R^2	0.889	0.890	0.889	0.890
Observations	34,657	34,657	34,657	34,657

Table 9. Interaction with product market competition and labor unions

This table presents results from estimating the effect of the board independence mandate on establishment-level workplace injury rate with product market competition and unionization. The sample consists of all establishments belonging to firms in the matched sample of treatment and control firms over the period from 1996 to 2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *TCR* is the number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. *TNIC Market HHI* is the industry concentration based on the text-based network industry classification (Hoberg and Phillips, 2016). *TNIC Product Similarity* is a firm's product similarity index relative to its competitors (Hoberg and Phillips, 2016). *Union Membership* is the percentage of workers who are unionized in the industry of a firm. High/Low group is defined if the variable is above/below the sample median in one year before the regulation and zero otherwise. All columns include the same control variables as Column (3) of Table 2. All variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*		
	(1)	(2)	(3)
Independent Board × *High TNIC Market HHI*	-1.511***		
	(0.440)		
Independent Board × *Low TNIC Market HHI*	-0.199		
	(0.758)		
Independent Board × *High TNIC Product Similarity*		-0.629	
		(0.543)	
Independent Board × *Low TNIC Product Similarity*		-1.507***	
		(0.516)	
Independent Board × *High Union Membership*			-0.264
			(0.580)
Independent Board × *Low Union Membership*			-1.833***
			(0.478)
Controls	Y	Y	Y
Establishment FE	Y	Y	Y
Industry × Year FE	Y	Y	Y
State × Year FE	Y	Y	Y
F-test (High - Low)	2.400	1.450	4.790
Prob > F	0.122	0.229	0.029
Adjusted R^2	0.589	0.589	0.589
Observations	34,463	34,463	34,534

Table 10. The effect on OSHA violations

This table presents results from estimating the effect of the board independence mandate on the likelihood of having OSHA safety violations. The sample consists of all OSHA-inspected establishments belonging to firms in the matched sample in Table 2 for the period 1996-2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *Violation* equals one if an establishment receives a citation or a fine from OSHA inspectors for violation of OSHA standards in a year and zero otherwise. *Serious Violation* equals one if an establishment receives a fine from OSHA inspectors in a year and zero otherwise. All columns include the same control variables as Column (3) of Table 2. See variable definitions in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*Violation (0/1)*		*Serious Violation (0/1)*	
	(1)	(2)	(3)	(4)
Independent Board	-0.092**	-0.125**	-0.105***	-0.135***
	(0.038)	(0.055)	(0.036)	(0.051)
Controls	N	Y	N	Y
Establishment FE	Y	Y	Y	Y
Industry × Year FE	Y	Y	Y	Y
State × Year FE	Y	Y	Y	Y
Adjusted R^2	0.083	0.082	0.084	0.081
Observations	3,923	3,923	3,923	3,923

Table 11. Channels: Safety spending and CEO compensation incentives

This table presents results from estimating the effect of the board independence mandate on corporate safety investment and managerial safety compensation incentives. The sample consists of all matched firms covered by Incentive Lab database over the period from 1996 to 2008. *Independent Board* is an indicator that equals one if a firm switches from a minority of independent board members to a majority of independent board members in 2003 or later, and zero otherwise. *SGA/Assets* is the ratio of the selling, general, and administrative expenses over lagged total assets. *SGA/Sales* is the ratio of the selling, general, and administrative expenses over total sales. *SGA/Employees* is the ratio of the selling, general, and administrative expenses over the number of employees. *CEO Safety Compensation (0/1)* is an indicator variable that equals one if a firm has at least one safety performance-based compensation award in its CEO compensation contract in a year and zero otherwise. All columns include the same firm-level control variables as Column (3) of Table 2. See variable definitions in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Safety Investment						Safety-related Executive Compensation	
Dependent Variable	*SGA/Assets*		*SGA/Sales*		*SGA/Employees*		*CEO Safety Compensation (0/1)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Independent Board	0.022**	0.027***	0.010*	0.011**	0.736	1.437	0.133*	0.108**
	(0.010)	(0.008)	(0.006)	(0.005)	(1.492)	(1.431)	(0.069)	(0.052)
Controls	N	Y	N	Y	N	Y	N	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm Industry × Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.904	0.932	0.903	0.913	0.902	0.911	0.372	0.375
Observations	3,089	3,089	3,089	3,089	3,089	3,089	644	644

Table 12. The effect of full independence of board committees on workplace safety

This table examines the roles of board committees on establishment-level workplace injury rate during the board independence mandate. The model is a difference-in-differences model with treatment effects from two separate sources: the board independence and the full independence of a board committee. The sample consists of all establishments in our matched sample for the period 1996–2008. *Independent Audit Committee* is an indicator variable that equals one if a firm has a fully independent audit committee in a year and zero otherwise. *Independent Nominating Committee* is an indicator variable that equals one if a firm has a fully independent nominating committee in a year and zero otherwise. *Independent Compensation Committee* is an indicator variable that equals one if a firm has a fully independent compensation committee in a year and zero otherwise. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *TCR* is the number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. Even columns include the same control variables as Column (3) of Table 2. See variable definitions in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*					
	(1)	(2)	(3)	(4)	(5)	(6)
Independent Audit Committee	-1.550***	-1.289**				
	(0.583)	(0.620)				
Independent Nominating Committee			-0.699	-0.483		
			(0.437)	(0.349)		
Independent Compensation Committee					-0.200	0.145
					(0.499)	(0.465)
Independent Board		-0.778*		-1.055***		-1.147***
		(0.443)		(0.396)		(0.407)
Controls	N	Y	N	Y	N	Y
Establishment FE	Y	Y	Y	Y	Y	Y
Industry × Year FE	Y	Y	Y	Y	Y	Y
State × Year FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.587	0.588	0.586	0.588	0.585	0.588
Observations	34,657	34,657	34,657	34,657	34,657	34,657

Appendix

Table A1. Variable Definitions

Board Independence Mandate		Data Source
Independent Board	An indicator that equals one for the year 2003 and beyond for firms that had a non-independent board in 2001 but an independent board in 2003 or later and zero otherwise.	ISS
Independent Audit Committee	An indicator variable that equals one if a firm has a fully independent audit committee in a year and zero otherwise.	ISS
Independent Nominating Committee	An indicator variable that equals one if a firm has a fully independent nominating committee in a year and zero otherwise.	ISS
Independent Compensation Committee	An indicator variable that equals one if a firm has a fully independent compensation committee in a year and zero otherwise.	ISS
Establishment Characteristics		
TCR	The number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year multiplied by 200,000.	OSHA ODI
Ln(Number of Employees)	The natural logarithm of total number of employees at an establishment.	OSHA ODI
Ln(Total Hours Worked)	The natural logarithm of total number of annual hours worked at an establishment.	OSHA ODI
Ln(Hours/Employee)	The natural logarithm of total number of annual hours worked at an establishment divided by the number of employees.	OSHA ODI
Strike	An indicator variable that equals one if an establishment has a strike/lockout in a year.	OSHA ODI
Shutdown	An indicator variable that equals one if an establishment has a shutdown/layoff in a year.	OSHA ODI
Seasonal	An indicator variable that equals one if an establishment employs seasonal workers in a year.	OSHA ODI
Natural Disaster	An indicator variable that equals one if an establishment has adverse weather conditions/natural disasters in a year.	OSHA ODI
Violation	An indicator variable that equals one if the establishment has any safety violations under OSHA inspection in the year and zero otherwise.	OSHA Enforcement
Serious Violation	An indicator variable that equals one if the establishment has any fines-associated safety violations under OSHA inspection in the year and zero otherwise.	OSHA Enforcement
Firm Characteristics		
Ln(Assets)	The natural logarithm of book value of total assets.	Compustat
Cash/Assets	The ratio of cash and short-term investment over total assets.	Compustat
Leverage	The ratio of long-term and short-term debt over total assets.	Compustat
Tobin's Q	The ratio of market value of assets (book value of total assets minus book value of equity minus deferred taxes plus market value of equity) over book value of total assets.	Compustat
ROA	The ratio of a firm's operating income over lagged total assets.	Compustat
PPE/Assets	The ratio of net property, plant, and equipment over total assets.	Compustat
CapEx/Assets	The ratio of capital expenditures over total assets.	Compustat
R&D/Assets	The ratio of research and development spending over lagged total assets.	Compustat

Dividends/Assets	The ratio of common dividends paid over lagged total assets.	Compustat
Ln(CEO Compensation)	The natural logarithm of total CEO compensation.	Execucomp
% of Independent Directors	The percentage of independent directors in a board.	BoardEx and ISS
Δ*Independent Director*	The percentage change of independent directors from 2001 to passing the mandate threshold value of 50%.	BoardEx and ISS
Labor Suit Risk	The likelihood of being sued in a labor lawsuit. The likelihood is estimated with all firms in Compustat and Audit Corporate Legal database based on Model 3 of Kim and Skinner (2012). First, we define the dependent variable as "Sued" if a firm is sued in a labor-related lawsuit in a year. We classify a labor lawsuit based on the violation of two law categories in Audit Analytics Legal database: "Labor Law" and "Fair Labor Standards Act". Second, we regress "Sued" on FPS (Francis, Philbrick and Schipper) industry indicator, lagged book assets, lagged sales growth, lagged market-adjusted return, lagged return skewness, lagged return standard deviation, and lagged asset turnover. Third, we obtain the fitted value as the probability of being sued for a firm.	Compustat and Audit Analytics Corporate Legal
Media Coverage	The number of media outlets that track a firm in a year.	RavenPack
Dedicated IO	The percentage of shares outstanding owned by dedicated institutional investors (Bushee, 2001)	TR 13F and Bushee's Investor Classification
Employee Friendly IO	The percentage of shares outstanding owned by employee friendly institutional investors. Similar with Cao et al. (2022) and Thomas et al. (2023), we identify from 13F institutions based on the employee treatment footprint of their portfolio firms. First, we calculate KLD employee net score for each firm in a year. We measure the employee orientation of an institutional investor by taking the stock value-weighted average of the employee net score of all stocks in its portfolio at the end of each quarter. Third, we sort all institutions into three groups based on the average environment net score of their holding portfolios each quarter and define those in the top tercile as environmentally sustainable institutions. Fourth, Employee Friendly IO is the percentage of shares outstanding owned by employee friendly institutions.	TR 13F and MSCI KLD
Abnormal SGA	The residual from regressions of the selling, general, and administrative expenses divided by the beginning book assets [$XSGA_t/AT_{t-1}$] on the inverse beginning book assets [$1/AT_{t-1}$] and the sales divided by the beginning book assets [$SALE_t/AT_{t-1}$] for each year and 2-digit SIC industry. Each industry-year has at least 15 observations. We multiply *Abnormal SGA* by minus one so that higher values indicate more real earnings management in SGA.	Compustat
Earnings Suspect	An indicator variable that equals one if a firm meets or beats the average analyst earnings forecasts by one cent or less in a year.	IBES
Abnormal Production	The residual from regressions of the sum of the cost of goods sold and the change in inventory divided by the beginning book assets [$(COGS_t+INVCH_t)/AT_{t-1}$] on the inverse beginning book assets [$1/AT_{t-1}$], the sales divided by the beginning book assets [$SALE_t/AT_{t-1}$], the sales changes divided by the beginning book assets [$SALE_t/AT_{t-1}$] and the beginning sales changes divided by the beginning book assets [$SALE_{t-1}/AT_{t-1}$]for each year and 2-digit SIC industry. Each industry-year has at least 15 observations	Compustat

Abnormal Discretionary	The residual from regressions of the sum of research and development expense and advertisement expenses divided by the beginning book assets [$(XRD_t+XAD_t)/AT_{t-1}$] on the inverse beginning book assets [$1/AT_{t-1}$] and the sales divided by the beginning book assets [$SALE_t/AT_{t-1}$] for each year and 2-digit SIC industry. Each industry-year has at least 15 observations. We multiply *Abnormal Discretionary* by minus one so that higher values indicate more real earnings management.	Compustat
SGA/Assets	The ratio of the selling, general, and administrative expenses over lagged total assets.	Compustat
SGA/Sales	The ratio of the selling, general, and administrative expenses over total sales.	Compustat
SGA/Employees	The ratio of the selling, general, and administrative expenses over the number of employees.	Compustat
CEO Safety Compensation	An indicator variable that equals one if a firm has at least one safety performance-based compensation award in its CEO compensation contract in a year and zero otherwise.	ISS Incentive Lab
TNIC Market HHI	The industry concentration based on the text-based network industry classification.	(Hoberg and Phillips, 2016)
TNIC Product Similarity	The firm's product similarity index relative to its competitors.	(Hoberg and Phillips, 2016)
Dual CEO	An indicator variable that equals one if an CEO is also the chair of the board.	BoardEx and ISS
Board Size	The number of directors in a board.	BoardEx and ISS
Busy Board	An indicator variable that equals one if a majority of the independent directors on the board serve on three or more boards.	BoardEx and ISS
IO	The percentage of shares outstanding owned by institutional investors.	TR 13F
Analyst Coverage	The natural logarithm of one plus the number of analyst earnings forecasts in a year.	IBES
Firm-Director Characteristics		
Board Seats	The natural logarithm of one plus the number of board seats a director sits on in a year.	BoardEx
Board Tenure	The natural logarithm of one plus the number of years a director sits on a board in a year.	BoardEx
Industry Characteristics		
Union Membership	The percentage of workers who are unionized in the industry of a firm. Industries are defined by 4-dight SIC codes before 2002 and 6-digit NAICS codes after 2002.	Union Membership and Coverage

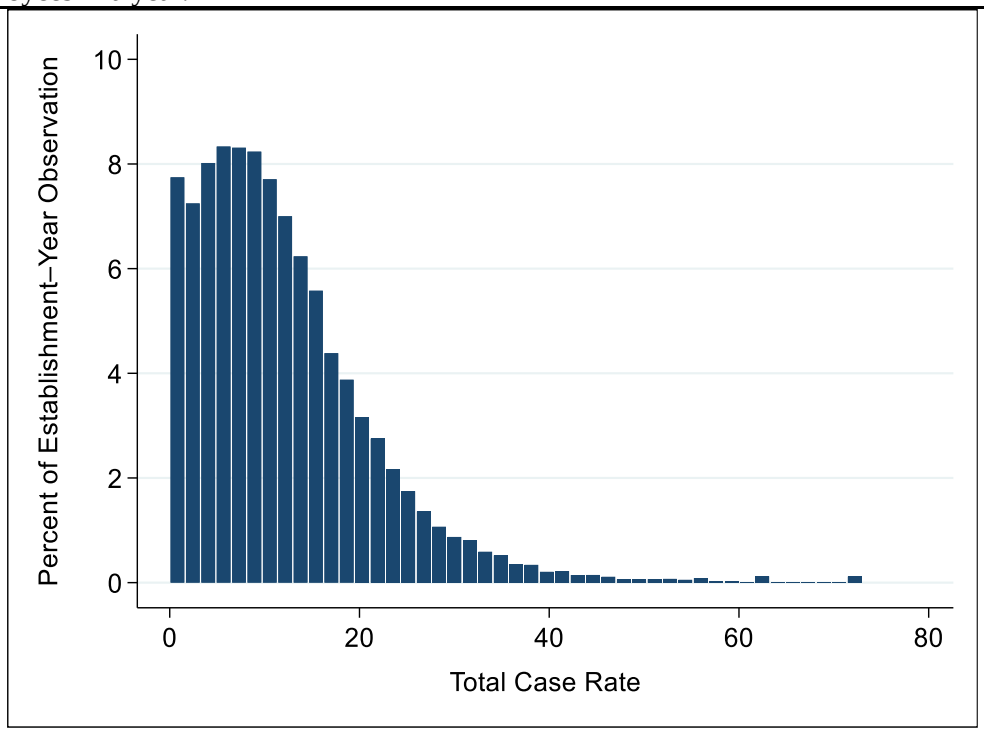
Internet Appendix for
"Do Independent boards harm employee safety and health?"

Figures:

Tables:

Figure IA1. Distribution of Establishment-Level Total Case Rate

Panel A presents the histogram of total case rate (TCR) in our establishment-year sample between 1996 and 2008. TCR equals the number of workplace injuries and illnesses per 100 full-time equivalents (FTE) employees in a year.



Panel B presents the average TCR by industry in our sample between 1996 and 2008. Industries are defined using the Fama and French 48 industry definitions.

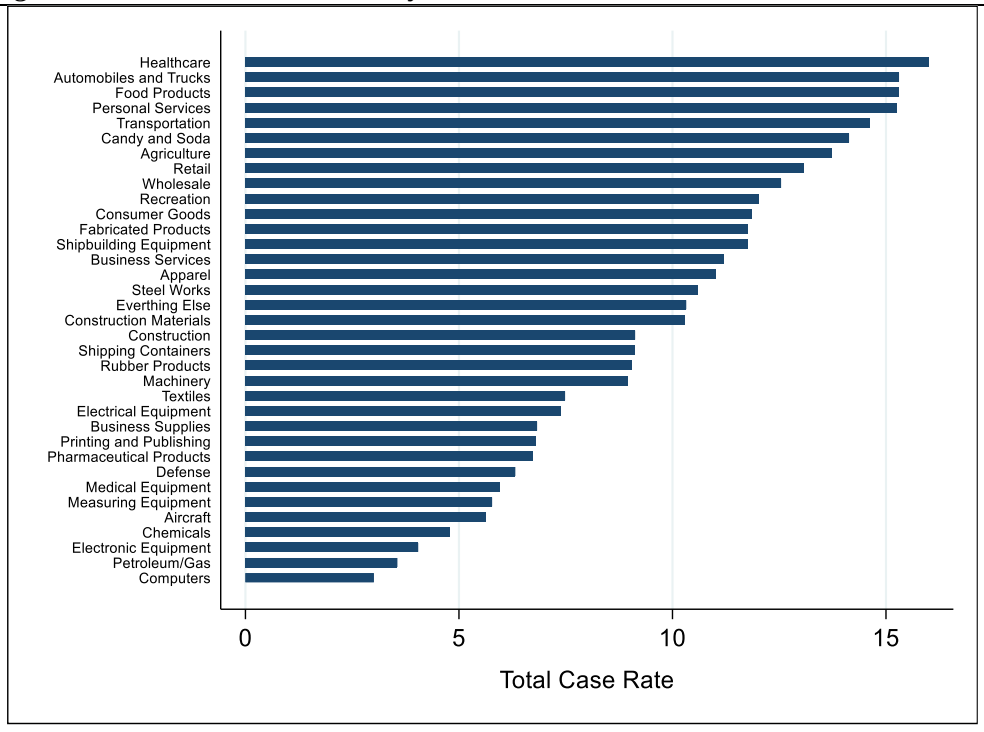
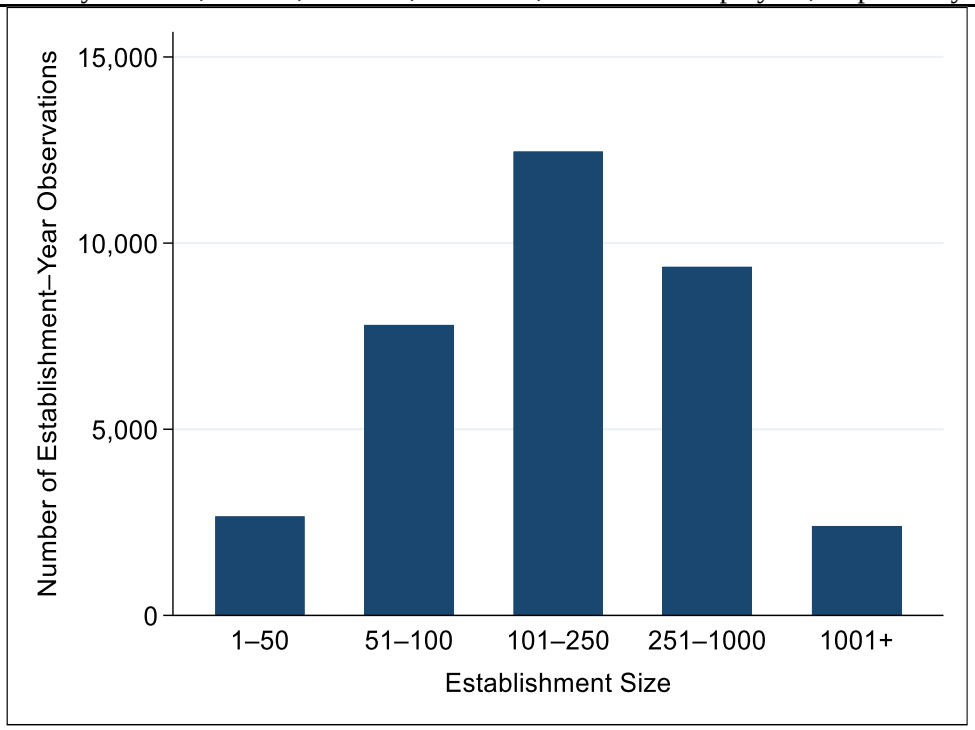


Figure IA2. Distribution of Sample Establishments by Size and Industry

Panel A presents the distribution of establishment-year observations by the number of employees in our sample for the period 1996–2008. Establishments are grouped into five bins based on the number of employees. They are 1-50, 51-100, 101-250, 251-1000, and 1001+ employees, respectively.



Panel B presents the distribution of establishment-year observations by industry in our sample for the period 1996–2008. Industries are defined using the Fama and French 48 industry codes.

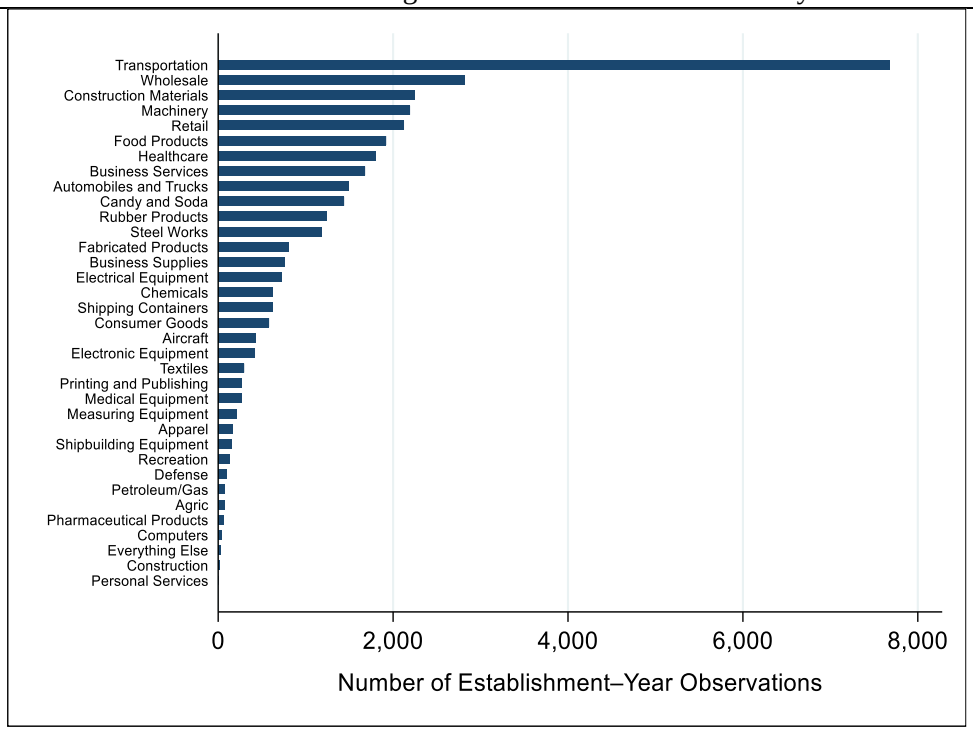


Table IA1. Dynamic Effects of Independent Board

This table presents results from dynamic difference-in-differences regressions of establishment-level workplace injury rate on the board independence mandate, based on a modified model of Equation (1). The sample consists of all establishments in the matched treatment and control firms for the period 1996-2008. *Independent Board (n)* is an indicator variable that equals one for the n-th years relative to the firm switch from a minority of independent board members to a majority of independent board members in 2002, and zero otherwise. For instance, *Independent Board (-4)* equals one for the year that is four years before the firms start to switch from a minority of independent board members to a majority of independent board members in 2002, and zero otherwise. *Independent Board (-1)* is excluded from the regressions. That is, all coefficient estimates are relative to the year that is one year before the board independence mandate. *TCR* is the number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. See variable definitions in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*	
	(1)	(2)
Independent Board -4	-0.416	-0.629
	(0.544)	(0.539)
Independent Board -3	0.108	-0.032
	(0.492)	(0.475)
Independent Board -2	0.244	0.265
	(0.321)	(0.333)
Independent Board 0	-1.095***	-1.150***
	(0.342)	(0.348)
Independent Board +1	-0.974**	-1.024**
	(0.461)	(0.453)
Independent Board +2	-0.860***	-0.886***
	(0.314)	(0.318)
Independent Board +3	-1.603***	-1.620***
	(0.491)	(0.471)
Independent Board +4	-1.990**	-1.862**
	(0.813)	(0.744)
Controls	N	Y
Establishment FE	Y	Y
Industry × Year FE	Y	Y
State × Year FE	Y	Y
Adjusted R^2	0.586	0.588
Observations	34,657	34,657

Table IA2. Additional Controls: Board Characteristics, Institutional Ownership, and Analysts

This table reports estimates from a difference-in-differences regression estimating the effect of the independent board mandate on establishment-level workplace injury rate controlling for other firm characteristics. The sample consists of all establishments in our matched sample for the period 1996-2008. *Independent Board* is an indicator variable that equals one for the year 2003 and beyond if the parent firm of an establishment had a non-independent board in 2001 but an independent board in 2003 or later, and zero otherwise. *TCR* is the number of injuries and illnesses divided by the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. *Dual CEO* is an indicator that equals one if a CEO serves as the board chair. *Busy Board* is an indicator variable that equals one if the majority of independent directors serve on more than three boards in a year. *Board Size* is the number of directors in a board. *IO* is the percentage of shares outstanding owned by institutional investors. *Analyst Coverage* is the natural logarithm of one plus the number of analyst earnings forecasts in a year. All control variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*		
	(1)	(2)	(3)
Independent Board	-0.874**	-0.876**	-0.882**
	(0.416)	(0.414)	(0.414)
Dual CEO	-0.414	-0.414	-0.413
	(0.280)	(0.280)	(0.280)
Busy Board	-0.255	-0.256	-0.246
	(0.346)	(0.345)	(0.346)
Board Size	-0.040	-0.040	-0.032
	(0.098)	(0.098)	(0.101)
IO		-0.027	0.196
		(0.214)	(0.239)
Analyst Coverage			-1.115
			(1.040)
Controls	Y	Y	Y
Establishment FE	Y	Y	Y
Industry × Year FE	Y	Y	Y
State × Year FE	Y	Y	Y
Adjusted R^2	0.598	0.598	0.598
Observations	31,429	31,429	31,429

Table IA3. Injuries and Firm Value

This table presents results from OLS regressions of long-term firm value on firm-level injury rate. The sample consists of firms covered by ODI database and Compustat database over the period from 1996 to 2011. *Firm TCR* is the number of injuries and illnesses over the number of hours worked by all employees in a firm in a year and multiplied by 200,000. *Tobin's Q* is the ratio of market value of assets (book value of total assets minus book value of equity minus deferred taxes plus market value of equity) over book value of total assets. Firm-level control variables are included in even columns variables. They are *Ln(Assets), Cash/Assets, Leverage, CapEx/Assets and ROA*. All variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*Tobin's Qt+1*		*Tobin's Qt+2*	
	(1)	(2)	(3)	(4)
Firm TCR	-0.011***	-0.010***	-0.014***	-0.013***
	(0.002)	(0.002)	(0.003)	(0.002)
Controls	N	Y	N	Y
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Adjusted R^2	0.132	0.220	0.124	0.180
Observations	13,799	13,799	13,799	13,799

Table IA4. Injuries and Labor Lawsuits

This table presents results from Logistic and OLS regressions of labor lawsuit on firm-level injury rate level. The sample consists of firms covered by ODI database and Compustat database over the period from 1996 to 2011. *Firm TCR* is the number of injuries and illnesses over the number of hours worked by all employees in a firm in a year and multiplied by 200,000. *Suit(0/1)* is an indicator variable that equals one if a firm has at least one labor lawsuit as the defendant in a year. We define a firm to have labor-related lawsuits if a firm has any lawsuit cases in "Category 30, Labor Law" or "Category 63, fair labor standards act" from Audit Analytics Corporate Legal database. In even columns, we include firm control variables: *Ln(Assets), Cash/Assets, Leverage, CapEx/Assets, ROA and Tobin's Q*. All variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$Suit(0/1)_{t+1}$				$Suit(0/1)_{t+2}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm TCR	0.034***	0.043***	0.001***	0.001***	0.027**	0.035***	0.001**	0.001***
	(0.012)	(0.012)	(0.000)	(0.000)	(0.011)	(0.011)	(0.000)	(0.000)
Model	Logit	Logit	OLS	OLS	Logit	Logit	OLS	OLS
Controls	N	Y	N	Y	N	Y	N	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Adjusted R^2	N/A	N/A	0.048	0.054	N/A	N/A	0.051	0.058
Observations	10,076	10,076	14,568	14,568	10,398	10,398	14,568	14,568

Table IA5. Independent Board and Workplace Safety: Propensity Score Matching

This table presents the results from estimating the effect of the board independence mandate on establishment-level workplace injury rate with the two-stage propensity score matching method. Firms and establishments are matched based on two-digit SIC industry codes, the natural logarithm of total assets, Tobin's Q, ROA, leverage, cash, and free cash flow at the firm level and then based on 2-digit SIC industry codes, the number of employees, and the total hours worked at the establishment level. The sample consists of all matched establishments over the period from 1996 to 2008. *Independent Board* is an indicator variable that equals one if a firm switches from a minority of independent board members to a majority of independent board members in 2003 or later, and zero otherwise. *TCR* is the number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. All columns include the same control variables in Table 3. All variables are defined in the Appendix. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	*TCR*		
	(1)	(2)	(3)
Independent Board	-1.037**	-1.035**	-0.940**
	(0.449)	(0.455)	(0.425)
Controls	Column (1) Table 2	Column (2) Table 2	Column (3) Table 2
Establishment FE	Y	Y	Y
Industry × Year FE	Y	Y	Y
State × Year FE	Y	Y	Y
Adjusted R^2	0.576	0.577	0.578
Observations	28,408	28,408	28,408

Table IA6. Alternative Injury Measures and Establishment Sizes

This table presents robustness checks from estimating the effect of board independence mandate on establishment-level workplace injury rate using alternative injury measures and establishments of different sizes. The sample consists of all establishments belonging to firms in the matched sample of treatment and control firms over the period from 1996 to 2008. *Independent Board* is an indicator variable that equals one if a firm switches from a minority of independent board members to a majority of independent board members in 2003 or later, and zero otherwise. *DART* is the number of injuries and illnesses with days away from work and with job restriction or transfer divided by the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. *DAFWII* is the number of injuries and illnesses with days away from work divided by the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. *TCR* is the number of injuries and illnesses over the number of hours worked by all employees at an establishment in a year and multiplied by 200,000. Columns (1)-(2) use *DART* and *DAFWII* as dependent variables. Columns (3) – (5) use *TCR* as dependent variable and exclude establishments with less than 25, 50, and 100 employees, respectively. All columns include the same firm-level control variables as Column (3) of Table 2. All variables are defined in Table A1. Standard errors are clustered at the firm level and are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Establishment Size	All	All	>=25	>=50	>=100
Dependent Variable	DART	DAFWII		*TCR*	
	(1)	(2)	(3)	(4)	(5)
Independent Board	-0.868**	-1.344***	-1.145***	-1.117***	-1.265***
	(0.361)	(0.340)	(0.407)	(0.382)	(0.448)
Controls	Y	Y	Y	Y	Y
Establishment FE	Y	Y	Y	Y	Y
Industry × Year FE	Y	Y	Y	Y	Y
State × Year FE	Y	Y	Y	Y	Y
Adjusted R^2	0.566	0.563	0.590	0.606	0.653
Observations	34,657	34,657	34,408	32,088	24,140