

**DOCTOR OF PHILOSOPHY IN MANAGEMENT**

**ENVIRONMENTAL PERFORMANCE AND FIRM DECISIONS**

**By**

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**By**

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*To my Wife, Daughter, and Son*

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## ACRONYMS

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AEM	Accruals-based Earnings Management
BTM	Book To Market
CAR	Cumulative Abnormal Return
CEO	Chief Executive Officer
COGS	Cost of Goods Sold
CRSP	The Center for Research in Security Prices (database)
CSR	Corporate Social Responsibility
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESG	Environmental, Social, and Governance
FE	Fixed Effects
GHG	Greenhouse Gases
M&A	Mergers and Acquisitions
PRW	Production-Related Waste
R&D	Research and Development
REM	Real Earnings Management
ROA	Return on Assets
SDC	Securities Data Company (database)
SE	Shareholder Expense
SG&A	Selling, General, and Administrative
SPM	Sustainable Portfolio Management
SWM	Stakeholder Welfare Maximization
TRI	Toxic Release Inventory
U.S.	United States of America

# Abstract

A growing body of research in corporate finance examines the relationship between environmental, social, and governance (ESG) factors and corporate decisions/outcomes. A subset of this research examines how firm, board, and management characteristics influence ESG outcomes (Benabou and Tirole, 2010; Borghesi, Houston, and Naranjo, 2014). Another sub-stream of ESG research examines the effect of ESG variables on firm performance, cost of capital, and risk (Chava, 2014; Gillan, Koch, and Starks, 2021). While prior research has examined ESG motives and effects for broad samples, the role of ESG within specific contexts/decisions has not received much attention. In particular, very little is known about how ESG factors influence (i) acquisition and (ii) accounting decisions/outcomes. In this thesis, I aim to redress this gap in the Corporate Finance-ESG literature by examining how firm-level environmental variables (such as toxic waste and carbon emissions) influence firm decisions and outcomes during mergers and acquisitions and in relation to real earnings management activities. Chapter One provides the introduction of the Thesis.

Academics have recently begun to investigate the effect of ESG, or alternatively corporate social responsibility (CSR), during acquisitions. The evidence indicates that the acquirers' announcement date stock returns are positively related to their CSR performance (Deng, Kang, and Low, 2013). Further, acquirer stock prices increase when they acquire targets with socially responsible activities (Aktas, Bodt, and Cousin, 2011). Bereskin, Byun, Officer, and Oh (2018) show that the CSR similarity between the acquirers and targets increases the probability of being merged.

In Chapter Two, I contribute to this nascent literature by examining how the environmental component of ESG affects the target selection and deal outcomes during M&A. To do so, I assemble a dataset with a dependent variable that equals

## *Abstract*

whether or not a firm is acquired (obtained from the SDC M&A database) and independent variables that measure potential targets' environmental performance. The U.S. Environmental Protection Agency's (EPA) Toxic Release Inventory dataset (TRI) is my data source for environmental performance variables. TRI contains chemical-level and plant-level waste released, recycled, energy recovered, and treated that I aggregate to construct firm-level measures.

After manually matching TRI and Compustat firm names, my sample of potential targets (targets and non-targets) consists of 109,337 plant-year observations belonging to 13,048 unique plants. These plants belong to 1,461 different firms from 2005-2018. My final sample consists of 549 targets and 12,499 non-targets. The 549 deals involved 2,458 plants that were acquired between 2006 and 2019. My conditional logit regressions of target probability on environmental performance include control variables from prior literature that I obtain from Compustat and CRSP.

My main findings in Chapter Two are as follows. When targets release higher quantities of their production-related wastes into the environment (weaker environmental performance), they are less likely to be acquired. A one-standard deviation increase in target toxic releases is associated with a 10.66% decrease in the odds of being a target. My findings are consistent with the Stakeholder Welfare Maximization hypothesis, which posits that acquirers prefer targets with superior environmental performance, enabling the former to influence stakeholder perceptions. I find some evidence that waste management strategies of recycling, energy recovery, and treatment influence acquisition likelihood, but this evidence is not robust across specifications.

I complement my target likelihood evidence with evidence on how acquiring firm investors value target environmental performance. I find that acquirers' cumulative abnormal returns (CAR) on acquisition announcement dates are decreasing in target environmental performance. This price reaction evidence lends further support to the stakeholder welfare maximization view. To provide additional insights into inter-temporal variation in investor valuation of environmental

## *Abstract*

performance, I divide my sample based on Republican and Democratic Presidencies. Consistent with anecdotal evidence that Republicans (Democrats) care less (more) about environmental issues and could impose lower (higher) costs for poor environmental performance, I find that target toxic wastes are valued positively (negatively) during the Bush (Obama) Presidency.

My contributions in Chapter Two are as follows. First, I contribute to the growing body of literature that examines the effect of environmental performance on the financial decisions of firms. To my knowledge, this is the first study that examines whether acquirers consider environmental variables such as toxic emissions in their decision calculus when evaluating potential targets. Prior research has examined the role of target CSR activities but has not examined the environmental performance separately. My second contribution relates to the measurement of environmental performance. Existing studies use ESG ratings or ESG scores that could be potentially measured with error. Using objective firm-level environmental data makes my results less susceptible to measurement error and increases the credibility of my findings. My third contribution relates to the scope of environmental performance studied. Prior studies examining TRI data use the total quantity of toxic chemicals *released*. By expanding the analysis to firms' three waste management strategies – recycling, energy recovery, treatment, and total production-related waste, I provide a more comprehensive analysis of waste management outcomes.

Mergers and acquisitions create value through synergies (Bai, Jin, and Serfling, 2021). One possible source of synergy is the improvement in the environmental performance of the combined firm. Acquirers can either learn from targets with stronger environmental performance (learning hypothesis) or discipline the targets with poorer environmental performance and improve the overall environmental performance of the combined entity (disciplining hypothesis). Despite much research on mergers and acquisitions, there is no empirical evidence of how acquisitions alter the environmental performance of acquirers and targets.

In Chapter Three, I provide new evidence on how acquirers' and targets'

## *Abstract*

environmental performance evolve after acquisitions. I employ a sample of 2,333 acquirer plants and 673 target plants acquired through 182 deals from 2007 to 2016. My estimation method is a panel regression that includes firm, year, state, and plant fixed effects. I find that target plants improve their environmental performance by releasing lower amounts of toxic chemicals into the environment after the acquisition. Specifically, on average, target plants reduce their toxic chemical releases by 1.67 percentage points after the acquisition, with the results significant at a 10% level. This evidence is consistent with the view that the acquirers discipline targets after the acquisition. On the other hand, there is no significant change in the acquirer's performance, inconsistent with the learning hypothesis.

I make three contributions to the M&A and Corporate Finance literatures in Chapter Three. First, I contribute to the research that examines the sources of efficiency gains from mergers. Maksimovic, Phillips, and Prabhala (2011) show that M&A improves productivity through resource reallocation. Bai, Jin, and Serfling (2021) show that value is created by adopting structured management practices after M&A deals. I contribute to this literature by showing that the improvement in environmental performance creates value.

The post-acquisition behavior of targets has been a black box since acquirers do not disclose target financials after the acquisition. Acquirers prepare consolidated financial statements for the combined entity; hence, it is impossible to track the performance of acquirers and targets separately (Erel, Jang, and Weisbach, 2015). By examining the post-acquisition environmental performance of target plants, I provide new insights into how target firms behave in the post-merger period. This is my second contribution to the literature.

Finally, I add to the growing literature that studies corporate events' impact on firms' environmental performance. Lyu, Shan, and Tang (2022) show that the firms' toxic chemicals released increase after the debt issuance. Xu and Kim (2022) show that financial constraints increase firms' toxic emissions. I contribute to this literature by examining the relationship between M&A and environmental performance.



## *Abstract*

Recent research documents that investors are reducing their exposure to carbon-intensive industries and are increasing their exposure to socially responsible firms (McCahery, Sautner, and Starks, 2016; Choi, Gao, Jiang, and Zhang, 2021; Boermans and Galema, 2019). Further, this research shows that carbon-intensive firm valuations decrease after increased public attention to climate activism (Ramelli, Ossola, and Rancan, 2021) and firm disclosures about carbon emissions (Matsumura, Prakash, and Vera-muñoz, 2014). Overall, environmental performance is increasingly influencing investor perceptions of firm value.

In response to investor concerns about firms' environmental performance, firms with higher carbon risk can (a) try to reduce the carbon risk and improve their environmental performance or (b) show better earnings and profitability to reduce the negative impression of poor environmental performance. Managerial actions undertaken to report better earnings are defined as real earnings management (REM) activities (Roychowdhury, 2006; Cohen and Zarowin, 2010). In Chapter Four, I study the relationship between real earnings management by firms and their Greenhouse Gas (GHG) emissions. I propose and test if firms engage in REM and improve their reported performance to reduce negative perceptions of poor environmental performance.

To conduct my tests, I measure REM using the measures proposed by RoyChowdhury (2006). These measures are abnormal production, abnormal R&D expenses, abnormal advertising expenses, abnormal other selling, general, and administrative (SG&A) expenses, and abnormal cash flows. To measure greenhouse gas (GHG) emissions, I obtain data from the United States Environment Protection Agency (EPA) website. My sample period is 2010-2015, which relates to 2,639 plants belonging to 448 U.S. public firms.

My results are as follows. I show that most measures of REM are positively related to GHG emissions. I find that a ten percent increase in carbon emissions results in a 0.18% increase in abnormal production levels (or a 10.55% increase in abnormal production at its median). Similarly, a 10% increase in carbon emissions is associated

## *Abstract*

with an 0.12% reduction in abnormal selling, general, and administrative expenses (or a 2.5% decrease in abnormal SG&A at its median). Two of SG&A's components, advertising expense and other SG&A, also exhibit statistically significant reductions when GHG emissions increase. Additionally, consistent with firms offering lenient credit terms and discounts to customers, abnormal cash flows decline in response to emission increases. The evidence suggests that firm modify their real activities to improve profits to counteract the negative perceptions created by higher emissions.

This relationship between GHG emissions and real earnings management behavior could be afflicted by reverse causality. Firms' real decisions related to production and discretionary spending could influence GHG emissions. To address endogeneity, I use a quasi-natural experiment that allows me to capture an exogenous increase in emissions related to a regulatory change - the California cap-and-trade program was signed in December 2011 and was implemented in January 2013. This program set annual limits (caps) on GHG emission levels for firms with plants in California. Because lowering emission levels can involve lowering production levels that can lead to lost sales or investing in costly abatement technology that would lower profits, I predict that firms will engage in REM to offset the lower profits. I find modest evidence consistent with this prediction. Firms with plants in California engage in over-production and exhibit abnormally lower cash flows in the years following the enactment of the cap-and-trade regulation.

To provide additional insights into the effect of emissions on REM, I build on recent work by Bartram, Hou, and Kim (2021). Bartram et al., (2021) examine the California cap-and-trade program's effect on financially constrained firms with plants in California. They show that these financially constrained firms shift their production to other states to avoid the regulatory costs of the program. Interestingly, they find that the financially constrained firms' overall emissions increased after the program. Taking this increase as a stylized fact, I predict that financially constrained firms with plants in California are more likely to engage in REM. I measure the financial constraints of firms using three measures from the prior literature, Kaplan and

## *Abstract*

Zingales (1997), Hadlock and Pierce (2010), and Whited and Wu (2006). I create two indicators of financial constraints – moderately financially constrained and severely financially constrained.

I find that severely constrained firms report abnormally higher production and lower SG&A expenses than their less constrained counterparts in response to emission increases after the regulations. Within SG&A expenses, they have lower advertising expenses and other SG&A. In sum, my findings suggest that increases in emissions are associated with higher REM levels, especially for financially constrained firms. I conclude that the pressure to reduce the negative impression associated with toxic emissions causes firms to distort short-term decisions.

In Chapter Four, I make three contributions to the literature. First, I add to the growing literature that studies the relationship between environmental performance and firm behavior by examining the former's impact on real earnings management. Second, I evaluate the causal impact of emissions on real earnings management using a quasi-natural experiment. Third, many existing studies that study the relationship between greenhouse gas emissions and firm characteristics use environmental scores or greenhouse gas emissions estimated by a vendor. Aswani, Raghunandan, and Rajgopal (2021) show that vendor-estimated emissions exhibit systematic differences from firm-disclosed emissions. I contribute to the literature by using plant-level greenhouse gas emissions data from the EPA, which is arguably of higher quality.