Capitalizing on Sustainability: Value of Going Green

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Abstract

This paper investigates how corporate Environmental, Social, and Governance (ESG) actions affect firm value. By employing an event study around two 5-to-4 Supreme Court rulings and using portfolio-based approaches, we document that prices capitalize sustainability in the cross-section. When the Court awards broader regulatory authority to the EPA, polluting firms with the largest discrepancies vis-a-vis the new rules heralded by the Court exhibit the largest price responses. Conversely, when the Court narrows the regulatory limit of an existing environmental law, polluting firms lose value. The announcement returns are more sensitive to the Court rulings for firms in regions with a higher level of social trust. More generally, a portfolio of firms improving their sustainability by adopting cleaner production practices earns alphas (4.43% annually for value-weighted returns) compared to firms which adopt more toxic practices and thereby reduce sustainability. Firms with greener production practices show positive earnings surprises, higher revenue and profitability, and more capital inflow from institutional investors with longer horizons. The abnormal returns are more pronounced among firms in regions with a high level of trust. In sum, we show that firms gain value when they go green.

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1 Introduction

When firms invest more resources in clean production processes, they internalize the negative externalities of modern production and capitalism. These efforts to deploy environmentally friendly production processes cost financial resources, yet yield private and social benefits such as enhancing brand equity, protecting public health, and increasing life expectancy. One of the central questions in this context is which force–cost or sustainability–outweighs the other, and this then shifts the focus to tallying the net cost of maintaining sustainable growth and going beyond what is required by environmental laws.

It is controversial whether stricter environmental regulations dampen economic growth or complement the overall socio-ecocomic prosperity.[1] Answers to these questions hinge on whether managers and investors correctly understand the value consequences of taking environmental, social, and governance (ESG) actions.

In this paper, drawing from a granular data set on micro-level toxic emissions, we evaluate the extent to which shareholders benefit financially from engaging in pollution abatement. When financial markets incorporate the social benefits of ESG practices, managers need not forego shareholder value by behaving in environmentally responsible ways. To isolate the likely causal effects of corporate ESG actions on firm value, we take two approaches. First, we exploit two opposing Supreme Court rulings as events that reshaped the regulatory limit of environmental regulations in the U.S. and examine stock price reactions around the Court rulings. As the rulings create plausibly exogenous shocks to a firm's pollution abatement practices, the market's reaction to such rulings provides a useful setting to examine the causal relationship between ESG activities and shareholder value.

Second, we employ portfolio sorts and Fama-MacBeth cross-sectional regressions to investigate whether corporate ESG actions to support sustainable growth are capitalized into

[1] Many scientific reports show that the environmental crisis is taking a huge toll on the economy. The federally mandated National Climate Assessment, available at https://nca2018.globalchange.gov/, reports that, without drastic cuts in emissions, the damage will be as much as 10 percent of the size of the US economy by the end of the century. On the other hand, many industrialist interest groups campaign for rollbacks of environmental regulations.

share prices. By adopting those approaches, we effectively control for risk exposures and firm-characteristics that may drive patterns observed in the data and test whether changes in firm-level sustainability is priced in the market.

We find that improvements in corporate ESG actions create shareholder value. Our findings from the event study show that the market reactions are larger for firms that are expected to be affected to the greatest extent by the Court decisions. We examine the announcement returns following two 5-to-4 Supreme Court rulings. When the Court widens the scope of environmental laws to stand, polluting firms, which must improve their pollution abatement processes to a greater extent than cleaner firms, show the largest stock-price gain. When a Court ruling restricts and narrows regulatory capacity of an existing regulation, firms emitting more toxic pollutants prior to the ruling lose more value.[2] In sum, when a Court ruling strengthens (weakens) the incentive of firms to adopt a more "green" production process, they gain (lose) value.

We further examine how a level of social trust affects the value-gain associated with the improvements in corporate environmental performances. Since a firm's major stakeholders such as workers, consumers, and shareholders are likely to be geographically concentrated around its headquarter (Coval and Moskowitz (1999)), we examine how the cross-sectional differences in regional trust level in which a firm is head-quartered affect the cross-sectional differences in announcement returns. Shareholders with stronger belief in social trust and cooperative norms would appreciate firms that do not free-ride and internalize environmental responsibilities compared to the shareholders with lower level of social trust. We, thus, hypothesize that shareholders with a higher level of trust are going to penalize polluting firms to a lesser extent when the Court forces polluting firms to comply with a stricter environmental regulations. Our tests capture the difference-in-difference-in-differences in firm value. Polluting firms gain more value than clean ones when the Court orders them to improve their environmental performances. The differential reactions are larger for firms in regions with stronger social trust

[2] It is because the new lax environmental standard heralded by the Court would not be binding for firms that were already implementing cleaner production process.

where free-riding is penalized more severely.

More generally, we examine whether investors capitalize firm's sustainability into firm valuation. We show that investors with environmentally conscious utility can profit by taking a long position in "greenest" portfolio and a short position in most "toxic" portfolio. Firms create value that is beyond what is predicted by widely accepted factor models when they embrace environmental responsibility. For value-weighted returns, the alpha on this long and short portfolio is 0.37% monthly (4.43% annually). We show additionally that the firm-level pollution emissions produce negative premium that is distinct from other firm characteristics. A socially responsible investor can achieve both financial and social objectives by investing in a long-and-short portfolio based on firm-level toxic emission information. We show that firms that achieve more extensive pollution abatement earn CSR premiums.

Moreover, we find that the alphas on the long and short portfolio based on the changes in sustainability are more pronounced among firms headquartered in regions with a high level of social trust. We hypothesize that the relationship between changes in firm-level sustainability and subsequent returns is stronger the more the stakeholders of a firm value CSR. When the local stakeholders and investors value trust and cooperative norms strongly, firms exerting more efforts to be cleaner are more likely to show stronger subsequent returns. Similarly, firms located in regions with high trust may face stronger pressure to be environmentally responsible. In return, stakeholders can compensate those firms by showing consumer loyalty or providing capital at a lower cost to the firms with greener practices. The results imply that preferences and utility functions of stakeholders play a key role in linking CSR and asset prices (Baldauf, Garlappi and Yannelis (2018); Baker et al. (2018)).

We then investigate the relationship between pollution abatement and long-term valuation ratios and operating profits. We find that firms that engage more intensively in pollution abatement experience higher Tobin's Q, cash-flow, revenue, and gross profitability (Novy-Marx (2013)) and exhibit positive earnings surprises. The findings are consistent with the notion that firms improving their environmental performance deliver corporate culture conducive to productivity or stronger pricing power. Cleaner firms are also more likely to be held by investors with longer horizons.

Our results indicating accrued alpha, higher long-term valuation, higher profitability, and positive earnings surprises suggest that an average investor ultimately incorporates information on pollution abatement into prices, but does not immediately capitalize on the pollution abatement information at the time of data release. The pattern of investors' under-reaction pairs well with a large and growing set of literature studying the valuation of intangibles and a slow dissipation of information into asset prices (See e.g., Edmans (2011); Tetlock (2011); Cohen, Diether and Malloy (2013)). The findings are also consistent with La Porta (1996) showing superior future returns can be explained by errors in growth forecasts. Murfin and Spiegel (2018) show home prices do not reflect the risks of sea level rise. We document that firm-level abnormal returns are accruing slowly, not immediately, after firm-level sustainability information is revealed.

Despite the large amount of attention paid to corporate social responsibility (CSR) activities of firms and the investors' demand for socially responsible investing (SRI), we do not have clear evidence as to whether CSR creates shareholder value. ESG and CSR actions contribute to the provision of public goods and shareholders may not internalize the costs of negative externalities given the incentive to free-ride. These results are consistent with the long-held view that the sole purpose of corporations is to maximize profits (Friedman (1970)). Some papers find that CSR activities are value-destroying and driven by managerial entrenchment (Di Giuli and Kostovetsky (2014); Krüger (2015); Cheng, Hong and Shue (2016); Masulis and Reza (2015)). Notably, Servaes and Tamayo (2013) find that the positive relationship between CSR and Tobin's Q disappears once they control for firm-level fixed differences in their model.

Yet, CSR can generate financial value when CSR delivers more benefit than it costs. Baron (2001) provides a theory showing CSR can alter competitive positions of firms in an industry, and the returns to CSR occur through product market. Simiarly, according to Albuquerque, Koskinen and Zhang (Forthcoming), CSR can function like a marketing campaign to achieve product market differentiation. Adopting cleaner technology and production processes can help firms attract more customers who are keen on buying products made through socially responsible processes, which results in enhanced brand royalty. This hypothesis is consistent with our results pertaining to the positive relationship between ESG action and future profitability. In particular, we document that the increase in profitability of greener firms is driven by stronger growth in revenue as opposed to a reduction in costs. Moreover, firms employing cleaner processes may experience reduced regulatory penalities and public pressure, which increase firm value. CSR may reduce the implied cost of capital (ICC) since it mitigates regulatory and liability risks (Chava (2014)).

Some investors derive nonfinancial utility from directing capital to cleaner firms that are environmentally responsible. Due to demand for SRI, less-polluting firms will enjoy larger fund inflows from investors emphasizing good ESG performance and long-term value creation. In support of the hypothesis, we find that greener firms attract more institutional investors with longer horizons ("dedicated investors" classfied in (Bushee (2001))). Our results suggest that environmentally conscious investors and corporations do not have to trade-off wealth for non-monetary benefits.

One difficulty involved in studying ESG and SRI is that it is unclear how we should quantify social responsibility. Focusing on pollution abatement as an ESG tactic is natural. Pollution generates salient and direct consequences on society, which range from causing extreme weather events and reducing life expectancy to interfering with the accumulation of human capital.[3] The costs not only cause individual discomfort, but also generate dead-weight economic losses. Due to the grave damages to the environment and public health that pollution causes, the government enforces strict and uniform reporting rules on emissions. The reporting of pollution emissions from production facilities are federally regulated by the Environmental Protection

[3] Investing in ethically challenged stocks (or, sin stocks) may deliver dis-utility in abstract form, such as in personal moral preferences, while pollution can have a more direct daily impact. Nearly 50 percent of Americans live in areas where the air is unhealthy to breathe (American Lung (2018)), and more than 20,000 deaths each year are attributable to air pollution. https://www.nytimes.com/2017/12/27/well/live/air-pollution-smog-soot-deaths-fatalities.html

Agency (EPA) and related environmental laws. Hence, the degree of cleaner production processes can be precisely evaluated by measuring final disposals from production facilities owned by firms. The total final disposal of pollution emissions serves as an intuitive and effective index for measuring a firm's engagement in environmental sustainability.

Our paper is closely related to the researches performing event study surrounding firm-level CSR announcements. Inferential challenges exist since earlier studies provide mixed results and suffer from methodological issues and small sample sizes (Margolis, Elfenbein and Walsh (2011) for a review). Karpoff, John R. Lott and Wehrly (2005) find that firms suffer value losses when news about violations of environmental regulations are announced. Some studies find successful ESG activism are followed by positive announcement returns (Dimson, Karakas and Li (2015); Flammer (2015)). Ferrell, Liang and Renneboog (2016) find that well-governed firms are more likely to engage in CSR. An advantage of our setting of exploiting Court rulings is that the Court rulings are less likely to be driven by firm characteristics.[4]

We contribute to the impact investing literature. Investors express preferences for SRI that are driven by non-financial motives (Barber, Morse and Yasuda (2018); Liang and Renneboog (2017); Riedl and Smeets (2017)), and CSR is a way to build social capital of a firm (Lins, Servaes and Tamayo (2017)). Scholars document investor demand for firms demonstrating CSR initiatives and funds driven by SRI consciousness (Hartzmark and Sussman (2018)) and, that this demand exists especially among investors with longer horizons (Starks, Venkat and Zhu (2017)). Chowdhry, Davies and Waters (2018) and Dyck et al. (2018) show financial stake-holding of social impact investors incentivizes profit-motivated firms to pursue social goals, and socially minded investors are more likely to invest in firms with potentially higher social value.

Our paper adds to the literature on corporate governance and corporate culture. Gompers, Ishii and Metrick (2003) show that an investment strategy that bought firms with the strongest rights and sold firms with the weakest rights earned abnormal returns of 8.5 percent per year

[4]We additionally investigate the possibility that the Supreme Court decisions are "captured" by lobbying influences, and we do not find support for the hypothesis.

during the sample period. Guiso, Sapienza and Zingales (2015) find that firms with a culture of integrity exhibit stronger performance.

The paper is organized as follows. Section 2 presents a detail on the data used in our analysis. Section 3 describes empirical design and results of the event study analysis. Section 4 describes our empirical results based on portfolio-based analysis. Section 5 provides results suggesting the channels of influence. Section 6 concludes.

2 Data and Summary Statistics

In this section, we describe the data sources and construction of the main variables.

2.1 Pollution Abatement

As an agency of the federal government established in 1970, the mission of the EPA is to protect human health and the environment. The EPA has the authority and responsibility to maintain and enforce a variety of environmental laws and works closely with U.S. states and local government. Violations of environmental regulations or laws will trigger civil or criminal trials and penalties.

Pollution emissions data are available from the Toxics Release Inventory (TRI) program administered by the EPA during the period running from 1990 through 2015.[5] The TRI program oversees all production facilities in a TRI-reportable industry and sector within the U.S. as long as the facility manufactured or processed TRI-listed chemicals. Any facility in the U.S. within a TRI-reportable industry sector must submit a TRI report containing detailed information about their waste management practice to the TRI program, as long as the facility has ten or more employees and manufactured or processed TRI-listed chemicals in amounts greater than the quantity threshold posted by the EPA. The TRI report includes information about the final release of the toxin through air, water, or landfill.

[5] For more details on TRI data, please see Kim and Xu (2018).

Due to the profound impact of toxic chemical emissions, TRI reporting rules and processes are strictly monitored by the EPA. The EPA conducts an extensive quality analysis on reported data to the TRI and provides analytical support for enforcement efforts led by the Office of Enforcement and Compliance Assurance. The EPA first identifies TRI forms containing potential errors and then contacts the facilities that submitted them. If errors are confirmed, the facilities then submit corrected reports. The EPA also utilizes the Office of the Inspector General, which performs audits to prevent and detect fraud and abuse in the TRI program.[6]

In our empirical exercises, we focus on the total quantity of toxic releases, which is the amount of toxic chemicals disposed of directly. To measure the amount of total toxic emissions of a firm, we sum the quantity of toxic releases from all facilities owned by a firm. We also consider toxic releases regulated under the Clean Air Act (CAA), given its wide-ranging influence and capacity for regulating daily emissions of pollutants in the U.S.

The EPA outlines waste management guidelines, "Waste Management Hierarchy." Source reduction is the preferred method of waste management, since pollution is to be prevented or reduced at the source. By replacing toxic inputs with cleaner raw materials, source reduction implements elimination of toxic byproducts from the beginning of the production process. In the production, firms are expected to fully engage in recycling, energy recovery, and treatment to reduce the toxic byproducts.[7] After the intermediate processes, firms will have to release toxic chemicals as direct disposals via landfill, water discharge, and air releases. Direct disposal is most harmful to the environment, although it is the least expensive waste-management method. The EPA calls for direct disposal as a last resort.[8]

[6]Section 325(c) authorizes civil and administrative penalties for noncompliance with TRI reporting requirements. Section 1101 of Title 18 of the U.S. Code makes it a criminal offense to falsify information given to the U.S. Government (including intentionally false records maintained for inspection).

[7]Recycling consists of activities through which discarded toxic chemical in waste is put for reuse. Energy recovery is the process of generating energy from the combustion of toxic chemicals. Treatment involves alteration and destruction of toxic chemical properties of hazardous materials.

[8]https://www.epa.gov

2.2 Trust

To measure the level of trust of residents across the U.S. we use data from the General Social Survey (GSS) from 1990 through 2015 (Kelly (2015); Lins, Servaes and Tamayo (2017)). The survey is administered by the non-partisan and objective research organization (NORC) with principal funding from the National Science Foundation. The survey was annual from 1990 through 1994 and biannual since 1996.

We identify a firm's local stakeholders as the residents of the region where a firm is headquartered. We gauge the trust level of local stakeholders in each region by considering the respondents' answers to the question, "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" The multiple choices include "Can't be too careful," "Depends," "Don't know," or "Refused." We take the fraction of local respondents whose answers are "Most people can be trusted" as an index of local stakeholders' trust level in a given year.

2.3 Lobbying Expenditure

Under the Lobbying Disclosure Act of 1995, lobbying firms must disclose their income and organizations with in-house lobbyists must disclose all compensation paid to the hired lobbyists. The data is available from 1998.

2.4 Financial Statements

We obtain firm-level accounting information from the annual tape of Standard & Poor's Compustat and stock market information from the Center for Research in Security Prices (CRSP). Our sample of stock price information runs from 1991 through 2016. We link EPA TRI parent company information with the Compustat/CRSP databases using a name-matching algorithm. We obtain historical company names and addresses from CRSP, 10-K, 10-Q, and 8-K filings using the SEC Analytical Package provided by the Wharton Research Data Service. The institutional ownership exploiting 13F filings data are from Thomson Reuters.

2.5 Construction of Variables and Summary Statistics

Our final sample includes 1,621 U.S. public firms from 1990 through 2016. In Table 1, we present summary statistics for the firm-level observations regarding our sample. Our main variable of focus is $\Delta Toxic$, which captures annual innovations in corporate ESG actions and commitment to sustainable growth. $\Delta Toxic$ is defined as annual changes in total amounts of toxic chemical releases discharged as direct disposal from all facilities owned by a firm scaled by sales to take into account the overall production level. Correlations between $\Delta Toxic$ and asset growth, investment growth, or sales growth is virtually zero. We use $\Delta Toxic$ as a sorting variable for portfolio analysis and a main explanatory variable in our panel regressions. We define the group as *High* Δ *Toxic* if a firm had $\Delta Toxic$ level higher than the median value of $\Delta Toxic$ in the sample of all firms with toxic emissions reporting to the EPA's TRI program. For details on construction of variables used in the analysis, please refer to Appendix A.

On average, we annually have 667 firms with stock price data, financial accounting information, and toxic emissions data each year. The H quintile portfolio represents a set of firms that are the cleanest and greenest, while the L portfolio represents firms that are the most toxic. Besides the $\Delta Toxic$ profile, H and L portfolios show similar characteristics including the size of the assets or Tobin's Q. Compared to second, third, and fourth quintile portfolios, both H and L are composed of firms that are smaller, less profitable, with higher investment and leverage, and with lower Tobin's Q.

3 Event Study Analysis

In this subsection, we explore the causal relationship between pollution abatement and firm value.

3.1 Legislative Events

Schwert (1977, 1981) initiated a long tradition of empirically evaluating regulatory changes with reference to stock market data. We exploit two Supreme Court rulings that have largely re-defined the scope of the EPA's regulatory authority. These rulings were very close, 5-to-4, decisions and our results show that the rulings contain significant unexpected information.[9]

We believe Supreme Court rulings provide an ideal quasi-experimental setting for our study for a number of reasons (Larcker, Ormazabal and Taylor (2011); Cohen, Diether and Malloy (2013)). First, we are able to identify event dates precisely. Legislative events, especially those pertaining to Supreme Court rulings, have more salient announcement dates than regulatory events. Environmental rules tend to go through multiple rounds of an extensive process in which feedback from various sets of interests groups and citizens is heard, before a law becomes finalized. These intermediate processes attenuate the surprise information contained in the announcement of an adoption of the final rule. Second, a Court ruling lays out expected changes in regulations and proposed changes are both material and "binding," which implies substantial treatment effect.

Third, we have two Court ruling events that affect the expected intensity of pollution abatement in opposite directions. When the Court rules in favor of the EPA's regulatory authority and in effect extends the scope of environmental laws, we can infer the value of the adoption of cleaner production processes by observing stock market reactions around the court rulings. In the same vein, when the Supreme Court rules that the EPA should be restricted in terms of the breath or intensity of the regulations, we infer a value change due to the expected adoption of lax environmental regulations and the resulting rollback in pollution abatement.

Finally, our pollution emission data guide us to determine a set of firms that are affected to a larger extent by a ruling than a set of firms that are affected to a lesser extent. We exploit cross-sectional variations in the degree of the expected changes in pollution abatement driven

[9] If the market had partially anticipated the Court rulings before the announcement, our results would underestimate the value of the cleaner production practices.

by the same Court rulings. We expect the effects of Court rulings are more pronounced for firms having the largest discrepancy between existing pollution abatement and the new standard declared by the Court.

3.1.1 Ruling on April 2, 2007

In Massachusetts v. EPA, the Supreme Court found that the EPA has the authority to regulate greenhouse gases and carbon dioxide emission as part of the pollutants under the CAA (Sugar (2007)).[10] It was a 5-to-4 decision. The case set the stage for greenhouse gas regulations and was a huge win for environmentalists. Before the ruling, the U.S. had not regulated greenhouse gas emissions, since the EPA considered greenhouse gas emissions beyond their statutory authority under the CAA. Justice John Paul Stevens delivered the opinion for the court, observing that "greenhouse gases fit well within the CAA's capacious definition of air pollutants." It was a landmark decision, and widely considered one of the "most important environmental decisions in years."[11]

3.1.2 Ruling on June 29, 2015

In Michigan v. EPA, the Supreme Court found that the EPA "unreasonably" interpreted the CAA when it declined to consider compliance costs on the industry in determining the regulatory threshold for toxic chemical emissions. The Court ruled that the EPA violated the CAA when it refused to consider such costs. It was a 5-to-4 decision. Although the EPA argued that the health benefits of the rule outweigh the costs to industry, the ruling ordered the EPA to scale back its regulations.[12]

[10] CAA section 302(g), in relevant part, defines an air pollutant as an "air pollution agent or combination of such agents, including any physical, chemical, biological, radioactive substance or matter that is emitted into or otherwise enters the ambient air."

[11] https://www.nytimes.com/2007/04/03/washington/03scotus.html

[12] The EPA argued that "the public gets 9 dollars of health benefits for every 1 dollar the industry spends."

3.2 Methodology

We adopt an event study framework to examine abnormal returns surrounding the Court rulings to measure the net value creation driven by the expected change in equilibrium pollution abatement practices. We consider abnormal returns earned over the event window that are above and beyond expected returns predicted by the CAPM and Fama-French three-factor models. To compute abnormal returns, we first use recent 36 months daily returns prior to a month before the event to compute a firm's sensitivity to factors based on the CAPM and Fama-French three-factor models (Dimson (1979)). Using the estimated sensitivity to return factors, we compute each stock's expected rate of returns predicted by the CAPM and Fama-French three-factor model. We then obtain the abnormal return of each stock by subtracting the expected return from the raw returns during the event window.

We examine the cross-sectional variations in the market reactions depending on the implied changes in the greenness of the manufacturing process caused by the Court decision. For the 2007 Supreme Court ruling, we ideally want to measure a firm's emissions of greenhouse gases to determine the degree to which firms have to adjust the greenness of their production practices due to the ruling. Since the U.S was not regulating greenhouse gas emissions, the EPA was not collecting information on the amount of greenhouse gas emissions prior to the ruling. We, hence, use the $\Delta Toxic$ based on the quantity of toxins regulated under the CAA as a measure to gauge a firm's existing commitment to sustainability. For the 2015 Supreme Court ruling, it changed the intensity of the EPA's enforcement of the CAA. We, thus, use the $\Delta Toxic$ computed based on the amounts of toxic chemicals that are regulated under the CAA. It is useful to have a precisely-measured quantity measure of a degree of sustainability, since this allows us to identify a "treatment" group of firms that needed to change their ESG actions to a greater extent compared to the "control" group of firms following an identical Court ruling.[13]

We consider two alternative event windows. We first construct an event window that is from

[13] Cross-sectional tests are applicable even when the average price effect of an event is zero (Khotari and Warner (2006)).

one day prior to the date of ruling to three days after the ruling. We then consider an event window from one day prior to the date of ruling to the 10 days after the ruling. The dependent variable, $AbRet$, is the cumulative abnormal returns for the firm i over the event window. To test the cross-sectional variations in the market reactions, we estimate the following model:

$$AbRet_i = \alpha + \beta * (High\ \Delta\ Toxic)_i + Ctrls_i + FEs + \epsilon_i. \tag{3.1}$$

where *High* Δ *Toxic* is an indicator variable that takes value of one when a firm has $\Delta Toxic$ above the median value in the sample of firms that report to the TRI program administered by the EPA in one year prior to the Court ruling and zero otherwise. $Ctrls$ is a vector of control variable including $Size$, Tobin's Q, and market leverage ratio measured by the end of the year prior to the ruling.

3.3 Results

We examine the cross-sectional variations in the cumulative returns among the firms that process toxic chemicals in their manufacturing, and thus report to the EPA's TRI program. We estimate the model 3.1. The coefficient of interest is β. Our hypothesis is that, the more polluting a firm is, the larger implied benefit of implementing changes in production process caused by the Court ruling is. Thus, we expect β to be positive, since the ruling causes *High* Δ *Toxic* to adjust their pollution abatement more than non-polluters. We find empirical support for the prediction.

Following the ruling on April 2, 2007, we observe significant movements in stock prices of firms reporting to the EPA's TRI program. These firms, on average, gained raw return of 1.6% over the four-day event window. We examine whether the market reactions to the Court ruling vary according to the firm's existing pollution abatement intensity.

We report the results on the cross-sectional variations in the announcement returns in Panel A and B of Table 2. We present results of the four-day event window in Panel A and 11-day event window in Panel B. Stock price reactions are about 1% higher for *High* Δ *Toxic* than other firms in the TRI sample. The coefficient captures within-industry variations. The results are robust when we consider alternative event windows.

We then examine the abnormal returns following the ruling on June 29, 2015. On average, firms with TRI reporting lost raw returns of 2.2% over the four-day event window. We then examine the cross-sectional variations in the stock price reactions by estimating the model 3.1. The coefficient of interest is β in model 3.1. We expect β coefficient to be negative, since the ruling would render *High* Δ *Toxic* to improve their pollution abatement more than non-polluters. Greener firms are already using smarter and cleaner procedures that are beyond what is required by the law, and hence, weaker regulations do not necessarily curtail greener firms' efforts in ESG. At the same time, the ruling allows *High* Δ *Toxic* not to keep up their investment in clean production practices. We report the results in Panel A and Panel B of Table 3. Consistent with the prediction, we find that stock price reactions are about 0.72% lower for $Polluters$ than other firms in the TRI sample during the four-day event window. The coefficient captures within-industry variations. As shown in Panel B of Table 3, we find consistent results when we examine cumulative abnormal returns over an 11-day window.

3.4 Social Trust

We investigate differential stock price reactions around the Court rulings depending on the level of social trust. We estimate 3.1 separately for firms located in regions with high social trust and firms located in regions with low social trust. Trust and cooperative norms are a form of social capital. We hypothesize that firms located in regions with a high-level of social trust would exhibit more intense stock price reactions around the Court rulings. Because people with stronger social trust are likely to have stronger preference toward corporate ESG actions, and these types of investors tend to be more keen and appreciative to changes in ESG actions (Choi, Gao and Jiang (2019)). We, thus, expect value of firms facing these types of local investors to be more sensitive to the Court rulings.

We report the results in Table 4 and Table 5. When the Court delivers rulings that imply changes in corporate environmental policies, investors who value ESG actions more tend to show stronger responses. Consistent with this hypothesis, we find that stock market reactions to the two Court rulings are stronger for firms having local residents with a high-level of social trust.

3.5 Lobbying

One might be concerned that the Supreme Court is captured by the lobbying efforts of interest groups, which implies any regulatory changes directed by the Court ruling should benefit firms with stronger lobbying influences at the expense of firms without lobbying influences. To address this alternative story, we construct an indicator variable, *Lobbying Firm*, that takes value of one if a company incurs a positive amount of lobbying expenditure or hires lobbyists in a year prior to the ruling, and zero otherwise. We report the results in Panel C of Table 2 and Table 3. We include the lobbying indicator in our regression model 3.1 as one of the control variables and find that the main effects are not subsumed by the lobbying indicator. The announcement returns are larger for firms that are expected to show a larger change in the greenness of their production process, and the differential value effects are not driven by firms' lobbying efforts.

Overall, we find empirical support for the predictions pertaining to the value of engaging in cleaner production practices. Our results show that the stock market largely recognizes the social cost of the negative externalities associated with the environmental costs of modern production.

4 Cross-section of Stock Returns

The above-mentioned results show that the stock market generates positive value for firms that adopt green practices. We now expand our analysis to cover the entire sample period and show that the sustainability premium is a general phenomenon in the market.

4.1 Portfolio Sort

Our hypothesis is that, because investors see clean production as a positive attribute, improving greenness should lead to superior returns. This requires a negative portfolio spread when we form portfolios based on toxic releases in the cross-section.

We form quintile portfolios based on the variable of interest ($\Delta Toxic$). Firms are grouped into quintile portfolios using NYSE breakpoints of the previous year. We form both equal- and value-weighted portfolios of monthly stock returns, and the portfolios are rebalanced in June of each year following Fama and French (1993). Therefore, we implicitly assume that the dissemination of toxic information is slow, as is the case with accounting data. We obtain alphas from the Fama-French three- and five- factor models (Fama and French (2015)) to ensure that sustainability premium is not a result of systematic risk exposure.

In Table 6, we document the excess returns and alphas of portfolios sorted on $\Delta Toxic$. Consistent with the prediction, we find a significant and negative return spread in the cross-section. Moving from the lowest to the highest quintile, the average monthly equal-weighted (EW) excess return decreases from 1.16% to 0.83%. In addition, the difference between the highest and lowest portfolio returns (-0.33%) is statistically significant at the 1% level. We find a similar pattern for the value-weighted (VW) results as well, with the high-minus-low return spread (-0.37%) being slightly wider than the EW spread. Moreover, this decreasing pattern across quintiles does not seem driven by risk-factor exposures, since we also find significant and negative alphas for high-minus-low portfolios. For example, when alphas are obtained from the Fama and French (2015) five-factor model, the difference between the highest and lowest portfolio alphas are -0.34% (EW) and -0.42% (VW), both of which are significant at least at the 5% level.

These results imply that a portfolio strategy that takes a long position in a "greener" portfolio and a short position in a "toxic" portfolio can succeed as a profitable zero-cost strategy. The returns are economically large and not subsumed by risk factors. Riedl and Smeets (2017) and Barber, Morse and Yasuda (2018) show that investors may be willing to sacrifice financial returns in exchange for nonpecuniary benefits from investing in funds dedicated to generating social or environmental benefits. Based on our findings, an important implication can be drawn if investors have nonpecuniary preferences (Hartzmark and Sussman (2018)). In terms of investors' utility, our results suggest that an ESG-preference-based investment strategy achieves both financial and social objectives.

4.2 Fama-MacBeth Regressions

The results based on portfolio sorts reported in the previous section do not control for other characteristics that might affect stock returns. In this section, we test whether pollution emission information earns a premium that is distinct from other firm-level characteristics. We employ the standard Fama-MacBeth regression approach to control for other firm-level characteristics. We use the following model:

$$R_{i,t+1} = \alpha_t + \beta_t * \Delta Toxic_{i,t} + Ctrls_{i,t} + \epsilon_{i,t+1}. \tag{4.1}$$

The coefficient of interest is β_t, which shows how $\Delta Toxic$ predicts subsequent stock returns. In the specifications, we include several explanatory variables as control variables: firm size (Size), book-to-market ratio (BM), momentum (Mom), reversal (Rev), book leverage (Leverage), capital investment (CAPX/AT), gross profitability (GP), and idiosyncratic risk (Idiosyn.). Firm-level variables in the regressions are winsorized at the top and bottom 1% to reduce the influence of outliers. The hypothesis is that we should observe negative coefficients on $\Delta Toxic$ when investors consider ESG activity a positive attribute.

In Table 7, we report the estimation results. As seen in column (1), where only $\Delta Toxic$ is included, we find the time-series average of coefficients on $\Delta Toxic$ is -0.551 and statistically significant at the 1% level. The estimate suggests that a one-standard-deviation increase in

$\Delta Toxic$ (0.4) is associated with a 0.22% greater decrease in returns, which is consistent with previously reported portfolio results. The negative covariance between pollution abatement and returns is robust to other controls. In column (2), we include standard controls such as size, book-to-market, momentum, and reversal. We further add leverage, capital investment, profitability, and idiosyncratic risk variables and report the results in column (3). In both specifications, the coefficient estimates are still significantly negative (-0.41 in column(2), -0.361 in column (3)), implying that the outperformance of greener firms is not likely to be subsumed by other firm characteristics.

In columns (4) to (6), we include alternative investment measures other than CAPX/AT, since high $\Delta Toxic$ is simply a consequence of high investment. Therefore, we consider the asset growth ratio (AG) in column (4), and the growth rate of CAPX/AT (IG) in column (5). We also consider the R&D expenditure to asset ratio (XRD/AT) in column (6) because firm-level $\Delta Toxic$ may be related to the investment in green technology. In all, the negative coefficient estimates on $\Delta Toxic$ seem a robust feature of data.

5 Channels

5.1 Future Firm Performance

In this section, we examine whether polluting behavior also affects firm value and operating performance to investigate the potential channel for outperformance documented in the previous section. If our proposed measure of pollution abatement captures firm sustainability that enhances firm value, we should observe increases in firms' long-term valuation ratios and subsequent performance. To test the hypothesis, we examine yearly changes in Tobin's Q, cash flow, earnings surprise, and gross profitability as measures indicating changes in long-term valuations and operating performance.

As an additional channel through which greener firms create value, we also consider changes in institutional ownership exploiting 13F filings data from Thomson Reuters. The rationale behind this strategy is to investigate whether cleaner firms attract more institutional investors, who are relatively long-term investors, resulting in return outperformance documented in the previous section. To do this, we implement panel regressions as follows:

$$\Delta Y_{i,t+1} = \beta * \Delta Toxic_{i,t} + Ctrls_{i,t} + FEs + \epsilon_{i,t+1}. \tag{5.1}$$

For control variables, we add the logarithm of total assets, leverage, capital investment, and Tobin's Q.[14] In all specifications, we include industry (based on the Fama-French 48-industry classification) and year fixed effects. Standard errors are clustered at the industry level.

In Table 8, we report the panel regression results. To obtain the results reported in columns (1) and (2), we regress the change in Tobin's Q on $\Delta Toxic$ and other controls. The coefficient estimates of -0.036 (column (1)) and -0.021 (column (2)) for $\Delta Toxic$ indicate a decrease in firm value in the year after releasing more toxic chemicals. In terms of economic magnitude, a one-standard-deviation increase in $\Delta Toxic$ is associated with a 1.44% decrease in Tobin's Q (column (1)) compared to an average firm in the sample.

From column (3) to (6), we present the change in operating profits and earnings surprise as a consequence of toxic release. Similar to Tobin's Q, we find significant and negative coefficients on $\Delta Toxic$, indicating that the polluting firms tend to have poorer operating performance and more negative earnings surprise. Greener firms tend to show better earnings than the analysts' forecasts. The results collectively suggest that investors initially undervalue the firms in the greener portfolio, and the realized abnormal returns of the greener firms can be partially attributable to the investors' inattention to firm-level earnings growth of greener firms.

A similar finding is found for gross profitability, and results are reported in columns (7) and (8). We find that greener firms show outperformance by delivering higher gross profitability in the following year. A one-standard-deviation increase in $\Delta Toxic$ predicts a decrease in gross

[14] Tobin's Q is excluded from the set of control variables when the change in Tobin's Q is used as a dependent variable.

profitability by -0.52% (column (5)). To further examine the mechanism behind the outperformance of greener firms, we decompose gross profits into revenue and cost and evaluate the relative importance of cost reduction and revenue enhancement. The estimated results from column (9) to (12) suggest that the increase in revenue drives the overall change in gross profitability.

Lastly, in columns (1) and (4) in Table 9, we show that institutional investors on average reduce their holding of toxic firms after an increase in toxic material release, although the effect is not far from statistical significance when other controls are included. We then separate institutional holdings into two groups based on the classification introduced in Bushee (2001), namely long-term (i.e. "dedicated" institutions) and short-term ("transient" institutions) investors. It turns out to be that greener firms tend to attract more capital from a subset of institutional investors who prioritize long-term value creation. We show the results in column (2) in Table 9. The results on the changes in the average percentage of ownership held by institutional investors, shown in column (1), seem mainly driven by the changes in holdings by institutional investors with relatively longer investment horizons rather than investors with shorter investment horizons.

5.2 Social Trust

When we consider the demand-side explanations for CSR, one can hypothesize that the relationship between improvements in firm-level sustainability and subsequent returns is stronger the more the stakeholders of a firm value CSR. Given that firms' major stakeholders such as workers, consumers, and shareholders are largely geographically concentrated around its headquarters (Coval and Moskowitz (1999)), we capture the base of a firm's stakeholders as residents in regions in which a firm is headquartered. To measure the degree of residents' social trust, we utilize individual-level survey data and proxy regional level of trust by calculating the fraction of respondents whose answers are "Most people can be trusted." We construct an index of local stakeholders' social trust at region-year level.

We consider the level of social trust capturing local stakeholders' collective preference toward CSR and private provision of public goods. Since one of the core concepts of trust is reciprocity (i.e.,'the idea that "I will be good to you because I believe you will be good to me at some point in the future"') (Lins, Servaes and Tamayo (2017)) and cooperative norms, it is reasonable to expect that stakeholders with a stronger belief in social trust value firms that do their fair share in preserving the environment by internalizing some of the negative externalities (Baron (2008)). Similarly, these stakeholders may penalize toxic firms to a larger extent by showing lower demand for products or even engaging in a boycott.

We find support for the hypothesis and show the results in Table 10. To test the hypothesis, we sort firms into two portfolios using trust measure. Meanwhile, independently, firms are grouped into quintile portfolios based $\Delta Toxic$. As it turns out, the abnormal returns earned on an investment strategy that buys greener firms and shorts toxic firms are more pronounced among firms headquartered in regions with a high level of social trust. In particular, the significant dispersion in the subsequent returns is largely driven by the poorer performance of a toxic portfolio of firms headquartered in regions with high trust. Consumers and investors can reward greener firms for CSR expenses and penalize toxic firms for not enough CSR expense. We find the results suggesting the preferences of consumers, workers, and investors drive the relationship between sustainability and returns.

6 Conclusion

Our paper finds that firm-level ESG actions have important implications for managers and investors. Our results suggest that socially conscious managers and investors do not have to trade-off shareholders' value for being environmentally responsible. Making use of highly granular data on pollution emissions of production facilities, we find that improvements in corporate ESG actions create value.

Exploiting Court rulings that change the trajectory of average pollution abatement done by firms in the U.S. we find that stricter and broader environmental enforcement create shareholder value. By examining future stock returns based on a portfolio-based approach, we show that firms becoming cleaner outperform firms becoming more toxic with similar factor exposures. By forming quintile portfolios based on toxic releases, we show that investors earn alpha by taking a long position on a portfolio of the cleanest firms and taking a short position on the most toxic ones. For value-weighted returns, investors gain 4.3% alpha on the strategy. We also show that the alphas are driven by the premium earned on firm-level toxic releases. The announcement returns around the Court rulings and the long-and-short portfolio alphas are larger for firms located in regions with residents showing higher level of social trust. The results imply that preferences of stakeholders play a key role in linking CSR and subsequent returns.

Furthermore, we examine whether pollution abatement is associated with future financial and valuation performances. We find that firm-level toxic releases are negatively correlated with Tobin's Q, cash-flow profitability, gross profitability, and long-term investment among institutional investors in the next year. Additionally, firm-level sustainability is positively related to positive earnings surprises. The results suggest that clean firms show enhanced operating profitability and valuation ratios, which translates into subsequent returns.

Even though information on pollution emissions–the amount of toxic chemical releases from production facilities– is public and the reporting process is uniformly regulated by environmental laws, our results suggest pollution emissions information is slowly capitalized into stock prices. We show that environmentally conscious investors can construct a financially profitable strategy based on publicly available information on firm-level sustainability.

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Table 1: **Average Median Characteristics of Portfolios Sort on ($\Delta Toxic$)**

This Table reports average characteristics for firms in portfolios formed on the intensity of pollution abatement. Firms are grouped into quintile portfolios sorted by $\Delta Toxic$ using NYSE breakpoints at the end of each June.

Panel A: Sample Firm Characteristics						
	Mean	Median	SD	P25	P75	N
$\Delta Toxic$	0.020	0.000	0.398	-0.025	0.007	15998
log(AT)	6.981	6.904	1.900	5.637	8.243	15998
CAPX/AT	0.060	0.047	0.049	0.028	0.076	15900
Leverage	0.263	0.216	0.212	0.092	0.390	15974
Tobin's Q	1.616	1.359	0.839	1.078	1.847	15996
CF	0.150	0.143	0.092	0.097	0.199	15975
GP	0.370	0.335	0.206	0.223	0.478	15995
Panel B: Average Median Characteristics of Portfolios Sort on ($\Delta Toxic$)						
	All	L	2	3	4	H
$\Delta Toxic$	-0.001	-0.152	-0.016	-0.001	0.004	0.099
log(AT)	6.987	6.782	7.239	7.017	7.148	6.824
CAPX/AT	0.046	0.048	0.043	0.043	0.047	0.051
Leverage	0.222	0.272	0.219	0.184	0.197	0.254
Tobin's Q	1.359	1.257	1.375	1.463	1.445	1.294
CF	0.142	0.127	0.144	0.149	0.150	0.138
GP	0.334	0.285	0.338	0.387	0.364	0.300
Average # Firms	667	138	122	138	133	136

Table 2: **Announcement Returns Around the Court Decision on April 2, 2007**

This Table reports the results on stock price reactions surrounding the Supreme Court rulings on April 2, 2007. *High* Δ *Toxic* is an indicator variable that takes the value of one when firm-level $\Delta Toxic$ in 2006 comes in above the median value in the sample of firms reporting to the EPA's TRI program in 2006 and zero otherwise. *Firms with TRI Reporting* is an indicator variable that takes the value of one when a firm reports pollution emissions to the TRI program. Control variables include log of total assets, market leverage ratio, and Tobin's Q. Standard errors are clustered at the Fama-French 48 Industry level. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Panel A: Cross-sectional variations in CAR(-1,3)

	(1) RawRet(-1,3)	(2) CAPM-Adj(-1,3)	(3) FF-Adj(-1,3)
High Δ *Toxic*	0.698**	0.707**	0.716**
	(2.35)	(2.23)	(2.32)
Observations	601	601	601
R^2	15.44%	14.74%	14.81%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Panel B: Cross-sectional variations in CAR(-1,10)

	(1) RawRet(-1,10)	(2) CAPM-Adj(-1,10)	(3) FF-Adj(-1,10)
High Δ *Toxic*	0.657**	0.682*	0.714**
	(2.02)	(1.90)	(2.11)
Observations	601	601	601
R^2	14.22%	12.95%	13.47%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Panel C: Robustness

	(1) RawRet(-1,3)	(2) CAPM-Adj(-1,3)	(3) FF-Adj(-1,3)
High Δ *Toxic*	0.696**	0.703**	0.712**
	(2.34)	(2.21)	(2.30)
Lobbying Firms	0.096	0.203	0.184
	(0.30)	(0.67)	(0.59)
Observations	601	601	601
R^2	15.45%	14.79%	14.86%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Table 3: **Announcement Returns Around the Court Decision on June 29, 2015**

This Table reports the results on stock price reactions surrounding the Supreme Court rulings on June 29, 2015. *High Δ Toxic* is an indicator variable that takes the value of one when firm-level $\Delta Toxic$ in 2014 comes in above the median value in the sample of firms reporting to the EPA's TRI program in 2014 and zero otherwise. *Firms with TRI Reporting* is an indicator variable that takes the value of one when a firm reports pollution emissions to the TRI program. Control variables include log of total assets, market leverage ratio, and Tobin's Q. Standard errors are clustered at the Fama-French 48 Industry level. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Panel A: Cross-sectional variations in CAR(-1,3)

	(1) RawRet(-1,3)	(2) CAPM-Adj(-1,3)	(3) FF-Adj(-1,3)
High Δ Toxic	-0.753**	-0.673**	-0.669*
	(-2.36)	(-2.05)	(-1.99)
Observations	485	485	485
R^2	28.73%	27.49%	23.21%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Panel B: Cross-sectional variations in CAR(-1,10)

	(1) RawRet(-1,10)	(2) CAPM-Adj(-1,10)	(3) FF-Adj(-1,10)
High Δ Toxic	-1.120**	-1.123**	-1.087**
	(-2.39)	(-2.41)	(-2.22)
Observations	485	485	485
R^2	36.64%	36.03%	29.18%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Panel C: Robustness

	(1) RawRet(-1,3)	(2) CAPM-Adj(-1,3)	(3) FF-Adj(-1,3)
High Δ Toxic	-0.816**	-0.738**	-0.747**
	(-2.59)	(-2.29)	(-2.30)
Lobbying Firms	-0.686*	-0.693*	-0.836**
	(-1.88)	(-1.93)	(-2.29)
Observations	485	485	485
R^2	29.30%	28.09%	24.14%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Table 4: **Trust and Announcement Returns Around the Court Decision on April 2, 2007**

This Table reports the results on stock price reactions surrounding the Supreme Court rulings on April 2, 2007. *High Δ Toxic* is an indicator variable that takes the value of one when firm-level $\Delta Toxic$ in 2006 comes in above the median value in the sample of firms reporting to the EPA's TRI program in 2006 and zero otherwise. *Firms with TRI Reporting* is an indicator variable that takes the value of one when a firm reports pollution emissions to the TRI program. Control variables include log of total assets, market leverage ratio, and Tobin's Q. Standard errors are clustered at the Fama-French 48 Industry level. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Panel A: Announcement Returns in High Trust Regions

	(1) RawRet(-1.3)	(2) CAPM-Adj(-1.3)	(3) FF-Adj(-1.3)
High Δ Toxic	1.134***	1.140**	1.129**
	(2.75)	(2.45)	(2.45)
Observations	369	369	369
R^2	25.17%	23.77%	23.32%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Panel B: Announcement Returns in Low Trust Regions

	(1) RawRet(-1.3)	(2) CAPM-Adj(-1.3)	(3) FF-Adj(-1.3)
High Δ Toxic	-0.140	-0.177	-0.147
	(-0.24)	(-0.31)	(-0.25)
Observations	200	200	200
R^2	25.38%	25.62%	25.63%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Table 5: **Trust and Announcement Returns Around the Court Decision on June 29, 2015**

This Table reports the results on stock price reactions surrounding the Supreme Court rulings on June 29, 2015. *High* Δ *Toxic* is an indicator variable that takes the value of one when firm-level $\Delta Toxic$ in 2014 comes in above the median value in the sample of firms reporting to the EPA's TRI program in 2014 and zero otherwise. *Firms with TRI Reporting* is an indicator variable that takes the value of one when a firm reports pollution emissions to the TRI program. Control variables include log of total assets, market leverage ratio, and Tobin's Q. Standard errors are clustered at the Fama-French 48 Industry level. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Panel A: Cross-sectional Variations in Announcement Returns in High Trust Regions

	(1) RawRet(-1.3)	(2) CAPM-Adj(-1.3)	(3) FF-Adj(-1.3)
High Δ *Toxic*	-0.806**	-0.704**	-0.672*
	(-2.36)	(-2.07)	(-1.91)
Observations	345	345	345
R^2	23.93%	20.91%	16.76%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Panel B: Cross-sectional Variations in Announcement Returns in Low Trust Regions

	(1) RawRet(-1.3)	(2) CAPM-Adj(-1.3)	(3) FF-Adj(-1.3)
High Δ *Toxic*	-1.016	-1.144	-1.146
	(-1.05)	(-0.98)	(-0.94)
Observations	121	121	121
R^2	61.26%	58.81%	53.73%
Controls	Yes	Yes	Yes
FF48 Ind FE	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes

Table 6: **Average Portfolio Returns Sort on ($\Delta Toxic$)**

This Table provides average monthly returns and alphas for quintile portfolios sorted on sustainability measure ($\Delta Toxic$). Based on information available at the end of the previous years, we form equal- and value-weighted quintile portfolios in June of each year. Alphas are estimated from the Fama-French three- and five-factor models. Standard errors are calculated based on White (1980) standard errors. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Weight		L	2	3	4	H	H − L
EW	Excess Returns	1.164	1.037	1.077	0.920	0.831	-0.333***
		(3.43)	(3.37)	(3.42)	(2.96)	(2.66)	(-2.93)
	3 Factor Alpha	0.236	0.187	0.246	0.067	-0.014	-0.250**
		(1.73)	(1.54)	(2.36)	(0.58)	(-0.11)	(-2.21)
	5 Factor Alpha	0.156	0.045	0.179	-0.102	-0.141	-0.335***
		(1.01)	(0.36)	(1.50)	(-0.84)	(-0.97)	(-2.69)
VW	Excess Returns	0.836	0.645	0.643	0.678	0.467	-0.369**
		(3.17)	(2.67)	(2.54)	(2.97)	(1.65)	(-2.15)
	3 Factor Alpha	0.211	0.107	0.087	0.210	-0.192	-0.403**
		(1.65)	(0.96)	(0.85)	(1.68)	(-1.15)	(-2.28)
	5 Factor Alpha	0.066	-0.059	0.068	-0.053	-0.478	-0.420**
		(0.49)	(-0.52)	(0.66)	(-0.46)	(-2.72)	(-2.44)

Table 7: **Fama-MacBeth Regressions**

This Table provides the second stage Fama-MacBeth regressions of monthly excess stock returns on the sustainability measure ($\Delta Toxic$) along with a set of controls. Control variables include log market capitalization (Size), log book-to-market ratio (BM), past 12 month stock return skipping the most recent month (Mom), past 1 month stock return (Rev), capital investment (CAPX/AT), asset growth (AG), investment growth (IG), R&D expenditure (XRD), market leverage (Leverage), gross profitability (GP), idiosyncratic risk (Idiosyn.). Standard errors are calculated based on White (1980) standard errors. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Toxic$	-0.551***	-0.410***	-0.361**	-0.372**	-0.392***	-0.420***
	(-3.28)	(-2.80)	(-2.52)	(-2.55)	(-2.69)	(-2.90)
Size		-0.094**	-0.089	-0.09	-0.09	-0.084
		(-2.02)	(-1.37)	(-1.39)	(-1.39)	(-1.31)
BM		0.079	0.113	0.089	0.082	0.122
		(0.95)	(1.30)	(1.05)	(0.96)	(1.54)
Mom		0.003	0.003	0.003	0.003	0.002
		(0.85)	(0.89)	(0.90)	(0.84)	(0.72)
Rev		-0.034***	-0.037***	-0.036***	-0.036***	-0.036***
		(-4.78)	(-5.47)	(-5.37)	(-5.28)	(-5.44)
CAPX/AT			-2.944***			
			(-2.82)			
AG				-0.689***		
				(-3.10)		
IG					-5.108***	
					(-3.75)	
XRD/AT						5.539***
						(2.71)
G-Index						
E-Index						
Leverage			0.176	0.233	0.146	0.114
			(0.52)	(0.69)	(0.44)	(0.39)
GP			0.691**	0.549*	0.411	0.019
			(2.09)	(1.86)	(1.52)	(0.21)
Idiosyn.			-0.018	-0.011	-0.003	0.279
			(-0.20)	(-0.12)	(-0.03)	(0.83)
Intercept	0.997***	1.340***	1.259	1.141	1.143	0.987
	(3.23)	(2.84)	(1.65)	(1.46)	(1.47)	(1.31)
R^2	0.28%	5.19%	7.73%	7.61%	7.58%	8.03%
Observations	188022	170862	169505	170577	169144	170577

Table 8: **Long-term Valuation and Financial Performances**

This Table reports relationships between sustainability measure, $\Delta Toxic$, in year t and various performance measures in year $t+1$. The outcome variables are Tobin's Q, cash-flow profitability, gross profitability, and earnings surprises. Control variables include log of total assets, leverage, and capital investment. Standard errors are clustered at the Fama-French 48-industry level. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔQ		ΔCF		$\Delta Surprise$	
$\Delta Toxic$	-0.036***	-0.021**	-0.007**	-0.004*	-0.004***	-0.004**
	(-2.95)	(-2.06)	(-2.26)	(-1.70)	(-2.84)	(-2.68)
Controls	No	Yes	No	Yes	No	Yes
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes	Yes	Yes	Yes
R^2	12.08%	14.52%	5.53%	9.04%	3.37%	3.57%
N	14719	14610	14701	14588	12400	12323
	(7)	(8)	(9)	(10)	(11)	(12)
	ΔGP		$\Delta Revenue$		$\Delta Cost$	
$\Delta Toxic$	-0.013***	-0.008**	-0.035**	-0.021*	-0.023**	-0.014
	(-2.95)	(-2.28)	(-2.61)	(-1.78)	(-2.29)	(-1.52)
Controls	No	Yes	No	Yes	No	Yes
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes	Yes	Yes	Yes
R^2	5.44%	10.86%	7.01%	13.04%	6.77%	11.87%
N	14729	14616	14729	14616	14729	14616

Table 9: **Institutional Investors' Ownership**

This Table reports relationships between sustainability measure, $\Delta Toxic$, in year t and institutional ownership in year $t+1$. The outcome variables are percentage of ownership held by institutional investors, institutional investors with longer investment horizons, and institutional investors with shorter investment horizons. Control variables include log of total assets, leverage, and capital investment. Standard errors are clustered at the Fama-French 48-industry level. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta Inst.Holdings$		$\Delta Long\text{-}term$		$\Delta Short\text{-}term$	
$\Delta Toxic$	-0.011*	-0.010	-0.006*	-0.007**	-0.008	-0.006
	(-1.69)	(-1.44)	(-1.90)	(-2.10)	(-1.46)	(-1.05)
Controls	No	Yes	No	Yes	No	Yes
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
FF48 Ind Cluster	Yes	Yes	Yes	Yes	Yes	Yes
R^2	12.17%	12.24%	20.86%	20.80%	28.40%	28.90%
N	14661	14550	9969	9887	14166	14065

Table 10: **Average Portfolio Returns Sort on Trust and ($\Delta Toxic$)**

This Table provides average monthly returns and alphas for portfolios double sorted on trust and sustainability measure ($\Delta Toxic$). In June of each year, based on information available at the end of the previous years, we sort stocks into two portfolios using median value of trust measure. Meanwhile, independently, firms are grouped into quintile portfolios based on $\Delta Toxic$. We form both equal- and value-weighted portfolios. Alphas are estimated from the Fama-French three- and five-factor models. Standard errors are calculated based on White (1980) standard errors. Parentheses enclose t-statistics. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

			$\Delta Toxic$					
Weight	Type	$Trust$	L	2	3	4	H	H − L
EW	Excess Returns	Low	1.076	1.126	1.215	0.903	0.934	-0.142
			(2.82)	(3.19)	(3.52)	(2.67)	(2.65)	(-0.89)
		High	1.196	0.959	0.909	0.96	0.792	-0.404**
			(3.36)	(2.94)	(2.59)	(2.88)	(2.36)	(-2.52)
	FF3 Alpha	Low	0.171	0.261	0.401	0.077	0.086	-0.085
			(0.97)	(1.86)	(2.88)	(0.56)	(0.53)	(-0.53)
		High	0.338	0.175	0.087	0.15	-0.01	-0.348**
			(2.20)	(1.15)	(0.64)	(1.05)	(-0.06)	(-2.17)
	FF5 Alpha	Low	0.188	0.137	0.301	-0.108	-0.079	-0.194
			(0.96)	(0.93)	(1.87)	(-0.74)	(-0.44)	(-1.13)
		High	0.184	-0.028	0.002	-0.095	-0.14	-0.382**
			(1.12)	(-0.17)	(0.01)	(-0.65)	(-0.86)	(-2.22)
VW	Excess Returns	Low	0.935	0.583	0.804	0.859	0.657	-0.278
			(2.82)	(2.13)	(3.00)	(3.45)	(2.10)	(-1.09)
		High	1.015	0.688	0.667	0.575	0.337	-0.678**
			(3.57)	(2.38)	(2.03)	(2.19)	(0.96)	(-2.56)
	FF3 Alpha	Low	0.311	0.071	0.272	0.394	0.026	-0.285
			(1.61)	(0.38)	(1.79)	(2.34)	(0.13)	(-1.17)
		High	0.412	0.109	0.032	0.063	-0.398	-0.809***
			(2.39)	(0.70)	(0.19)	(0.39)	(-1.77)	(-3.04)
	FF5 Alpha	Low	0.202	-0.175	-0.007	0.063	-0.223	-0.268
			(0.97)	(-0.97)	(-0.05)	(0.36)	(-1.09)	(-1.13)
		High	0.171	0.012	0.184	-0.131	-0.628	-0.803***
			(0.96)	(0.08)	(1.09)	(-0.83)	(-2.73)	(-2.91)

Appendix A: Variable construction

$\Delta Toxic$ is the difference between the amount of total toxic releases in year t and t-1 (*Toxic Release* - *L.Toxic Release*) scaled by the beginning-of-the-year sales ($sale$).
$Capx/AT$ is the ratio of capital expenditure ($capex$) to beginning-of-the-year book value of assets (at).
CF, cash-flow, is defined as income before depreciation and amortization ($oibdp$) scaled by the beginning-of-the-year book value of assets (at).
$Leverage$ is the ratio of total outstanding debt ($dlcq + dlttq$) to beginning-of-the-year book value of assets (at).
$Tobin's\ Q$ is defined as the market-to-book ratio, where the numerator equals the market value of equity ($prcc_f * csho$) plus the book assets (at) minus the sum of the book value of common equity (ceq) and deferred taxes and investment credit ($txditc$), and the denominator is the book value of assets (at).
$Size$ is log of market capitalization ($csho * prcc_f$).
BM is the logarithm of the ratio of the book value of equity to the market value of equity following Fama and French (1993).
Mom is the 11-month return momentum, skipping the previous month.
Rev is the return over the previous month.
$Idiosyn.$ is the measure of idiosyncratic risk as the ratio of idiosyncratic volatility (obtained from the Fama-French three-factor model residual) to total volatility, following Ferreira and Laux (2007).
AG is the annual change in total assets divided by beginning-of-the-year book value of assets (at).
IG is the annual change in capital expenditure ($capex$) divided by beginning-of-the-year book value of assets (at).
XRD/AT is the R&D expenditure (xrd) divided by beginning-of-the-year book value of assets (at). We set the value of xrd equal to zero if missing.
GP, gross profitability, is the revenues ($revt$) minus cost of goods sold ($cogs$) scaled by the beginning-of-the-year book value of assets (at).
$Surprises$ is the difference between the actual earnings-per-share and the median analyst forecast 3 months prior to the end of the forecast period scaled by stock price on a day before the analyst forecasts.
$Revenue$ is the revenues ($revt$) scaled by the beginning-of-the-year book value of assets (at).
$Cost$ is cost of goods sold ($cogs$) scaled by the beginning-of-the-year book value of assets (at).
$Inst.Holdings$ is the proportion of institution holdings reported on 13-F filings.
$Long\text{-}term$ is the proportion of dedicated holders according to Bushee (2001) reported on 13-F filings.
$Short\text{-}term$ is the proportion of transient holders according to Bushee (2001) reported on 13-F filings.